

CHAPTER 15:

Creating and Interpreting the TIMSS 2015 Context Questionnaire Scales

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Overview

As described in [Chapter 2: Developing the TIMSS 2015 Context Questionnaires](#), many of the TIMSS 2015 context questionnaire items were developed to be combined into scales measuring a single underlying latent construct. For reporting, the scales were constructed using item response theory (IRT) scaling methods, specifically the Rasch partial credit model (Masters and Wright, 1997). As a parallel to the TIMSS International Benchmarks of achievement, each context scale allowed students to be classified into regions corresponding to high, middle, and low values on the construct. To facilitate interpretation of the regions, the cutpoints delimiting the regions were defined in terms of combinations of response categories. For certain scales that maintained many of the same items across TIMSS 2011 and TIMSS 2015, the scales were linked to allow for trend measurement on the background construct.

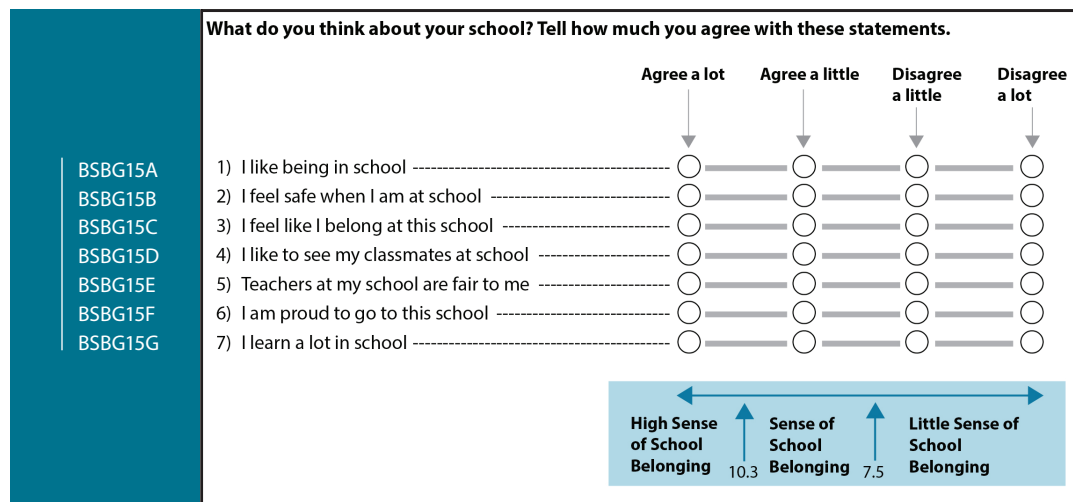
This chapter describes the procedures for constructing, interpreting, and validating scales based on responses to student, teacher, school, and home questionnaires, and then details the process for linking and reporting trend scales.

Reporting TIMSS 2015 Context Questionnaire Scales

As an example illustrating the TIMSS approach to reporting context questionnaire data, Exhibit 15.1 presents the TIMSS 2015 *Students' Sense of School Belonging* scale at the eighth grade, a scale that was reported for the first time for the 2015 assessment. As the name suggests, this scale seeks

to measure students’ feelings towards their school and connectedness with the school community. For each of the seven statements, students were asked to indicate the degree of their agreement with the statement: agree a lot, agree a little, disagree a little, or disagree a lot. Using IRT partial credit scaling, the data from student responses were placed on a scale constructed so that the scale centerpoint of 10 was located at the mean score across all TIMSS countries. The units of the scale were chosen so that 2 scale score points corresponded to the standard deviation across all countries. Students with a High Sense of School Belonging had a scale score greater than or equal to the point on the scale, 10.3 in this case, corresponding to agreeing a lot, on average, with four of the seven statements and agreeing a little with three of the statements. Students with Little Sense of School Belonging had a score no higher than the point (7.5) on the scale corresponding to disagreeing a little with four of the statements, on average, and agreeing a little with three of them.

Exhibit 15.1: Items in the TIMSS 2015 *Students’ Sense of School Belonging* Scale, Eighth Grade



Scaling Procedure

Partial credit IRT scaling is based on a statistical model that relates the probability that a person will choose a particular response to an item to that person’s location on the underlying construct. In the TIMSS 2015 *Students’ Sense of School Belonging* scale, the underlying construct is students’ feelings about their school, and students who agree in general with the seven statements are assumed to have a greater sense of belonging and students who disagree with the statements are assumed to feel less belonging.

The partial credit model is shown below:

$$P_{x_i}(\theta_n) = \frac{e^{\sum_{j=0}^{x_i} (\theta_n - \delta_i + \tau_{ij})}}{\sum_{h=0}^{m_i} e^{\sum_{j=0}^{x_i} (\theta_n - \delta_i + \tau_{ij})}} \quad x_i = 0, 1, \dots, m_i$$

where $P_{x_i}(\theta_n)$ denotes the probability that person n with location θ_n on the latent construct would choose response level x_i to item i out of the m_i possible response levels for the item. The item parameter δ_i gives the location of the item on the latent construct and τ_{ij} denotes step parameters for the response levels. For each scale, the scaling procedure involves first estimating the δ_i and τ_{ij} item parameters, and then using the model with these parameters to estimate θ_n , the score on the latent construct, for each on the n respondents. Depending on the scale, respondents may be students, parents, teachers, or school principals.

The TIMSS 2015 context questionnaire scaling was conducted using the ConQuest 2.0 software (Wu, Adams, Wilson, & Haldane, 2007).

In preparation for the context questionnaire scaling effort, the TIMSS & PIRLS International Study Center developed a system of production programs that could effectively calibrate the items on each scale using ConQuest and produce scale scores for each scale respondent. Each assessment population (TIMSS fourth grade, TIMSS eighth grade) consisted of approximately 300,000 students, as well as their parents, teachers, and school principals. The estimation of the item parameters, a procedure also known as item calibration, was conducted on the combined data from all countries, with each country contributing equally to the calibration. This was achieved by assigning weights that sum to 500 for each country's student data. Exhibit 15.2 shows the international item parameters for the *Students' Sense of School Belonging* scale. For each item, the delta parameter δ_i shows the estimated overall location of the item on the scale, and the tau parameters τ_{ij} show the location of the steps, expressed as deviations from delta. Also, included in the right column is the Rasch infit item statistic, which is a measure of how well the data matches the model, with values above 1.3 indicating unexpected response patterns. As can be seen in this exhibit, the data seemed to match the model well for the seven items of the *Belonging* scale.

Exhibit 15.2: Item Parameters for the TIMSS 2015 *Students' Sense of School Belonging* Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|---------|----------|----------|----------|---------|-------|
| BSBG15A | 0.38218 | -0.95870 | -0.74432 | 1.70302 | 1.01 |
| BSBG15B | 0.07288 | -0.94599 | -0.58632 | 1.53231 | 0.99 |
| BSBG15C | 0.21160 | -0.83609 | -0.55012 | 1.38621 | 0.94 |
| BSBG15D | -0.73119 | -0.52286 | -0.46686 | 0.98972 | 1.17 |
| BSBG15E | 0.20067 | -0.98123 | -0.56256 | 1.54379 | 1.12 |
| BSBG15F | 0.26647 | -0.76246 | -0.50391 | 1.26637 | 0.91 |
| BSBG15G | -0.40261 | -0.89880 | -0.61886 | 1.51766 | 0.98 |

Once the calibration was completed and international item parameters were estimated, individual scores for each respondent (students, teachers, principals, or parents) were generated using weighted maximum likelihood estimation (Warm, 1989). All cases with valid responses to at least two items on a scale were included in the calibration and scoring processes.

The scale scores produced by the weighted likelihood estimation are in the logit metric with measured values ranging from approximately -5 to $+5$. To convert to a more convenient reporting metric, a linear transformation was applied to the international distribution of logit scores for each scale, so that the resulting distribution across all countries had a mean of 10 and a standard deviation of 2. Exhibit 15.3 presents the scale transformation constants applied to the international distribution of logit scores for the *Students' Sense of School Belonging* scale to transform them to the (10, 2) reporting metric.

Exhibit 15.3: Scale Transformation Constants for the TIMSS 2015 *Students' Sense of School Belonging* Scale, Eighth Grade

Scale Transformation Constants

$$A = 7.847376$$

$$B = 1.363355$$

$$\text{Transformed Scale Score} = 7.847376 + 1.363355 \cdot \text{Logit Scale Score}$$

To provide an approach to reporting the context questionnaire scales analogous to the TIMSS International Benchmarks for the TIMSS achievement scales, a method was developed to divide each scale into high, middle, and low regions and provide a content-referenced interpretation for these regions. For the TIMSS achievement scales, the Low, Intermediate, High, and Advanced International Benchmarks are specific reference points on the scale that can be used to monitor progress in student achievement. Using a [scale anchoring procedure](#), student performance at each Benchmark is described in terms of the mathematics and science (depending on the subject) that students reaching that Benchmark know and can do. The percentage of students reaching each of these International Benchmarks can serve as a profile of student achievement in a country.

For the high, middle, and low regions of the context questionnaire scales, the interpretation is content-referenced to the extent that the boundaries of the regions were defined in terms of identifiable combinations of response categories. The particular response combinations that defined the regions boundaries, or cutpoints, were based on a judgment of what constituted a high or low region on each individual scale. For example, based on a consideration of the questions making up the *Students' Sense of School Belonging* scale, it was determined that in order to be in the high region of the scale and labeled “High Sense of School Belonging,” a student would have to agree a lot, on average, to at least four of the seven statements and agree a little to the other three. Similarly, it was determined that a student who, on average, at most agreed a little with three of the statements and disagreed a little with the other four would be labeled to have “Little Sense of School Belonging.”

The scale region cutpoints were quantified by assigning a numeric value to each response category, such that each respondent's responses to the scale's questions could be expressed as a "raw score." Assigning 0 to "Disagree a lot," 1 to "Disagree a little," 2 to "Agree a little," and 3 to "Agree a lot," results in raw scores on the *Students' Sense of School Belonging* scale ranging from 0 (disagree a lot with all seven statements) to 21 (agree a lot to all seven). A student who agreed a lot with four statements and agreed a little with the other three would have a raw score of 18 ($4 \times 3 + 3 \times 2$). Following this approach, a student with a raw score of 18 or more would be in the "High Sense of School Belonging" region of the scale. Similarly, agreeing a little with three statements and disagreeing a little with four statements would result in a raw score of 10 ($3 \times 2 + 4 \times 1$), so that a student with a raw score less than or equal to 10 would be in the "Little Sense of School Belonging" region.

A property of a Rasch scale is that each raw score has a unique scale score associated with it. Exhibit 15.4 presents a raw score-scale score equivalence table for the *Students' Sense of School Belonging* scale. From this table, it can be seen that a raw score of 10 corresponds to a scale score of 7.5 (rounding up) and a raw score of 18 corresponds to a scale score of 10.3 (rounding down).¹ These scale scores were the cutpoints used to divide the scale into the three regions.

¹ The reason for rounding was to facilitate reporting, and it was decided that the highest cutpoint would be rounded down to ensure that those with an unrounded scale score (e.g., 10.39858 for the *Belonging* scale) at the cutpoint were included within the highest region. For a similar reason, the lower cutpoint was rounded up.

Exhibit 15.4: Equivalence Table of Raw and Transformed Scale Scores for the TIMSS 2015 *Students' Sense of School Belonging Scale, Eighth Grade*

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 3.04846 | |
| 1 | 4.43161 | |
| 2 | 5.08351 | |
| 3 | 5.53680 | |
| 4 | 5.89159 | |
| 5 | 6.19976 | |
| 6 | 6.47840 | |
| 7 | 6.73927 | |
| 8 | 6.99036 | |
| 9 | 7.23785 | |
| 10 | 7.48892 | 7.5 |
| 11 | 7.74446 | |
| 12 | 8.01437 | |
| 13 | 8.30564 | |
| 14 | 8.62531 | |
| 15 | 8.98361 | |
| 16 | 9.39043 | |
| 17 | 9.85678 | |
| 18 | 10.39858 | 10.3 |
| 19 | 11.05536 | |
| 20 | 11.94384 | |
| 21 | 13.62245 | |

Linking Procedures for Trend Context Questionnaire Scales

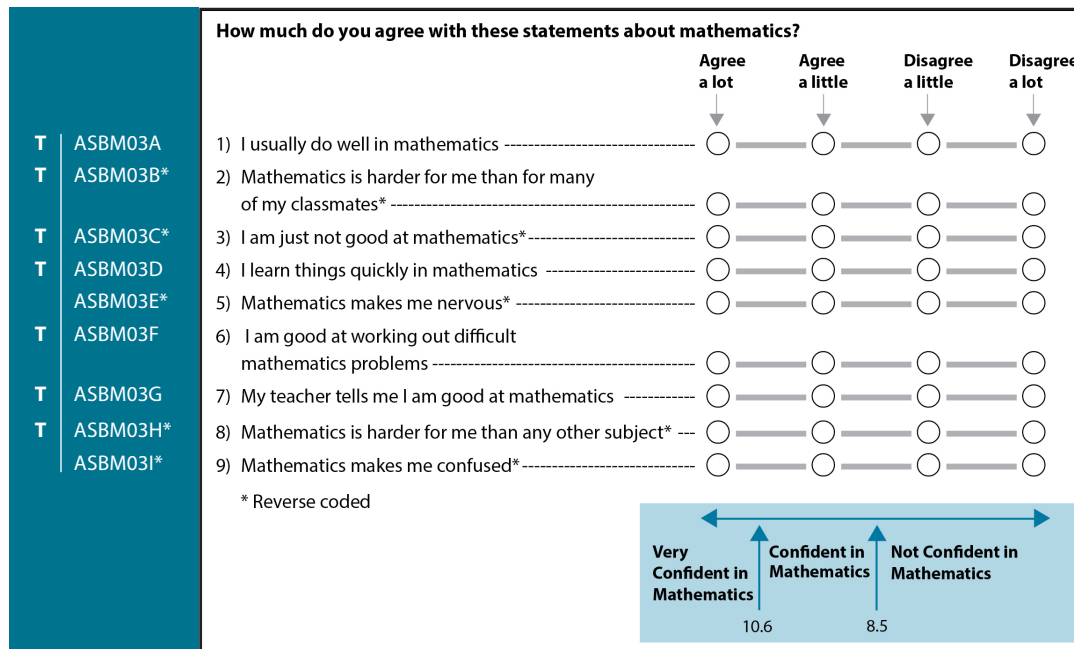
As a new initiative, trend results in the form of changes from 2011 to 2015 were reported for 12 fourth grade and 20 eighth grade context questionnaire scales. For these trend scales, linking procedures were implemented to place the data from the two cycles on a common metric. This section describes the procedures for measuring trends—placing data for the TIMSS 2015 context questionnaire scales onto the TIMSS 2011 metric and validating this process.

As described in [Chapter 2](#), with each cycle of TIMSS, the questionnaires are revised to keep up with the times and to improve the measurement of the constructs. Using context questionnaire IRT scales to measure background constructs began with TIMSS 2011, and during the development phase of the TIMSS 2015 questionnaires, a conscious effort was made to increase the number of items contributing to each scale in order to enhance scale reliability. The context scales used to

measure trends in TIMSS 2015 have items common to both TIMSS 2011 and TIMSS 2015—also called trend items—and new items unique to TIMSS 2015. Generally, a context questionnaire scale was considered for trend reporting in 2015 if it had a sufficient number of items in common with 2011: a minimum of 5 common items and more than half of the TIMSS 2015 items being common items.

As an example, Exhibit 15.5 shows the TIMSS 2015 *Students Confident in Mathematics* scale for fourth grade students—one of the scales where trend measurement was reported. This scale measures how confident students feel about their ability in mathematics, in terms of their level of agreement with nine statements about mathematics. Statements expressing negative sentiment were reverse coded during the scaling. Seven of the nine statements were common to the TIMSS 2011 and TIMSS 2015 versions of this scale, with ‘T’ for trend identifying these items to the left of their variable name. Two new statements were added to the seven common items to improve the measure of *Students Confident in Mathematics* for TIMSS 2015.

Exhibit 15.5: Items in the TIMSS 2015 *Students Confident in Mathematics* Trend Scale, Fourth Grade



T Trend item—item was included in the same scale in TIMSS 2011 and was used for linking the TIMSS 2011 and TIMSS 2015 scales.

The IRT calibration and scoring methods for trend scales were the same as those used for the new context scales. The data for these nine items were calibrated across all TIMSS 2015 countries using the Rasch partial credit model, and, through this calibration, item parameters were estimated on a logit scale that was unique to the 2015 cycle. Following calibration, weighted maximum likelihood estimation was used to derive Rasch logit scale scores based on these estimated item

parameters for all countries and benchmarking participants, and as such student scores were placed on this 2015 logit metric. Although similar, the TIMSS 2015 logit metric is not identical to the TIMSS 2011 logit metric, and thus the TIMSS 2015 scores needed to be transformed to the 2011 metric to allow for trend reporting.

This linking was achieved through a two-step transformation process. The first transformation—with linear constants A_1 and B_1 —placed the TIMSS 2015 logit scale scores on the TIMSS 2011 logit metric, and the second transformation—with linear constants A_2 and B_2 —transformed the TIMSS 2011 logit metric to the TIMSS scale metric, which uses the (10, 2) metric described earlier. To increase the efficiency of this transformation process and reduce rounding errors, both transformations were combined into one calculation using the equations below to create a set of final scale transformation constants, A and B :

$$B = B_2 \cdot B_1$$

$$A = A_2 + B_2 \cdot A_1$$

The first set of transformation parameters, A_1 and B_1 , were obtained by applying the mean/sigma method (Kolen & Brennan, 2004) to the two sets of common item parameters: one from the current calibration of TIMSS 2015 data and the other from the previous calibration of TIMSS 2011 data. The mean and standard deviation of the estimates of the difference between item location and item step parameter, $(\delta_i - \tau_{ij})$, were first found over all common items and all categories for each calibration. The transformation parameters A_1 and B_1 were calculated based on these two sets of means and standard deviations:

$$B_1 = \frac{SD_{c11}}{SD_{c15}}$$

$$A_1 = MN_{c11} - \frac{SD_{c11}}{SD_{c15}} \cdot MN_{c15}$$

where MN_{c15} and SD_{c15} are the mean and standard deviation of the estimates of $(\delta_i - \tau_{ij})$ of all common items and categories from the current calibration on TIMSS 2015 data; MN_{c11} and SD_{c11} are the mean and standard deviation of the estimates of $(\delta_i - \tau_{ij})$ of all common items and categories from the previous calibration on TIMSS 2011 data.

The second set of transformation parameters, A_2 and B_2 , were retrieved from the scale transformations which were established in 2011 for reporting. This transformation aimed to place the resulting Rasch scores on the TIMSS (10, 2) trend reporting metric.

Exhibit 15.6 presents the final trend scale transformation constants applied to the TIMSS 2015 international distribution of logit scale scores for the *Students Confident in Mathematics* trend scale to transform them to the (10, 2) trend reporting metric.

Exhibit 15.6: Scale Transformation Constants for the TIMSS 2015 *Students Confident in Mathematics* Scale, Fourth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 8.5562 | Transformed Scale Score = 8.5562 + 1.599041 • Logit Scale Score |
| B = 1.599041 | |

To assess the accuracy of the linking, item parameter estimates for the trend items were compared across the two cycles by examining the differences between the TIMSS 2015 item parameter estimates after being transformed to the TIMSS 2011 logit metric, and the TIMSS 2011 item parameter estimates on the 2011 logit scale. Exhibit 15.7 presents the differences between these estimates for the *Students Confident in Mathematics* trend scale. As can be seen in the exhibit, the differences were at an acceptable level for both location and step parameters, with most deviations being less than 0.1.

Exhibit 15.7: Differences in Parameter Estimates for Common Items on the TIMSS 2011 Logit Metric, *Students Confident in Mathematics* Scale, Fourth Grade

| TIMSS 2015 Variable | TIMSS 2011 Variable | Difference in delta | Difference in tau_1 | Difference in tau_2 | Difference in tau_3 |
|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| ASBM03A | ASBM03A | 0.01907 | -0.01847 | -0.08334 | 0.10181 |
| ASBM03B* | ASBM03B* | 0.07164 | 0.00355 | -0.07789 | 0.07434 |
| ASBM03C* | ASBM03C* | -0.05559 | -0.00555 | -0.03665 | 0.04220 |
| ASBM03D | ASBM03D | 0.02644 | 0.07476 | -0.07052 | -0.00424 |
| ASBM03F | ASBM03E | 0.05700 | 0.08382 | -0.02372 | -0.06010 |
| ASBM03G | ASBM03F | -0.08982 | 0.04175 | -0.03405 | -0.00770 |
| ASBM03H* | ASBM03G* | -0.02875 | -0.01985 | -0.03125 | 0.05110 |

* Reverse coded

Validating the TIMSS 2015 Context Questionnaire Scales

As evidence that the context questionnaire scales provide comparable measurement across countries, reliability coefficients were computed for each scale for every country and benchmarking participant, and a principal components analysis of the scale items was conducted. Exhibit 15.8 presents the results of this analysis for the *Students Confident in Mathematics* scale. The Cronbach's Alpha reliability coefficients generally were at an acceptable level, with almost all above 0.7 and many above 0.8. The exhibit also shows the percentage of variance among the scale items accounted for by the first principal component in each country. In most cases this was acceptably high, indicating that the items could be adequately represented by a single scale. The component loadings of each questionnaire item from the principal components analysis are positive and substantial, indicating a strong correlation between each item and the scale in every country.

Exhibit 15.8: Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the TIMSS 2015 *Students Confident in Mathematics* Scale, Fourth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | | |
|-----------------------|--|-------------------------------|----------------------------------|----------|----------|---------|----------|---------|---------|----------|----------|--|
| | | | ASBM03A | ASBM03B* | ASBM03C* | ASBM03D | ASBM03E* | ASBM03F | ASBM03G | ASBM03H* | ASBM03I* | |
| Australia | 0.87 | 50 | 0.74 | 0.71 | 0.78 | 0.71 | 0.65 | 0.74 | 0.42 | 0.78 | 0.74 | |
| Bahrain | 0.76 | 35 | 0.18 | 0.72 | 0.74 | 0.38 | 0.73 | 0.34 | 0.33 | 0.79 | 0.74 | |
| Belgium (Flemish) | 0.88 | 52 | 0.81 | 0.76 | 0.82 | 0.70 | 0.50 | 0.71 | 0.60 | 0.80 | 0.72 | |
| Bulgaria | 0.87 | 49 | 0.73 | 0.70 | 0.73 | 0.71 | 0.62 | 0.70 | 0.66 | 0.74 | 0.73 | |
| Canada | 0.86 | 48 | 0.73 | 0.75 | 0.77 | 0.70 | 0.63 | 0.69 | 0.38 | 0.78 | 0.74 | |
| Chile | 0.82 | 41 | 0.65 | 0.60 | 0.70 | 0.64 | 0.64 | 0.61 | 0.44 | 0.72 | 0.75 | |
| Chinese Taipei | 0.86 | 48 | 0.74 | 0.68 | 0.65 | 0.74 | 0.57 | 0.70 | 0.62 | 0.75 | 0.76 | |
| Croatia | 0.89 | 53 | 0.75 | 0.73 | 0.71 | 0.76 | 0.69 | 0.70 | 0.67 | 0.77 | 0.78 | |
| Cyprus | 0.86 | 47 | 0.71 | 0.68 | 0.71 | 0.68 | 0.61 | 0.70 | 0.59 | 0.73 | 0.74 | |
| Czech Republic | 0.88 | 51 | 0.74 | 0.74 | 0.80 | 0.75 | 0.64 | 0.59 | 0.61 | 0.78 | 0.73 | |
| Denmark | 0.87 | 50 | 0.78 | 0.75 | 0.80 | 0.74 | 0.58 | 0.63 | 0.54 | 0.75 | 0.74 | |
| England | 0.87 | 49 | 0.73 | 0.70 | 0.78 | 0.71 | 0.64 | 0.72 | 0.36 | 0.79 | 0.76 | |
| Finland | 0.86 | 49 | 0.78 | 0.73 | 0.81 | 0.74 | 0.64 | 0.70 | 0.52 | 0.77 | 0.53 | |
| France | 0.87 | 50 | 0.75 | 0.72 | 0.77 | 0.74 | 0.64 | 0.61 | 0.54 | 0.76 | 0.77 | |
| Georgia | 0.76 | 35 | 0.38 | 0.71 | 0.73 | 0.44 | 0.65 | 0.32 | 0.39 | 0.75 | 0.70 | |
| Germany | 0.89 | 53 | 0.76 | 0.76 | 0.80 | 0.74 | 0.66 | 0.70 | 0.63 | 0.77 | 0.73 | |
| Hong Kong SAR | 0.86 | 48 | 0.72 | 0.68 | 0.81 | 0.71 | 0.56 | 0.71 | 0.60 | 0.77 | 0.63 | |
| Hungary | 0.88 | 52 | 0.78 | 0.72 | 0.78 | 0.76 | 0.56 | 0.74 | 0.72 | 0.74 | 0.68 | |
| Indonesia | 0.75 | 34 | 0.37 | 0.70 | 0.73 | 0.41 | 0.70 | 0.16 | 0.32 | 0.75 | 0.76 | |
| Iran, Islamic Rep. of | 0.76 | 34 | 0.50 | 0.56 | 0.50 | 0.52 | 0.68 | 0.52 | 0.49 | 0.72 | 0.72 | |
| Ireland | 0.85 | 48 | 0.73 | 0.75 | 0.77 | 0.70 | 0.63 | 0.69 | 0.29 | 0.78 | 0.74 | |
| Italy | 0.85 | 45 | 0.69 | 0.70 | 0.64 | 0.71 | 0.66 | 0.59 | 0.60 | 0.75 | 0.71 | |
| Japan | 0.88 | 50 | 0.71 | 0.67 | 0.83 | 0.72 | 0.66 | 0.77 | 0.46 | 0.75 | 0.75 | |
| Jordan | 0.75 | 35 | 0.09 | 0.73 | 0.76 | 0.26 | 0.78 | 0.17 | 0.25 | 0.80 | 0.77 | |
| Kazakhstan | 0.85 | 45 | 0.68 | 0.69 | 0.72 | 0.66 | 0.62 | 0.66 | 0.65 | 0.72 | 0.64 | |
| Korea, Rep. of | 0.88 | 53 | 0.82 | 0.78 | 0.78 | 0.73 | 0.43 | 0.79 | 0.56 | 0.80 | 0.76 | |
| Kuwait | 0.75 | 33 | 0.22 | 0.68 | 0.70 | 0.40 | 0.71 | 0.36 | 0.39 | 0.75 | 0.70 | |
| Lithuania | 0.84 | 45 | 0.75 | 0.70 | 0.75 | 0.66 | 0.48 | 0.69 | 0.62 | 0.72 | 0.59 | |
| Morocco | 0.74 | 32 | 0.39 | 0.66 | 0.71 | 0.35 | 0.71 | 0.27 | 0.32 | 0.72 | 0.70 | |
| Netherlands | 0.89 | 54 | 0.80 | 0.77 | 0.82 | 0.74 | 0.46 | 0.77 | 0.53 | 0.80 | 0.82 | |
| New Zealand | 0.83 | 42 | 0.70 | 0.66 | 0.74 | 0.66 | 0.54 | 0.67 | 0.42 | 0.72 | 0.67 | |
| Northern Ireland | 0.87 | 49 | 0.77 | 0.74 | 0.79 | 0.70 | 0.66 | 0.71 | 0.31 | 0.76 | 0.76 | |

* Reverse coded

Exhibit 15.8: Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the TIMSS 2015 *Students Confident in Mathematics Scale, Fourth Grade* (Continued)

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|----------|----------|---------|----------|---------|---------|----------|----------|
| | | | ASBM03A | ASBM03B* | ASBM03C* | ASBM03D | ASBM03E* | ASBM03F | ASBM03G | ASBM03H* | ASBM03I* |
| Norway (5) | 0.87 | 49 | 0.76 | 0.72 | 0.75 | 0.75 | 0.57 | 0.75 | 0.50 | 0.76 | 0.70 |
| Oman | 0.69 | 30 | 0.07 | 0.73 | 0.62 | 0.21 | 0.74 | 0.08 | 0.15 | 0.78 | 0.76 |
| Poland | 0.88 | 52 | 0.75 | 0.74 | 0.73 | 0.76 | 0.60 | 0.74 | 0.65 | 0.79 | 0.74 |
| Portugal | 0.86 | 49 | 0.72 | 0.64 | 0.77 | 0.67 | 0.65 | 0.72 | 0.66 | 0.69 | 0.75 |
| Qatar | 0.80 | 38 | 0.34 | 0.75 | 0.76 | 0.43 | 0.72 | 0.40 | 0.39 | 0.79 | 0.73 |
| Russian Federation | 0.89 | 54 | 0.75 | 0.75 | 0.78 | 0.77 | 0.69 | 0.71 | 0.62 | 0.76 | 0.76 |
| Saudi Arabia | 0.75 | 35 | 0.04 | 0.74 | 0.74 | 0.24 | 0.79 | 0.18 | 0.24 | 0.81 | 0.77 |
| Serbia | 0.88 | 51 | 0.71 | 0.72 | 0.75 | 0.68 | 0.68 | 0.68 | 0.66 | 0.76 | 0.75 |
| Singapore | 0.87 | 49 | 0.77 | 0.73 | 0.76 | 0.69 | 0.61 | 0.69 | 0.52 | 0.78 | 0.75 |
| Slovak Republic | 0.87 | 48 | 0.72 | 0.68 | 0.75 | 0.70 | 0.67 | 0.67 | 0.58 | 0.74 | 0.74 |
| Slovenia | 0.88 | 52 | 0.76 | 0.70 | 0.72 | 0.69 | 0.66 | 0.74 | 0.66 | 0.78 | 0.75 |
| South Africa (5) | 0.69 | 29 | 0.12 | 0.72 | 0.73 | 0.11 | 0.68 | 0.05 | 0.06 | 0.76 | 0.71 |
| Spain | 0.85 | 45 | 0.68 | 0.71 | 0.74 | 0.61 | 0.65 | 0.61 | 0.58 | 0.73 | 0.73 |
| Sweden | 0.87 | 49 | 0.75 | 0.73 | 0.74 | 0.74 | 0.60 | 0.71 | 0.47 | 0.79 | 0.72 |
| Turkey | 0.82 | 42 | 0.63 | 0.70 | 0.74 | 0.55 | 0.61 | 0.58 | 0.59 | 0.70 | 0.70 |
| United Arab Emirates | 0.79 | 37 | 0.46 | 0.67 | 0.71 | 0.51 | 0.65 | 0.48 | 0.44 | 0.73 | 0.70 |
| United States | 0.86 | 48 | 0.70 | 0.75 | 0.77 | 0.68 | 0.64 | 0.68 | 0.39 | 0.79 | 0.75 |
| Benchmarking Participants | | | | | | | | | | | |
| Buenos Aires, Argentina | 0.81 | 40 | 0.64 | 0.62 | 0.69 | 0.55 | 0.66 | 0.55 | 0.41 | 0.74 | 0.75 |
| Ontario, Canada | 0.86 | 49 | 0.73 | 0.76 | 0.78 | 0.69 | 0.61 | 0.70 | 0.39 | 0.78 | 0.74 |
| Quebec, Canada | 0.87 | 50 | 0.77 | 0.75 | 0.76 | 0.77 | 0.66 | 0.69 | 0.39 | 0.75 | 0.72 |
| Norway (4) | 0.84 | 45 | 0.71 | 0.67 | 0.72 | 0.73 | 0.49 | 0.74 | 0.47 | 0.72 | 0.68 |
| Abu Dhabi, UAE | 0.77 | 35 | 0.37 | 0.67 | 0.71 | 0.45 | 0.69 | 0.40 | 0.37 | 0.72 | 0.73 |
| Dubai, UAE | 0.83 | 42 | 0.62 | 0.69 | 0.70 | 0.60 | 0.63 | 0.60 | 0.54 | 0.73 | 0.69 |
| Florida, US | 0.87 | 50 | 0.71 | 0.78 | 0.76 | 0.68 | 0.68 | 0.67 | 0.47 | 0.81 | 0.75 |

* Reverse coded

As indicators of effective environments for learning, a positive relationship with achievement is an important aspect of validity for the TIMSS context questionnaire scales. For the *Students*

Confident in Mathematics scale, Exhibit 15.9 presents the Pearson correlation with mathematics achievement in TIMSS 2015 for each country, together with r -squared—the proportion of variance in mathematics and science achievement attributable to the *Students Confident* scale. These figures show a moderate relationship with achievement across participating countries. Also shown is the proportion of variance in achievement attributable to differences between the regions of the *Students Confident* scale. This is very similar to the proportion of variance explained by the scale as a whole, indicating that dividing the scale into regions loses little of its power to account for achievement differences.

Exhibit 15.9: Relationship Between the TIMSS 2015 *Students Confident in Mathematics* Scale, Fourth Grade, and TIMSS 2015 Mathematics Achievement

| Country | Pearson's Correlation with Mathematics Achievement | | Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|-----------------------|--|-----------|---|
| | (r) | (r^2) | |
| Australia | 0.44 | 0.19 | 0.18 |
| Bahrain | 0.37 | 0.14 | 0.13 |
| Belgium (Flemish) | 0.39 | 0.15 | 0.14 |
| Bulgaria | 0.40 | 0.16 | 0.16 |
| Canada | 0.44 | 0.19 | 0.19 |
| Chile | 0.41 | 0.17 | 0.17 |
| Chinese Taipei | 0.44 | 0.19 | 0.20 |
| Croatia | 0.45 | 0.20 | 0.19 |
| Cyprus | 0.44 | 0.19 | 0.18 |
| Czech Republic | 0.42 | 0.18 | 0.18 |
| Denmark | 0.42 | 0.17 | 0.17 |
| England | 0.32 | 0.10 | 0.12 |
| Finland | 0.43 | 0.19 | 0.17 |
| France | 0.40 | 0.16 | 0.16 |
| Georgia | 0.36 | 0.13 | 0.15 |
| Germany | 0.42 | 0.18 | 0.18 |
| Hong Kong SAR | 0.41 | 0.17 | 0.18 |
| Hungary | 0.49 | 0.24 | 0.25 |
| Indonesia | 0.29 | 0.09 | 0.09 |
| Iran, Islamic Rep. of | 0.30 | 0.09 | 0.10 |
| Ireland | 0.43 | 0.18 | 0.18 |
| Italy | 0.32 | 0.10 | 0.10 |
| Japan | 0.44 | 0.19 | 0.19 |
| Jordan | 0.38 | 0.14 | 0.15 |
| Kazakhstan | 0.22 | 0.05 | 0.05 |
| Korea, Rep. of | 0.54 | 0.29 | 0.27 |
| Kuwait | 0.26 | 0.07 | 0.07 |
| Lithuania | 0.46 | 0.21 | 0.21 |
| Morocco | 0.32 | 0.10 | 0.10 |

Exhibit 15.9: Relationship Between the TIMSS 2015 *Students Confident in Mathematics* Scale, Fourth Grade, and TIMSS 2015 Mathematics Achievement (Continued)

| Country | Pearson's Correlation with Mathematics Achievement | | Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|----------------------------------|--|-------------|---|
| | (r) | (r^2) | |
| Netherlands | 0.52 | 0.27 | 0.28 |
| New Zealand | 0.37 | 0.14 | 0.13 |
| Northern Ireland | 0.40 | 0.16 | 0.17 |
| Norway (5) | 0.42 | 0.18 | 0.16 |
| Oman | 0.31 | 0.10 | 0.10 |
| Poland | 0.47 | 0.22 | 0.22 |
| Portugal | 0.49 | 0.24 | 0.25 |
| Qatar | 0.28 | 0.08 | 0.10 |
| Russian Federation | 0.39 | 0.15 | 0.16 |
| Saudi Arabia | 0.28 | 0.08 | 0.09 |
| Serbia | 0.44 | 0.19 | 0.19 |
| Singapore | 0.47 | 0.22 | 0.22 |
| Slovak Republic | 0.40 | 0.16 | 0.15 |
| Slovenia | 0.46 | 0.21 | 0.21 |
| South Africa (5) | 0.38 | 0.15 | 0.15 |
| Spain | 0.44 | 0.19 | 0.21 |
| Sweden | 0.38 | 0.14 | 0.13 |
| Turkey | 0.47 | 0.22 | 0.20 |
| United Arab Emirates | 0.32 | 0.11 | 0.11 |
| United States | 0.43 | 0.18 | 0.19 |
| International Median | 0.41 | 0.17 | 0.17 |
| Benchmarking Participants | | | |
| Buenos Aires, Argentina | 0.33 | 0.11 | 0.12 |
| Ontario, Canada | 0.45 | 0.20 | 0.20 |
| Quebec, Canada | 0.43 | 0.19 | 0.17 |
| Norway (4) | 0.39 | 0.15 | 0.14 |
| Abu Dhabi, UAE | 0.37 | 0.14 | 0.14 |
| Dubai, UAE | 0.30 | 0.09 | 0.10 |
| Florida, US | 0.43 | 0.18 | 0.20 |

Item parameter estimates and item and scale statistics similar to those above are available in Appendix 15A for each of the fourth grade TIMSS 2015 context questionnaire scales and in Appendix 15B for each of the eighth grade context questionnaire scales.

Reporting the TIMSS 2015 Trend Context Questionnaire Scales

Exhibit 15.10 shows an excerpt from the *Students Confident in Mathematics* exhibit at the fourth grade. To represent trends from 2011, the two columns to the right of the exhibit present the average scale score in 2015 for each country and the difference from the average in 2011, respectively. Up and down arrows indicate whether the trend difference is significantly higher or lower in 2015, with a 99% level of confidence.

Trend results were not reported for the percentage of students in each region. To facilitate interpretation of the region boundaries in terms of combinations of response categories, trend scales followed the same procedure as non-trend scales in setting cutpoints for classification into regions. As such, the procedure was primarily dependent on similarities in response patterns without taking into account variations in difficulty across the items that were unique to 2011 or 2015. Consequently, although the cutpoints generally are quite close across the two cycles, they are not identical and therefore it was considered most appropriate to use differences in scale score means rather than changes in the percentages in scale regions as indicators of trend.

Exhibit 15.10: Excerpt from *Students Confident in Mathematics* Exhibit, Fourth Grade

Reported by Students

Students were scored according to their degree of agreement with nine statements on the *Students Confident in Mathematics* scale. Students **Very Confident in Mathematics** had a score on the scale of at least 10.6, which corresponds to their “agreeing a lot” with five of the nine statements and “agreeing a little” with the other four, on average. Students who were **Not Confident in Mathematics** had a score no higher than 8.5, which corresponds to their “disagreeing a little” with five of the nine statements and “agreeing a little” with the other four, on average. All other students were **Confident in Mathematics**.

| Country | Very Confident in Mathematics | | Confident in Mathematics | | Not Confident in Mathematics | | Average Scale Score | Difference in Average Scale Score from 2011 | |
|-------------|-------------------------------|---------------------|--------------------------|---------------------|------------------------------|---------------------|---------------------|---|---|
| | Percent of Students | Average Achievement | Percent of Students | Average Achievement | Percent of Students | Average Achievement | | | |
| Serbia | 45 (1.2) | 556 (5.2) | 36 (1.0) | 507 (4.1) | 19 (0.8) | 458 (4.7) | 10.5 (0.05) | 0.4 (0.07) | ▲ |
| Cyprus | 44 (1.1) | 560 (2.9) | 38 (0.9) | 511 (2.8) | 17 (0.8) | 469 (3.9) | 10.5 (0.05) | ◊ ◊ | |
| Norway (5) | 44 (1.0) | 578 (3.0) | 44 (0.9) | 536 (2.6) | 12 (0.6) | 493 (4.5) | 10.5 (0.05) | ◊ ◊ | |
| Bulgaria | 42 (1.2) | 561 (4.0) | 37 (0.9) | 513 (5.0) | 20 (1.1) | 478 (8.3) | 10.5 (0.06) | ◊ ◊ | |
| Jordan | 42 (1.2) | 434 (3.6) | 39 (0.9) | 376 (3.6) | 19 (1.0) | 328 (7.5) | 10.5 (0.06) | ◊ ◊ | |
| Turkey | 41 (1.0) | 532 (3.0) | 40 (0.9) | 464 (3.6) | 19 (0.8) | 423 (4.4) | 10.4 (0.05) | 0.1 (0.06) | |
| Netherlands | 40 (1.0) | 562 (1.8) | 39 (1.0) | 522 (2.1) | 21 (0.8) | 484 (2.1) | 10.3 (0.04) | 0.2 (0.06) | ▲ |
| Kazakhstan | 40 (1.5) | 566 (4.9) | 48 (1.2) | 535 (5.3) | 12 (0.9) | 515 (6.3) | 10.6 (0.06) | 0.1 (0.09) | |
| England | 37 (1.1) | 578 (4.7) | 43 (1.0) | 541 (3.4) | 20 (0.9) | 499 (3.3) | 10.1 (0.05) | 0.1 (0.06) | |
| Kuwait | 37 (1.1) | 387 (5.2) | 45 (0.9) | 342 (4.9) | 18 (0.7) | 317 (6.5) | 10.3 (0.05) | ◊ ◊ | |
| Georgia | 37 (1.6) | 501 (4.2) | 50 (1.3) | 458 (3.6) | 13 (0.8) | 400 (6.2) | 10.3 (0.06) | -0.2 (0.07) | ▼ |
| Ireland | 37 (0.9) | 583 (2.6) | 45 (0.8) | 539 (2.4) | 18 (0.8) | 498 (3.7) | 10.2 (0.04) | -0.2 (0.07) | ▼ |

Source: The full *Students Confident in Mathematics* exhibit at the fourth grade can be found within the [TIMSS 2015 International Results in Mathematics](#) report.

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

References

- Kolen, M.J. & Brennan, R.L. (2004). *Test equating, scaling, and linking* (2nd Ed.). NY: Springer Science + Business media, Inc.
- Masters, G.N., & Wright, B.D. (1997). The partial credit model. In M.J. van de Linden & R.K. Hambleton (Eds.), *Handbook of modern item response theory*. Berlin: Springer.
- Warm, T.A. (1989). Weighted likelihood estimation of ability in item response theory. *Psychometrika*, 54(3), 427–450.
- Wu, M.L., Adams, R.J., Wilson, M.R., & Haldane, S. (2007). Conquest 2.0 [computer software]. Camberwell, Australia: Australian Council for Educational Research.

Appendix 15A: TIMSS 2015 Context Questionnaire Scales, Fourth Grade

Challenges Facing Teachers Scale, Fourth Grade

The Challenges Facing Teachers (CFT) scale was created based on teachers' degree of agreement with the eight statements described below.

Items in the TIMSS 2015 Challenges Facing Teachers Scale, Fourth Grade

Indicate the extent to which you agree or disagree with each of the following statements.

| | Disagree a lot | Disagree a little | Agree a little | Agree a lot |
|---|-----------------------|-----------------------|-----------------------|-----------------------|
| ATBG11A 1) There are too many students in the classes ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ATBG11B 2) I have too much material to cover in class ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ATBG11C 3) I have too many teaching hours ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ATBG11D 4) I need more time to prepare for class ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ATBG11E 5) I need more time to assist individual students ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ATBG11F 6) I feel too much pressure from parents ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ATBG11G 7) I have difficulty keeping up with all the changes to the curriculum----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ATBG11H 8) I have too many administrative tasks ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Item Parameters for the TIMSS 2015 Challenges Facing Teachers Scale, Fourth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|---------|----------|----------|----------|---------|-------|
| ATBG11A | 0.07889 | -0.76467 | 0.14939 | 0.61528 | 1.15 |
| ATBG11B | 0.47864 | -1.35276 | 0.09232 | 1.26044 | 0.93 |
| ATBG11C | -0.52363 | -0.93560 | -0.19692 | 1.13252 | 0.97 |
| ATBG11D | 0.33075 | -1.28469 | 0.21303 | 1.07166 | 0.92 |
| ATBG11E | 1.28961 | -1.28077 | 0.54728 | 0.73349 | 0.89 |
| ATBG11F | -0.86698 | -1.40866 | -0.06337 | 1.47203 | 1.04 |
| ATBG11G | -0.76404 | -1.47618 | 0.14792 | 1.32826 | 1.00 |
| ATBG11H | -0.02324 | -0.71014 | 0.16389 | 0.54625 | 1.09 |

Scale Transformation Constants for the TIMSS 2015 Challenges Facing Teachers Scale, Fourth Grade

Scale Transformation Constants

A = 10.434525

B = 2.004701

Transformed Scale Score = 10.434525 + 2.004701 • Logit Scale Score

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Challenges Facing Teachers Scale, Fourth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 1.92363 | |
| 1 | 4.32702 | |
| 2 | 5.54237 | |
| 3 | 6.39547 | |
| 4 | 7.07364 | 7.1 |
| 5 | 7.64510 | |
| 6 | 8.14648 | |
| 7 | 8.59908 | |
| 8 | 9.01602 | |
| 9 | 9.40854 | |
| 10 | 9.78201 | |
| 11 | 10.14266 | |
| 12 | 10.49619 | 10.4 |
| 13 | 10.84813 | |
| 14 | 11.20423 | |
| 15 | 11.57049 | |
| 16 | 11.95345 | |
| 17 | 12.36030 | |
| 18 | 12.79709 | |
| 19 | 13.27735 | |
| 20 | 13.81571 | |
| 21 | 14.43884 | |
| 22 | 15.19930 | |
| 23 | 16.26129 | |
| 24 | 18.41488 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Challenges Facing Teachers Scale, Fourth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|---------|---------|
| | | | ATBGT1A | ATBGT1B | ATBGT1C | ATBGT1D | ATBGT1E | ATBGT1F | ATBGT1G | ATBGT1H |
| Australia | 0.74 | 38 | 0.61 | 0.70 | 0.53 | 0.75 | 0.68 | 0.49 | 0.49 | 0.61 |
| Bahrain | 0.81 | 43 | 0.63 | 0.66 | 0.73 | 0.72 | 0.68 | 0.60 | 0.64 | 0.60 |
| Belgium (Flemish) | 0.73 | 35 | 0.54 | 0.68 | 0.59 | 0.67 | 0.63 | 0.48 | 0.45 | 0.67 |
| Bulgaria | 0.71 | 34 | 0.61 | 0.62 | 0.74 | 0.65 | 0.55 | 0.37 | 0.44 | 0.58 |
| Canada | 0.77 | 39 | 0.62 | 0.65 | 0.56 | 0.66 | 0.60 | 0.61 | 0.59 | 0.68 |
| Chile | 0.72 | 38 | 0.58 | 0.68 | 0.67 | 0.74 | 0.76 | 0.47 | 0.31 | 0.60 |
| Chinese Taipei | 0.80 | 43 | 0.70 | 0.73 | 0.72 | 0.72 | 0.67 | 0.64 | 0.48 | 0.52 |
| Croatia | 0.78 | 40 | 0.56 | 0.65 | 0.62 | 0.69 | 0.70 | 0.67 | 0.52 | 0.64 |
| Cyprus | 0.66 | 30 | 0.49 | 0.55 | 0.63 | 0.72 | 0.50 | 0.49 | 0.51 | 0.42 |
| Czech Republic | 0.78 | 40 | 0.51 | 0.68 | 0.72 | 0.75 | 0.71 | 0.55 | 0.56 | 0.54 |
| Denmark | 0.78 | 41 | 0.57 | 0.58 | 0.78 | 0.76 | 0.67 | 0.55 | 0.52 | 0.62 |
| England | 0.86 | 51 | 0.65 | 0.79 | 0.69 | 0.72 | 0.78 | 0.62 | 0.71 | 0.77 |
| Finland | 0.67 | 31 | 0.49 | 0.59 | 0.61 | 0.70 | 0.60 | 0.46 | 0.55 | 0.41 |
| France | 0.61 | 28 | 0.42 | 0.62 | 0.56 | 0.62 | 0.46 | 0.41 | 0.57 | 0.50 |
| Georgia | 0.66 | 31 | 0.54 | 0.70 | 0.52 | 0.65 | 0.59 | 0.48 | 0.55 | 0.34 |
| Germany | 0.74 | 36 | 0.49 | 0.55 | 0.69 | 0.70 | 0.58 | 0.55 | 0.59 | 0.63 |
| Hong Kong SAR | 0.76 | 39 | 0.69 | 0.65 | 0.41 | 0.71 | 0.63 | 0.56 | 0.68 | 0.60 |
| Hungary | 0.78 | 41 | 0.48 | 0.67 | 0.69 | 0.78 | 0.75 | 0.58 | 0.54 | 0.56 |
| Indonesia | 0.70 | 33 | 0.49 | 0.71 | 0.63 | 0.55 | 0.44 | 0.57 | 0.52 | 0.61 |
| Iran, Islamic Rep. of | 0.73 | 35 | 0.53 | 0.52 | 0.55 | 0.67 | 0.68 | 0.56 | 0.61 | 0.61 |
| Ireland | 0.81 | 44 | 0.54 | 0.74 | 0.52 | 0.75 | 0.64 | 0.62 | 0.73 | 0.74 |
| Italy | 0.76 | 39 | 0.45 | 0.74 | 0.48 | 0.78 | 0.64 | 0.54 | 0.72 | 0.52 |
| Japan | 0.73 | 38 | 0.35 | 0.76 | 0.77 | 0.76 | 0.66 | 0.36 | 0.35 | 0.69 |
| Jordan | 0.76 | 39 | 0.65 | 0.58 | 0.73 | 0.82 | 0.60 | 0.61 | 0.42 | 0.52 |
| Kazakhstan | 0.66 | 32 | 0.26 | 0.35 | 0.68 | 0.57 | 0.46 | 0.70 | 0.65 | 0.69 |
| Korea, Rep. of | 0.84 | 48 | 0.55 | 0.75 | 0.79 | 0.72 | 0.75 | 0.67 | 0.67 | 0.62 |
| Kuwait | 0.76 | 38 | 0.52 | 0.66 | 0.75 | 0.66 | 0.60 | 0.59 | 0.62 | 0.50 |
| Lithuania | 0.67 | 31 | 0.43 | 0.59 | 0.48 | 0.65 | 0.57 | 0.58 | 0.66 | 0.47 |
| Morocco | 0.70 | 34 | 0.62 | 0.72 | 0.72 | 0.58 | 0.50 | 0.41 | 0.51 | 0.49 |
| Netherlands | 0.73 | 36 | 0.53 | 0.54 | 0.54 | 0.72 | 0.73 | 0.52 | 0.53 | 0.66 |
| New Zealand | 0.82 | 46 | 0.53 | 0.72 | 0.61 | 0.78 | 0.73 | 0.59 | 0.70 | 0.72 |
| Northern Ireland | 0.80 | 45 | 0.65 | 0.64 | 0.67 | 0.73 | 0.70 | 0.46 | 0.67 | 0.78 |
| Norway (5) | 0.79 | 42 | 0.53 | 0.68 | 0.72 | 0.74 | 0.61 | 0.66 | 0.60 | 0.65 |
| Oman | 0.75 | 38 | 0.58 | 0.70 | 0.67 | 0.73 | 0.63 | 0.60 | 0.51 | 0.43 |
| Poland | 0.74 | 36 | 0.46 | 0.48 | 0.58 | 0.74 | 0.71 | 0.59 | 0.60 | 0.59 |
| Portugal | 0.74 | 40 | 0.58 | 0.76 | 0.64 | 0.71 | 0.73 | 0.56 | 0.49 | 0.52 |
| Qatar | 0.79 | 41 | 0.52 | 0.66 | 0.64 | 0.71 | 0.58 | 0.72 | 0.67 | 0.58 |
| Russian Federation | 0.68 | 33 | 0.37 | 0.59 | 0.53 | 0.74 | 0.63 | 0.63 | 0.61 | 0.38 |
| Saudi Arabia | 0.75 | 38 | 0.73 | 0.73 | 0.69 | 0.66 | 0.65 | 0.45 | 0.46 | 0.46 |
| Serbia | 0.76 | 38 | 0.64 | 0.61 | 0.71 | 0.69 | 0.63 | 0.55 | 0.58 | 0.50 |
| Singapore | - | - | - | - | - | - | - | - | - | - |
| Slovak Republic | 0.79 | 42 | 0.60 | 0.77 | 0.73 | 0.69 | 0.66 | 0.59 | 0.54 | 0.53 |
| Slovenia | 0.68 | 31 | 0.65 | 0.62 | 0.64 | 0.55 | 0.53 | 0.50 | 0.50 | 0.45 |
| South Africa (5) | 0.66 | 31 | 0.51 | 0.50 | 0.70 | 0.70 | 0.56 | 0.25 | 0.56 | 0.53 |
| Spain | 0.72 | 34 | 0.56 | 0.50 | 0.60 | 0.71 | 0.54 | 0.54 | 0.61 | 0.57 |
| Sweden | 0.73 | 37 | 0.36 | 0.65 | 0.69 | 0.81 | 0.66 | 0.51 | 0.41 | 0.64 |
| Turkey | 0.76 | 38 | 0.57 | 0.77 | 0.75 | 0.72 | 0.65 | 0.42 | 0.39 | 0.48 |
| United Arab Emirates | 0.84 | 47 | 0.62 | 0.79 | 0.74 | 0.77 | 0.72 | 0.61 | 0.63 | 0.60 |
| United States | 0.79 | 41 | 0.49 | 0.76 | 0.55 | 0.73 | 0.65 | 0.57 | 0.70 | 0.65 |
| Benchmarking Participants | | | | | | | | | | |
| Buenos Aires, Argentina | 0.78 | 40 | 0.63 | 0.61 | 0.77 | 0.66 | 0.72 | 0.52 | 0.54 | 0.59 |
| Ontario, Canada | 0.77 | 39 | 0.63 | 0.72 | 0.52 | 0.65 | 0.56 | 0.61 | 0.64 | 0.63 |
| Quebec, Canada | 0.79 | 41 | 0.65 | 0.59 | 0.59 | 0.61 | 0.62 | 0.67 | 0.66 | 0.71 |
| Norway (4) | 0.74 | 37 | 0.58 | 0.63 | 0.64 | 0.65 | 0.58 | 0.64 | 0.53 | 0.59 |
| Abu Dhabi, UAE | 0.79 | 41 | 0.59 | 0.74 | 0.68 | 0.75 | 0.71 | 0.35 | 0.64 | 0.59 |
| Dubai, UAE | 0.84 | 49 | 0.56 | 0.82 | 0.74 | 0.73 | 0.73 | 0.72 | 0.63 | 0.64 |
| Florida, US | 0.73 | 37 | 0.49 | 0.67 | 0.29 | 0.73 | 0.81 | 0.49 | 0.60 | 0.65 |

A dash (-) indicates comparable data not available.

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Challenges Facing Teachers Scale, Fourth Grade, and TIMSS 2015 Achievement

| Country | Pearson's Correlation with Achievement | | | | Variance in Achievement Accounted for by Difference Between Regions of the Scale (η^2) | |
|----------------------------------|--|-------------|-------------------|-------------|---|-------------|
| | (r) | | (r ²) | | Mathematics | Science |
| | Mathematics | Science | Mathematics | Science | | |
| Australia | -0.01 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Bahrain | 0.01 | -0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Belgium (Flemish) | -0.11 | -0.11 | 0.01 | 0.01 | 0.01 | 0.01 |
| Bulgaria | 0.06 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| Canada | -0.07 | -0.06 | 0.01 | 0.00 | 0.00 | 0.00 |
| Chile | 0.04 | 0.05 | 0.00 | 0.00 | 0.01 | 0.01 |
| Chinese Taipei | 0.06 | -0.04 | 0.00 | 0.00 | 0.01 | 0.00 |
| Croatia | -0.06 | -0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cyprus | 0.01 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Czech Republic | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Denmark | -0.03 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| England | 0.04 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Finland | -0.01 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| France | 0.05 | 0.05 | 0.00 | 0.00 | 0.01 | 0.00 |
| Georgia | 0.07 | 0.11 | 0.00 | 0.01 | 0.01 | 0.01 |
| Germany | 0.02 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Hong Kong SAR | -0.04 | 0.10 | 0.00 | 0.01 | 0.01 | 0.01 |
| Hungary | -0.10 | -0.11 | 0.01 | 0.01 | 0.01 | 0.01 |
| Indonesia | 0.07 | 0.06 | 0.00 | 0.00 | 0.01 | 0.01 |
| Iran, Islamic Rep. of | 0.02 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Ireland | -0.05 | -0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Italy | -0.02 | -0.06 | 0.00 | 0.00 | 0.00 | 0.00 |
| Japan | -0.03 | -0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| Jordan | 0.09 | - | 0.01 | - | 0.00 | - |
| Kazakhstan | 0.15 | 0.16 | 0.02 | 0.03 | 0.00 | 0.00 |
| Korea, Rep. of | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Kuwait | 0.12 | 0.09 | 0.01 | 0.01 | 0.01 | 0.00 |
| Lithuania | -0.08 | -0.08 | 0.01 | 0.01 | 0.01 | 0.01 |
| Morocco | 0.14 | 0.16 | 0.02 | 0.03 | 0.01 | 0.01 |
| Netherlands | -0.05 | -0.07 | 0.00 | 0.00 | 0.01 | 0.01 |
| New Zealand | -0.01 | -0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Northern Ireland | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Norway (5) | 0.02 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| Oman | -0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 |
| Poland | -0.02 | -0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| Portugal | 0.08 | 0.06 | 0.01 | 0.00 | 0.02 | 0.01 |
| Qatar | 0.08 | 0.08 | 0.01 | 0.01 | 0.02 | 0.01 |
| Russian Federation | 0.06 | 0.06 | 0.00 | 0.00 | 0.01 | 0.01 |
| Saudi Arabia | 0.08 | 0.15 | 0.01 | 0.02 | 0.01 | 0.01 |
| Serbia | -0.04 | -0.03 | 0.00 | 0.00 | 0.01 | 0.01 |
| Singapore | - | - | - | - | - | - |
| Slovak Republic | 0.02 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Slovenia | -0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| South Africa (5) | 0.10 | - | 0.01 | - | 0.03 | - |
| Spain | -0.01 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Sweden | -0.01 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| Turkey | 0.02 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| United Arab Emirates | 0.13 | 0.16 | 0.02 | 0.03 | 0.01 | 0.02 |
| United States | -0.06 | -0.06 | 0.00 | 0.00 | 0.00 | 0.00 |
| International Median | 0.01 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Benchmarking Participants | | | | | | |
| Buenos Aires, Argentina | 0.13 | 0.14 | 0.02 | 0.02 | 0.01 | 0.01 |
| Ontario, Canada | -0.06 | -0.08 | 0.00 | 0.01 | 0.00 | 0.01 |
| Quebec, Canada | -0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 |
| Norway (4) | -0.04 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Abu Dhabi, UAE | 0.18 | 0.15 | 0.03 | 0.02 | 0.03 | 0.02 |
| Dubai, UAE | 0.05 | 0.08 | 0.00 | 0.01 | 0.00 | 0.00 |
| Florida, US | 0.02 | -0.02 | 0.00 | 0.00 | 0.00 | 0.00 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

A dash (-) indicates comparable data not available.

Could Do Literacy and Numeracy Tasks When Began Primary School Scale, Fourth Grade

The Could Do Literacy and Numeracy Tasks When Began Primary School (LNT) scale was created based on parents' responses to how well their children could do the tasks described below when they began primary school.

Items in the TIMSS 2015 Could Do Literacy and Numeracy Tasks When Began Primary School, Fourth Grade

| | | How well could your child do the following when he/she began the first grade of primary/elementary school? | | | |
|---------|--|---|-----------------------|-----------------------|-----------------------|
| | | Very well | Moderately well | Not very well | Not at all |
| ASBH07A | 1) Recognize most of the letters of the alphabet ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ASBH07B | 2) Read some words ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ASBH07C | 3) Read sentences ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ASBH07D | 4) Read a story ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ASBH07E | 5) Write letters of the alphabet ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ASBH07F | 6) Write some words ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | | <p>Could your child do the following when he/she began the first grade of primary/elementary school?</p> <p>Up to 100 or higher Up to 20 Up to 10 Not at all</p> | | | |
| ASBH08A | 1) Count by himself/herself ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ASBH08B | 2) Recognize written numbers ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ASBH08C | 3) Write numbers ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | | <p>Could your child do the following when he/she began the first grade of primary/elementary school?</p> <p>Yes No</p> | | | |
| ASBH08D | 1) Do simple addition ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ASBH08E | 2) Do simple subtraction ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Very Well Moderately Well Not Well

11.5 8.7

Item Parameters for the TIMSS 2015 Could Do Literacy and Numeracy Tasks When Began Primary School Scale, Fourth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|---------|----------|----------|----------|---------|-------|
| ASBH07A | -1.03450 | -1.59845 | -0.12765 | 1.72610 | 0.95 |
| ASBH07B | 0.00558 | -1.49311 | -0.20363 | 1.69674 | 0.80 |
| ASBH07C | 0.95109 | -1.27650 | -0.19632 | 1.47282 | 0.84 |
| ASBH07D | 1.46628 | -1.16350 | -0.27247 | 1.43597 | 1.06 |
| ASBH07E | -0.54696 | -1.61915 | -0.16181 | 1.78096 | 0.91 |
| ASBH07F | 0.16992 | -1.52300 | -0.23087 | 1.75387 | 0.87 |
| ASBH08A | -0.41760 | -2.17966 | 0.18999 | 1.98967 | 1.43 |
| ASBH08B | 0.05264 | -2.24322 | 0.38476 | 1.85846 | 1.14 |
| ASBH08C | 0.30953 | -2.07283 | 0.40542 | 1.66741 | 1.10 |
| ASBH08D | -0.97181 | | | | 1.01 |
| ASBH08E | 0.01583 | | | | 1.06 |

Scale Transformation Constants for the TIMSS 2015 Could Do Literacy and Numeracy Tasks When Began Primary School Scale, Fourth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 8.878367 | Transformed Scale Score = 8.878367 + 1.114077 • Logit Scale Score |
| B = 1.114077 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Equivalence Table of Raw and Transformed Scale Scores for the TIMSS 2015 Could Do Literacy and Numeracy Tasks When Began Primary School Scale, Fourth Grade

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 3.40776 | |
| 1 | 4.74405 | |
| 2 | 5.42885 | |
| 3 | 5.92038 | |
| 4 | 6.31822 | |
| 5 | 6.66220 | |
| 6 | 6.96984 | |
| 7 | 7.25206 | |
| 8 | 7.51564 | |
| 9 | 7.76514 | |
| 10 | 8.00345 | |
| 11 | 8.23377 | |
| 12 | 8.45736 | |
| 13 | 8.67576 | 8.7 |
| 14 | 8.89052 | |
| 15 | 9.10234 | |
| 16 | 9.31314 | |
| 17 | 9.52414 | |
| 18 | 9.73701 | |
| 19 | 9.95373 | |
| 20 | 10.17669 | |
| 21 | 10.40891 | |
| 22 | 10.65416 | |
| 23 | 10.91566 | |
| 24 | 11.20323 | |
| 25 | 11.52771 | 11.5 |
| 26 | 11.90919 | |
| 27 | 12.38473 | |
| 28 | 13.05784 | |
| 29 | 14.38775 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Could Do Literacy and Numeracy Tasks When Began Primary School Scale, Fourth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| | | | ASBH07A | ASBH07B | ASBH07C | ASBH07D | ASBH07E | ASBH07F | ASBH08A | ASBH08B | ASBH08C | ASBH08D | ASBH08E |
| Australia | 0.91 | 53 | 0.72 | 0.82 | 0.82 | 0.79 | 0.78 | 0.81 | 0.64 | 0.72 | 0.76 | 0.58 | 0.56 |
| Bahrain | 0.87 | 45 | 0.65 | 0.80 | 0.81 | 0.73 | 0.72 | 0.80 | 0.57 | 0.62 | 0.63 | 0.46 | 0.48 |
| Belgium (Flemish) | 0.89 | 48 | 0.73 | 0.82 | 0.80 | 0.75 | 0.78 | 0.80 | 0.44 | 0.63 | 0.68 | 0.50 | 0.53 |
| Bulgaria | 0.93 | 61 | 0.83 | 0.86 | 0.82 | 0.76 | 0.83 | 0.85 | 0.73 | 0.77 | 0.78 | 0.65 | 0.67 |
| Canada | 0.90 | 50 | 0.69 | 0.80 | 0.80 | 0.76 | 0.75 | 0.80 | 0.62 | 0.67 | 0.71 | 0.59 | 0.57 |
| Chile | 0.90 | 50 | 0.73 | 0.80 | 0.83 | 0.77 | 0.77 | 0.81 | 0.57 | 0.63 | 0.64 | 0.58 | 0.58 |
| Chinese Taipei | 0.83 | 40 | 0.78 | 0.85 | 0.85 | 0.79 | 0.80 | 0.76 | 0.21 | 0.26 | 0.26 | 0.39 | 0.42 |
| Croatia | 0.90 | 52 | 0.76 | 0.84 | 0.83 | 0.77 | 0.78 | 0.82 | 0.59 | 0.68 | 0.70 | 0.55 | 0.56 |
| Cyprus | 0.90 | 49 | 0.73 | 0.84 | 0.81 | 0.74 | 0.78 | 0.82 | 0.55 | 0.63 | 0.65 | 0.54 | 0.57 |
| Czech Republic | 0.89 | 49 | 0.78 | 0.85 | 0.83 | 0.77 | 0.79 | 0.82 | 0.50 | 0.60 | 0.62 | 0.45 | 0.50 |
| Denmark | 0.87 | 44 | 0.73 | 0.79 | 0.73 | 0.61 | 0.72 | 0.78 | 0.54 | 0.66 | 0.70 | 0.49 | 0.48 |
| England | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Finland | 0.91 | 53 | 0.75 | 0.83 | 0.82 | 0.78 | 0.78 | 0.83 | 0.66 | 0.72 | 0.72 | 0.49 | 0.52 |
| France | 0.88 | 46 | 0.65 | 0.77 | 0.76 | 0.68 | 0.71 | 0.76 | 0.60 | 0.69 | 0.69 | 0.56 | 0.52 |
| Georgia | 0.88 | 46 | 0.74 | 0.83 | 0.82 | 0.71 | 0.78 | 0.80 | 0.42 | 0.57 | 0.62 | 0.46 | 0.50 |
| Germany | 0.88 | 46 | 0.75 | 0.79 | 0.76 | 0.67 | 0.75 | 0.75 | 0.52 | 0.65 | 0.71 | 0.50 | 0.51 |
| Hong Kong SAR | 0.82 | 38 | 0.74 | 0.82 | 0.83 | 0.71 | 0.79 | 0.78 | 0.31 | 0.32 | 0.33 | 0.32 | 0.35 |
| Hungary | 0.90 | 50 | 0.80 | 0.86 | 0.82 | 0.72 | 0.81 | 0.80 | 0.49 | 0.67 | 0.72 | 0.43 | 0.44 |
| Indonesia | 0.91 | 53 | 0.76 | 0.83 | 0.82 | 0.76 | 0.76 | 0.80 | 0.66 | 0.71 | 0.71 | 0.58 | 0.57 |
| Iran, Islamic Rep. of | 0.90 | 51 | 0.77 | 0.82 | 0.81 | 0.74 | 0.81 | 0.82 | 0.43 | 0.62 | 0.64 | 0.63 | 0.62 |
| Ireland | 0.89 | 51 | 0.75 | 0.83 | 0.85 | 0.80 | 0.80 | 0.83 | 0.56 | 0.60 | 0.63 | 0.55 | 0.54 |
| Italy | 0.90 | 49 | 0.73 | 0.80 | 0.79 | 0.70 | 0.75 | 0.79 | 0.58 | 0.71 | 0.73 | 0.55 | 0.54 |
| Japan | 0.86 | 46 | 0.82 | 0.84 | 0.86 | 0.82 | 0.84 | 0.85 | 0.27 | 0.36 | 0.40 | 0.52 | 0.48 |
| Jordan | 0.89 | 50 | 0.78 | 0.85 | 0.81 | 0.69 | 0.81 | 0.84 | 0.54 | 0.59 | 0.61 | 0.58 | 0.60 |
| Kazakhstan | 0.88 | 46 | 0.69 | 0.79 | 0.80 | 0.76 | 0.73 | 0.78 | 0.57 | 0.64 | 0.67 | 0.46 | 0.48 |
| Korea, Rep. of | 0.84 | 47 | 0.85 | 0.89 | 0.92 | 0.90 | 0.90 | 0.89 | 0.21 | 0.19 | 0.22 | 0.38 | 0.41 |
| Kuwait | 0.89 | 48 | 0.74 | 0.82 | 0.82 | 0.74 | 0.77 | 0.82 | 0.56 | 0.63 | 0.63 | 0.48 | 0.48 |
| Lithuania | 0.89 | 48 | 0.75 | 0.81 | 0.80 | 0.75 | 0.73 | 0.75 | 0.60 | 0.65 | 0.65 | 0.53 | 0.54 |
| Morocco | 0.93 | 59 | 0.78 | 0.88 | 0.86 | 0.74 | 0.83 | 0.86 | 0.66 | 0.76 | 0.78 | 0.70 | 0.57 |
| Netherlands | 0.91 | 52 | 0.79 | 0.84 | 0.82 | 0.78 | 0.77 | 0.79 | 0.58 | 0.70 | 0.72 | 0.49 | 0.54 |
| New Zealand | 0.90 | 51 | 0.73 | 0.81 | 0.80 | 0.74 | 0.78 | 0.80 | 0.57 | 0.70 | 0.74 | 0.58 | 0.57 |
| Northern Ireland | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Norway (5) | 0.90 | 50 | 0.78 | 0.83 | 0.81 | 0.69 | 0.80 | 0.82 | 0.52 | 0.70 | 0.72 | 0.53 | 0.50 |
| Oman | 0.88 | 47 | 0.69 | 0.79 | 0.79 | 0.71 | 0.73 | 0.80 | 0.61 | 0.65 | 0.65 | 0.52 | 0.54 |
| Poland | 0.90 | 51 | 0.75 | 0.83 | 0.83 | 0.76 | 0.80 | 0.83 | 0.59 | 0.70 | 0.71 | 0.47 | 0.51 |
| Portugal | 0.89 | 48 | 0.73 | 0.80 | 0.77 | 0.71 | 0.77 | 0.79 | 0.54 | 0.65 | 0.67 | 0.55 | 0.56 |
| Qatar | 0.89 | 48 | 0.68 | 0.81 | 0.80 | 0.73 | 0.76 | 0.82 | 0.59 | 0.65 | 0.66 | 0.50 | 0.52 |
| Russian Federation | 0.90 | 51 | 0.75 | 0.83 | 0.83 | 0.77 | 0.74 | 0.77 | 0.65 | 0.71 | 0.72 | 0.50 | 0.52 |
| Saudi Arabia | 0.89 | 49 | 0.70 | 0.83 | 0.82 | 0.73 | 0.78 | 0.83 | 0.53 | 0.61 | 0.62 | 0.55 | 0.57 |
| Serbia | 0.89 | 49 | 0.77 | 0.81 | 0.77 | 0.51 | 0.78 | 0.82 | 0.61 | 0.67 | 0.70 | 0.59 | 0.61 |
| Singapore | 0.88 | 47 | 0.73 | 0.82 | 0.83 | 0.78 | 0.76 | 0.80 | 0.59 | 0.60 | 0.60 | 0.44 | 0.47 |
| Slovak Republic | 0.89 | 48 | 0.75 | 0.82 | 0.76 | 0.67 | 0.78 | 0.79 | 0.52 | 0.66 | 0.72 | 0.54 | 0.55 |
| Slovenia | 0.92 | 54 | 0.80 | 0.84 | 0.82 | 0.74 | 0.81 | 0.84 | 0.60 | 0.72 | 0.76 | 0.55 | 0.56 |
| South Africa (5) | 0.86 | 42 | 0.65 | 0.74 | 0.77 | 0.72 | 0.72 | 0.74 | 0.52 | 0.58 | 0.61 | 0.47 | 0.49 |
| Spain | 0.91 | 53 | 0.76 | 0.80 | 0.83 | 0.78 | 0.78 | 0.82 | 0.64 | 0.67 | 0.70 | 0.59 | 0.55 |
| Sweden | 0.90 | 52 | 0.76 | 0.84 | 0.83 | 0.76 | 0.78 | 0.81 | 0.61 | 0.68 | 0.70 | 0.52 | 0.57 |
| Turkey | 0.92 | 58 | 0.81 | 0.84 | 0.83 | 0.80 | 0.85 | 0.86 | 0.57 | 0.69 | 0.73 | 0.66 | 0.67 |
| United Arab Emirates | 0.88 | 47 | 0.68 | 0.80 | 0.80 | 0.74 | 0.73 | 0.80 | 0.61 | 0.65 | 0.66 | 0.47 | 0.48 |
| United States | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Benchmarking Participants | | | | | | | | | | | | | |
| Buenos Aires, Argentina | 0.91 | 52 | 0.76 | 0.81 | 0.80 | 0.73 | 0.77 | 0.77 | 0.65 | 0.73 | 0.73 | 0.54 | 0.54 |
| Ontario, Canada | 0.90 | 50 | 0.68 | 0.79 | 0.82 | 0.77 | 0.75 | 0.80 | 0.62 | 0.67 | 0.71 | 0.56 | 0.56 |
| Quebec, Canada | 0.89 | 48 | 0.68 | 0.79 | 0.76 | 0.69 | 0.73 | 0.77 | 0.65 | 0.68 | 0.72 | 0.59 | 0.55 |
| Norway (4) | 0.91 | 52 | 0.77 | 0.84 | 0.80 | 0.69 | 0.78 | 0.82 | 0.58 | 0.73 | 0.76 | 0.54 | 0.55 |
| Abu Dhabi, UAE | 0.89 | 47 | 0.70 | 0.82 | 0.81 | 0.75 | 0.74 | 0.81 | 0.61 | 0.64 | 0.65 | 0.45 | 0.45 |
| Dubai, UAE | 0.88 | 47 | 0.67 | 0.78 | 0.80 | 0.73 | 0.72 | 0.79 | 0.61 | 0.64 | 0.67 | 0.52 | 0.51 |
| Florida, US | - | - | - | - | - | - | - | - | - | - | - | - | - |

A dash (-) indicates comparable data not available.

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Could Do Literacy and Numeracy Tasks When Began Primary School Scale, Fourth Grade, and TIMSS 2015 Achievement

| Country | Pearson's Correlation with Achievement | | | | Variance in Achievement Accounted for by Difference Between Regions of the Scale (η^2) | |
|----------------------------------|--|-------------|-------------------|-------------|---|-------------|
| | (r) | | (r ²) | | Mathematics | Science |
| | Mathematics | Science | Mathematics | Science | | |
| Australia | 0.27 | 0.22 | 0.07 | 0.05 | 0.06 | 0.04 |
| Bahrain | 0.27 | 0.27 | 0.08 | 0.07 | 0.06 | 0.06 |
| Belgium (Flemish) | 0.03 | -0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| Bulgaria | 0.30 | 0.35 | 0.09 | 0.12 | 0.07 | 0.09 |
| Canada | 0.32 | 0.31 | 0.10 | 0.09 | 0.08 | 0.07 |
| Chile | 0.35 | 0.28 | 0.12 | 0.08 | 0.10 | 0.07 |
| Chinese Taipei | 0.30 | 0.26 | 0.09 | 0.07 | 0.07 | 0.05 |
| Croatia | 0.35 | 0.31 | 0.12 | 0.09 | 0.10 | 0.08 |
| Cyprus | 0.25 | 0.21 | 0.06 | 0.05 | 0.05 | 0.04 |
| Czech Republic | 0.24 | 0.15 | 0.06 | 0.02 | 0.05 | 0.03 |
| Denmark | 0.21 | 0.14 | 0.05 | 0.02 | 0.03 | 0.01 |
| England | - | - | - | - | - | - |
| Finland | 0.45 | 0.35 | 0.20 | 0.12 | 0.18 | 0.11 |
| France | 0.22 | 0.14 | 0.05 | 0.02 | 0.04 | 0.02 |
| Georgia | 0.20 | 0.19 | 0.04 | 0.04 | 0.03 | 0.03 |
| Germany | 0.15 | 0.07 | 0.02 | 0.00 | 0.01 | 0.00 |
| Hong Kong SAR | 0.32 | 0.33 | 0.10 | 0.11 | 0.07 | 0.08 |
| Hungary | 0.19 | 0.14 | 0.04 | 0.02 | 0.03 | 0.02 |
| Indonesia | 0.35 | 0.33 | 0.12 | 0.11 | 0.11 | 0.11 |
| Iran, Islamic Rep. of | 0.26 | 0.23 | 0.07 | 0.05 | 0.04 | 0.03 |
| Ireland | 0.41 | 0.36 | 0.16 | 0.13 | 0.14 | 0.11 |
| Italy | 0.18 | 0.09 | 0.03 | 0.01 | 0.02 | 0.01 |
| Japan | 0.35 | 0.29 | 0.13 | 0.08 | 0.11 | 0.08 |
| Jordan | 0.43 | - | 0.19 | - | 0.15 | - |
| Kazakhstan | 0.16 | 0.16 | 0.03 | 0.02 | 0.03 | 0.02 |
| Korea, Rep. of | 0.34 | 0.32 | 0.12 | 0.10 | 0.10 | 0.09 |
| Kuwait | 0.30 | 0.27 | 0.09 | 0.07 | 0.07 | 0.05 |
| Lithuania | 0.44 | 0.35 | 0.19 | 0.12 | 0.15 | 0.10 |
| Morocco | 0.22 | 0.27 | 0.05 | 0.07 | 0.06 | 0.07 |
| Netherlands | 0.25 | 0.23 | 0.06 | 0.05 | 0.04 | 0.04 |
| New Zealand | 0.26 | 0.19 | 0.07 | 0.03 | 0.06 | 0.03 |
| Northern Ireland | - | - | - | - | - | - |
| Norway (5) | 0.30 | 0.23 | 0.09 | 0.05 | 0.06 | 0.03 |
| Oman | 0.26 | 0.29 | 0.07 | 0.08 | 0.05 | 0.06 |
| Poland | 0.31 | 0.26 | 0.10 | 0.07 | 0.08 | 0.06 |
| Portugal | 0.21 | 0.17 | 0.04 | 0.03 | 0.03 | 0.02 |
| Qatar | 0.28 | 0.31 | 0.08 | 0.10 | 0.06 | 0.08 |
| Russian Federation | 0.32 | 0.32 | 0.10 | 0.10 | 0.09 | 0.09 |
| Saudi Arabia | 0.15 | 0.19 | 0.02 | 0.04 | 0.02 | 0.03 |
| Serbia | 0.39 | 0.33 | 0.15 | 0.11 | 0.13 | 0.10 |
| Singapore | 0.46 | 0.45 | 0.21 | 0.20 | 0.17 | 0.17 |
| Slovak Republic | 0.22 | 0.18 | 0.05 | 0.03 | 0.03 | 0.02 |
| Slovenia | 0.29 | 0.23 | 0.08 | 0.05 | 0.07 | 0.04 |
| South Africa (5) | 0.27 | - | 0.07 | - | 0.06 | - |
| Spain | 0.35 | 0.29 | 0.12 | 0.08 | 0.09 | 0.06 |
| Sweden | 0.34 | 0.25 | 0.11 | 0.06 | 0.10 | 0.05 |
| Turkey | 0.25 | 0.24 | 0.06 | 0.06 | 0.03 | 0.03 |
| United Arab Emirates | 0.29 | 0.32 | 0.09 | 0.10 | 0.07 | 0.09 |
| United States | - | - | - | - | - | - |
| International Median | 0.28 | 0.26 | 0.08 | 0.07 | 0.06 | 0.05 |
| Benchmarking Participants | | | | | | |
| Buenos Aires, Argentina | 0.35 | 0.22 | 0.12 | 0.05 | 0.10 | 0.05 |
| Ontario, Canada | 0.41 | 0.34 | 0.17 | 0.12 | 0.13 | 0.09 |
| Quebec, Canada | 0.27 | 0.21 | 0.07 | 0.04 | 0.06 | 0.04 |
| Norway (4) | 0.31 | 0.21 | 0.09 | 0.04 | 0.08 | 0.03 |
| Abu Dhabi, UAE | 0.35 | 0.37 | 0.12 | 0.14 | 0.10 | 0.11 |
| Dubai, UAE | 0.25 | 0.27 | 0.06 | 0.07 | 0.05 | 0.06 |
| Florida, US | - | - | - | - | - | - |

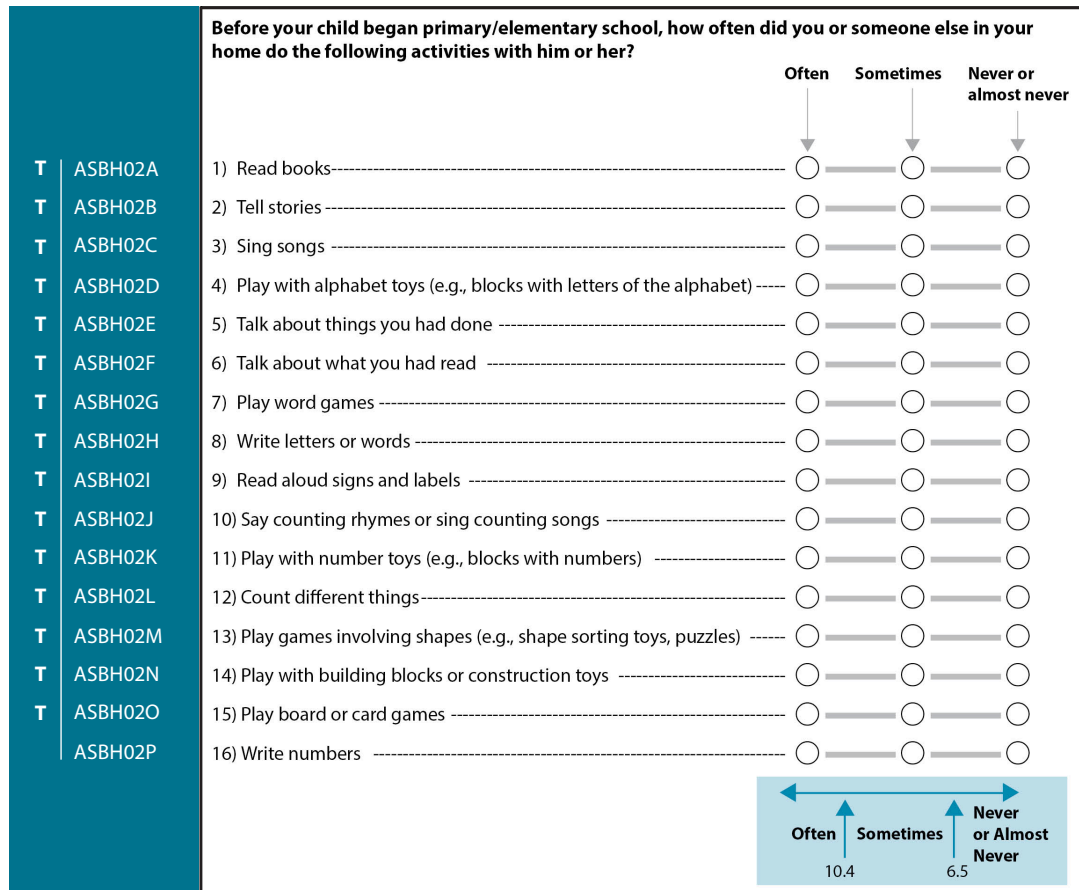
SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

A dash (-) indicates comparable data not available.

Early Literacy and Numeracy Activities Before Beginning Primary School Scale, Fourth Grade

The Early Literacy and Numeracy Activities Before Beginning Primary School (ELN) scale was created based on parents' frequency of doing the sixteen activities described below.

Items in the TIMSS 2015 Early Literacy and Numeracy Activities Before Beginning Primary School Scale, Fourth Grade



T Trend item—item was included in the same scale in TIMSS 2011 and was used for linking the TIMSS 2011 and TIMSS 2015 scales.

Item Parameters for the TIMSS 2015 Early Literacy and Numeracy Activities Before Beginning Primary School Scale, Fourth Grade

| Item | delta | tau_1 | tau_2 | Infit |
|---------|----------|----------|---------|-------|
| ASBH02A | -0.32169 | -1.40660 | 1.40660 | 1.01 |
| ASBH02B | -0.20513 | -1.37557 | 1.37557 | 1.00 |
| ASBH02C | 0.10661 | -1.03171 | 1.03171 | 1.17 |
| ASBH02D | 0.25379 | -1.05591 | 1.05591 | 0.94 |
| ASBH02E | -0.76183 | -1.25727 | 1.25727 | 1.09 |
| ASBH02F | 0.35496 | -1.37009 | 1.37009 | 1.03 |
| ASBH02G | 0.47225 | -1.25920 | 1.25920 | 0.93 |
| ASBH02H | 0.01255 | -1.16783 | 1.16783 | 0.99 |
| ASBH02I | 0.19765 | -1.01939 | 1.01939 | 1.00 |
| ASBH02J | 0.48348 | -1.02734 | 1.02734 | 1.01 |
| ASBH02K | 0.39214 | -1.07179 | 1.07179 | 0.89 |
| ASBH02L | -0.60000 | -1.25574 | 1.25574 | 0.90 |
| ASBH02M | -0.28391 | -1.03163 | 1.03163 | 0.95 |
| ASBH02N | -0.32170 | -0.85306 | 0.85306 | 1.02 |
| ASBH02O | 0.30628 | -1.16501 | 1.16501 | 1.08 |
| ASBH02P | -0.08545 | -1.21120 | 1.21120 | 1.02 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Scale Transformation Constants for the TIMSS 2015 Early Literacy and Numeracy Activities Before Beginning Primary School Scale, Fourth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 8.435922 | Transformed Scale Score = 8.435922 + 1.454568 • Logit Scale Score |
| B = 1.454568 | |

Equivalence Table of Raw and Transformed Scale Scores for the TIMSS 2015 for the TIMSS 2015 Early Literacy and Numeracy Activities Before Beginning Primary School Scale, Fourth Grade

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 1.52118 | |
| 1 | 3.21261 | |
| 2 | 4.05217 | |
| 3 | 4.63893 | |
| 4 | 5.10326 | |
| 5 | 5.49791 | |
| 6 | 5.84602 | |
| 7 | 6.16205 | |
| 8 | 6.45508 | 6.5 |
| 9 | 6.73118 | |
| 10 | 6.99414 | |
| 11 | 7.24849 | |
| 12 | 7.49560 | |
| 13 | 7.73744 | |
| 14 | 7.97558 | |
| 15 | 8.21137 | |
| 16 | 8.44607 | |
| 17 | 8.68032 | |
| 18 | 8.91562 | |
| 19 | 9.15294 | |
| 20 | 9.39354 | |
| 21 | 9.63897 | |
| 22 | 9.89110 | |
| 23 | 10.15236 | |
| 24 | 10.42416 | 10.4 |
| 25 | 10.71309 | |
| 26 | 11.02427 | |
| 27 | 11.36672 | |
| 28 | 11.75490 | |
| 29 | 12.21205 | |
| 30 | 12.79071 | |
| 31 | 13.62125 | |
| 32 | 15.30297 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Early Literacy and Numeracy Activities Before Beginning Primary School Scale, Fourth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| | | | ASBHO2A | ASBHO2B | ASBHO2C | ASBHO2D | ASBHO2E | ASBHO2F | ASBHO2G | ASBHO2H | ASBHO2I | ASBHO2J | ASBHO2K | ASBHO2L | ASBHO2M | ASBHO2N | ASBHO2O | ASBHO2P |
| Australia | 0.90 | 40 | 0.59 | 0.60 | 0.54 | 0.70 | 0.48 | 0.61 | 0.70 | 0.66 | 0.65 | 0.68 | 0.73 | 0.68 | 0.66 | 0.55 | 0.57 | 0.64 |
| Bahrain | 0.84 | 30 | 0.47 | 0.48 | 0.36 | 0.62 | 0.43 | 0.44 | 0.61 | 0.60 | 0.56 | 0.56 | 0.69 | 0.60 | 0.59 | 0.57 | 0.56 | 0.57 |
| Belgium (Flemish) | 0.84 | 29 | 0.45 | 0.44 | 0.45 | 0.60 | 0.35 | 0.43 | 0.65 | 0.59 | 0.59 | 0.62 | 0.66 | 0.64 | 0.53 | 0.46 | 0.51 | 0.57 |
| Bulgaria | 0.93 | 47 | 0.69 | 0.67 | 0.45 | 0.75 | 0.61 | 0.71 | 0.70 | 0.76 | 0.68 | 0.63 | 0.75 | 0.74 | 0.75 | 0.69 | 0.63 | 0.73 |
| Canada | 0.89 | 38 | 0.57 | 0.57 | 0.47 | 0.69 | 0.46 | 0.59 | 0.68 | 0.66 | 0.62 | 0.65 | 0.72 | 0.68 | 0.66 | 0.55 | 0.51 | 0.63 |
| Chile | 0.88 | 35 | 0.51 | 0.55 | 0.45 | 0.66 | 0.44 | 0.56 | 0.67 | 0.65 | 0.56 | 0.67 | 0.72 | 0.58 | 0.63 | 0.60 | 0.49 | 0.61 |
| Chinese Taipei | 0.90 | 40 | 0.61 | 0.61 | 0.52 | 0.65 | 0.52 | 0.54 | 0.64 | 0.56 | 0.65 | 0.73 | 0.74 | 0.74 | 0.72 | 0.70 | 0.48 | 0.64 |
| Croatia | 0.84 | 30 | 0.51 | 0.53 | 0.38 | 0.63 | 0.42 | 0.59 | 0.58 | 0.59 | 0.59 | 0.55 | 0.68 | 0.59 | 0.58 | 0.47 | 0.43 | 0.59 |
| Cyprus | 0.89 | 37 | 0.56 | 0.54 | 0.48 | 0.70 | 0.46 | 0.59 | 0.68 | 0.64 | 0.57 | 0.61 | 0.74 | 0.65 | 0.65 | 0.58 | 0.66 | 0.61 |
| Czech Republic | 0.82 | 27 | 0.38 | 0.45 | 0.40 | 0.61 | 0.43 | 0.54 | 0.54 | 0.58 | 0.52 | 0.53 | 0.67 | 0.61 | 0.51 | 0.45 | 0.44 | 0.60 |
| Denmark | 0.84 | 30 | 0.49 | 0.52 | 0.44 | 0.61 | 0.44 | 0.61 | 0.65 | 0.61 | 0.55 | 0.61 | 0.61 | 0.60 | 0.49 | 0.41 | 0.44 | 0.58 |
| England | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Finland | 0.84 | 29 | 0.45 | 0.50 | 0.39 | 0.59 | 0.41 | 0.57 | 0.59 | 0.62 | 0.59 | 0.52 | 0.62 | 0.62 | 0.54 | 0.43 | 0.50 | 0.63 |
| France | 0.83 | 29 | 0.50 | 0.49 | 0.43 | 0.63 | 0.38 | 0.50 | 0.61 | 0.61 | 0.52 | 0.58 | 0.65 | 0.62 | 0.54 | 0.45 | 0.41 | 0.58 |
| Georgia | 0.81 | 27 | 0.55 | 0.44 | 0.33 | 0.61 | 0.34 | 0.46 | 0.57 | 0.56 | 0.55 | 0.55 | 0.69 | 0.53 | 0.56 | 0.59 | 0.36 | 0.53 |
| Germany | 0.83 | 28 | 0.41 | 0.50 | 0.42 | 0.59 | 0.34 | 0.48 | 0.62 | 0.57 | 0.59 | 0.61 | 0.67 | 0.59 | 0.53 | 0.42 | 0.45 | 0.56 |
| Hong Kong SAR | 0.88 | 37 | 0.58 | 0.59 | 0.51 | 0.68 | 0.42 | 0.49 | 0.67 | 0.54 | 0.60 | 0.69 | 0.73 | 0.69 | 0.70 | 0.65 | 0.48 | 0.59 |
| Hungary | 0.82 | 28 | 0.44 | 0.46 | 0.38 | 0.64 | 0.37 | 0.47 | 0.63 | 0.57 | 0.57 | 0.60 | 0.68 | 0.57 | 0.52 | 0.41 | 0.44 | 0.57 |
| Indonesia | 0.88 | 36 | 0.51 | 0.49 | 0.51 | 0.63 | 0.56 | 0.61 | 0.65 | 0.63 | 0.59 | 0.64 | 0.64 | 0.63 | 0.65 | 0.63 | 0.59 | 0.59 |
| Iran, Islamic Rep. of | 0.88 | 35 | 0.58 | 0.52 | 0.50 | 0.64 | 0.47 | 0.55 | 0.66 | 0.63 | 0.62 | 0.58 | 0.67 | 0.60 | 0.63 | 0.58 | 0.62 | 0.59 |
| Ireland | 0.88 | 36 | 0.53 | 0.55 | 0.47 | 0.67 | 0.43 | 0.55 | 0.66 | 0.64 | 0.63 | 0.65 | 0.72 | 0.67 | 0.68 | 0.58 | 0.51 | 0.64 |
| Italy | 0.83 | 29 | 0.39 | 0.46 | 0.36 | 0.68 | 0.34 | 0.47 | 0.57 | 0.64 | 0.56 | 0.59 | 0.67 | 0.60 | 0.56 | 0.50 | 0.40 | 0.60 |
| Japan | 0.87 | 33 | 0.49 | 0.52 | 0.50 | 0.58 | 0.49 | 0.55 | 0.65 | 0.65 | 0.61 | 0.61 | 0.64 | 0.67 | 0.58 | 0.50 | 0.50 | 0.66 |
| Jordan | 0.86 | 33 | 0.44 | 0.52 | 0.45 | 0.64 | 0.50 | 0.46 | 0.62 | 0.63 | 0.56 | 0.61 | 0.69 | 0.59 | 0.59 | 0.58 | 0.59 | 0.61 |
| Kazakhstan | 0.85 | 31 | 0.53 | 0.45 | 0.43 | 0.62 | 0.47 | 0.53 | 0.57 | 0.55 | 0.53 | 0.56 | 0.68 | 0.56 | 0.62 | 0.59 | 0.62 | 0.56 |
| Korea, Rep. of | 0.90 | 40 | 0.55 | 0.48 | 0.48 | 0.65 | 0.50 | 0.59 | 0.72 | 0.69 | 0.70 | 0.72 | 0.75 | 0.75 | 0.66 | 0.59 | 0.48 | 0.68 |
| Kuwait | 0.85 | 31 | 0.46 | 0.45 | 0.34 | 0.63 | 0.40 | 0.44 | 0.60 | 0.61 | 0.56 | 0.57 | 0.69 | 0.59 | 0.63 | 0.56 | 0.56 | 0.62 |
| Lithuania | 0.84 | 30 | 0.54 | 0.48 | 0.39 | 0.66 | 0.48 | 0.60 | 0.63 | 0.59 | 0.42 | 0.56 | 0.70 | 0.59 | 0.55 | 0.53 | 0.41 | 0.56 |
| Morocco | 0.92 | 45 | 0.67 | 0.63 | 0.57 | 0.71 | 0.62 | 0.67 | 0.70 | 0.74 | 0.70 | 0.65 | 0.74 | 0.60 | 0.69 | 0.66 | 0.67 | 0.72 |
| Netherlands | 0.86 | 32 | 0.44 | 0.51 | 0.45 | 0.70 | 0.39 | 0.48 | 0.71 | 0.65 | 0.52 | 0.65 | 0.69 | 0.65 | 0.55 | 0.40 | 0.49 | 0.61 |
| New Zealand | 0.90 | 39 | 0.54 | 0.59 | 0.53 | 0.68 | 0.49 | 0.61 | 0.69 | 0.65 | 0.65 | 0.69 | 0.71 | 0.69 | 0.66 | 0.57 | 0.58 | 0.63 |
| Northern Ireland | 0.89 | 38 | 0.54 | 0.56 | 0.51 | 0.67 | 0.48 | 0.63 | 0.70 | 0.65 | 0.64 | 0.63 | 0.70 | 0.62 | 0.66 | 0.60 | 0.59 | 0.61 |
| Norway (5) | 0.87 | 34 | 0.52 | 0.54 | 0.44 | 0.67 | 0.45 | 0.61 | 0.70 | 0.63 | 0.59 | 0.64 | 0.69 | 0.63 | 0.55 | 0.42 | 0.51 | 0.60 |
| Oman | 0.83 | 29 | 0.49 | 0.47 | 0.21 | 0.61 | 0.38 | 0.51 | 0.59 | 0.58 | 0.59 | 0.50 | 0.65 | 0.52 | 0.57 | 0.58 | 0.60 | 0.57 |
| Poland | 0.85 | 32 | 0.48 | 0.49 | 0.46 | 0.65 | 0.50 | 0.59 | 0.62 | 0.58 | 0.58 | 0.59 | 0.71 | 0.61 | 0.51 | 0.47 | 0.48 | 0.62 |
| Portugal | 0.86 | 32 | 0.57 | 0.57 | 0.45 | 0.64 | 0.41 | 0.54 | 0.65 | 0.59 | 0.49 | 0.57 | 0.71 | 0.65 | 0.62 | 0.56 | 0.47 | 0.55 |
| Qatar | 0.87 | 33 | 0.50 | 0.52 | 0.38 | 0.63 | 0.47 | 0.49 | 0.61 | 0.60 | 0.58 | 0.60 | 0.70 | 0.65 | 0.65 | 0.59 | 0.55 | 0.62 |
| Russian Federation | 0.88 | 36 | 0.60 | 0.50 | 0.46 | 0.66 | 0.57 | 0.60 | 0.63 | 0.63 | 0.52 | 0.59 | 0.70 | 0.61 | 0.61 | 0.60 | 0.58 | 0.64 |
| Saudi Arabia | 0.85 | 31 | 0.43 | 0.47 | 0.22 | 0.62 | 0.49 | 0.45 | 0.65 | 0.62 | 0.57 | 0.55 | 0.71 | 0.53 | 0.60 | 0.59 | 0.62 | 0.61 |
| Serbia | 0.87 | 33 | 0.53 | 0.55 | 0.51 | 0.63 | 0.48 | 0.55 | 0.62 | 0.60 | 0.58 | 0.59 | 0.67 | 0.62 | 0.59 | 0.56 | 0.55 | 0.58 |
| Singapore | 0.91 | 43 | 0.62 | 0.62 | 0.55 | 0.69 | 0.53 | 0.58 | 0.66 | 0.68 | 0.69 | 0.69 | 0.74 | 0.74 | 0.66 | 0.56 | 0.66 | 0.61 |
| Slovak Republic | 0.86 | 33 | 0.51 | 0.52 | 0.36 | 0.65 | 0.52 | 0.61 | 0.60 | 0.59 | 0.60 | 0.61 | 0.69 | 0.62 | 0.62 | 0.55 | 0.46 | 0.61 |
| Slovenia | 0.86 | 32 | 0.47 | 0.55 | 0.51 | 0.65 | 0.46 | 0.60 | 0.64 | 0.61 | 0.58 | 0.63 | 0.65 | 0.60 | 0.54 | 0.37 | 0.44 | 0.64 |
| South Africa (5) | 0.89 | 36 | 0.61 | 0.50 | 0.44 | 0.63 | 0.52 | 0.61 | 0.63 | 0.64 | 0.65 | 0.60 | 0.68 | 0.61 | 0.67 | 0.60 | 0.56 | 0.60 |
| Spain | 0.84 | 30 | 0.50 | 0.53 | 0.46 | 0.65 | 0.35 | 0.44 | 0.61 | 0.61 | 0.55 | 0.57 | 0.69 | 0.54 | 0.63 | 0.57 | 0.42 | 0.58 |
| Sweden | 0.85 | 32 | 0.46 | 0.49 | 0.43 | 0.65 | 0.43 | 0.57 | 0.67 | 0.63 | 0.61 | 0.63 | 0.70 | 0.60 | 0.56 | 0.44 | 0.45 | 0.60 |
| Turkey | 0.90 | 40 | 0.64 | 0.64 | 0.47 | 0.61 | 0.60 | 0.67 | 0.67 | 0.65 | 0.69 | 0.65 | 0.68 | 0.65 | 0.70 | 0.56 | 0.54 | 0.65 |
| United Arab Emirates | 0.86 | 33 | 0.46 | 0.48 | 0.38 | 0.64 | 0.46 | 0.48 | 0.60 | 0.60 | 0.56 | 0.62 | 0.70 | 0.65 | 0.66 | 0.62 | 0.54 | 0.61 |
| United States | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Benchmarking Participants | | | | | | | | | | | | | | | | | | |
| Buenos Aires, Argentina | 0.85 | 31 | 0.48 | 0.48 | 0.44 | 0.69 | 0.41 | 0.51 | 0.69 | 0.63 | 0.46 | 0.53 | 0.67 | 0.49 | 0.63 | 0.57 | 0.52 | 0.54 |
| Ontario, Canada | 0.89 | 38 | 0.57 | 0.59 | 0.47 | 0.69 | 0.48 | 0.60 | 0.69 | 0.65 | 0.64 | 0.65 | 0.73 | 0.68 | 0.68 | 0.59 | 0.55 | 0.61 |
| Quebec, Canada | 0.87 | 34 | 0.54 | 0.55 | 0.43 | 0.67 | 0.43 | 0.53 | 0.66 | 0.64 | 0.58 | 0.64 | 0.69 | 0.66 | 0.63 | 0.48 | 0.48 | 0.62 |
| Norway (4) | 0.86 | 33 | 0.50 | 0.47 | 0.46 | 0.68 | 0.41 | 0.62 | 0.68 | 0.65 | 0.56 | 0.64 | 0.72 | 0.62 | 0.52 | 0.42 | 0.47 | 0.62 |
| Abu Dhabi, UAE | 0.86 | 33 | 0.46 | 0.48 | 0.35 | 0.63 | 0.47 | 0.48 | 0.62 | 0.60 | 0.55 | 0.62 | 0.70 | 0.66 | 0.66 | 0.64 | 0.57 | 0.64 |
| Dubai, UAE | 0.87 | 34 | 0.52 | 0.51 | 0.42 | 0.65 | 0.46 | 0.49 | 0.61 | 0.59 | 0.60 | 0.63 | 0.71 | 0.66 | 0.67 | 0.60 | 0.49 | 0.58 |
| Florida, US | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

A dash (-) indicates comparable data not available.

Relationship Between the TIMSS 2015 Early Literacy and Numeracy Activities Before Beginning Primary School Scale, Fourth Grade, and TIMSS 2015 Achievement

| Country | Pearson's Correlation with Achievement | | | | Variance in Achievement Accounted for by Difference Between Regions of the Scale (η^2) | |
|----------------------------------|--|-------------|-------------|-------------|---|-------------|
| | (r) | | (r) | | Mathematics | Science |
| | Mathematics | Science | Mathematics | Science | | |
| Australia | 0.15 | 0.19 | 0.02 | 0.04 | 0.02 | 0.03 |
| Bahrain | 0.19 | 0.19 | 0.04 | 0.04 | 0.03 | 0.03 |
| Belgium (Flemish) | 0.10 | 0.11 | 0.01 | 0.01 | 0.01 | 0.01 |
| Bulgaria | 0.25 | 0.33 | 0.06 | 0.11 | 0.05 | 0.10 |
| Canada | 0.13 | 0.19 | 0.02 | 0.04 | 0.01 | 0.03 |
| Chile | 0.21 | 0.22 | 0.05 | 0.05 | 0.03 | 0.03 |
| Chinese Taipei | 0.21 | 0.22 | 0.04 | 0.05 | 0.04 | 0.04 |
| Croatia | 0.19 | 0.21 | 0.04 | 0.04 | 0.03 | 0.03 |
| Cyprus | 0.18 | 0.24 | 0.03 | 0.06 | 0.03 | 0.04 |
| Czech Republic | 0.08 | 0.07 | 0.01 | 0.00 | 0.01 | 0.00 |
| Denmark | 0.14 | 0.12 | 0.02 | 0.01 | 0.01 | 0.01 |
| England | - | - | - | - | - | - |
| Finland | 0.12 | 0.16 | 0.01 | 0.03 | 0.01 | 0.02 |
| France | 0.16 | 0.15 | 0.03 | 0.02 | 0.02 | 0.02 |
| Georgia | 0.07 | 0.10 | 0.00 | 0.01 | 0.01 | 0.01 |
| Germany | 0.08 | 0.08 | 0.01 | 0.01 | 0.01 | 0.01 |
| Hong Kong SAR | 0.20 | 0.20 | 0.04 | 0.04 | 0.04 | 0.04 |
| Hungary | 0.14 | 0.13 | 0.02 | 0.02 | 0.03 | 0.03 |
| Indonesia | 0.17 | 0.15 | 0.03 | 0.02 | 0.02 | 0.02 |
| Iran, Islamic Rep. of | 0.25 | 0.25 | 0.06 | 0.06 | 0.05 | 0.04 |
| Ireland | 0.20 | 0.21 | 0.04 | 0.04 | 0.03 | 0.03 |
| Italy | 0.13 | 0.15 | 0.02 | 0.02 | 0.01 | 0.01 |
| Japan | 0.18 | 0.15 | 0.03 | 0.02 | 0.02 | 0.02 |
| Jordan | 0.25 | - | 0.06 | - | 0.05 | - |
| Kazakhstan | 0.12 | 0.14 | 0.01 | 0.02 | 0.01 | 0.01 |
| Korea, Rep. of | 0.27 | 0.24 | 0.07 | 0.06 | 0.06 | 0.05 |
| Kuwait | 0.15 | 0.17 | 0.02 | 0.03 | 0.02 | 0.02 |
| Lithuania | 0.11 | 0.09 | 0.01 | 0.01 | 0.01 | 0.01 |
| Morocco | 0.12 | 0.17 | 0.01 | 0.03 | 0.02 | 0.03 |
| Netherlands | 0.01 | 0.06 | 0.00 | 0.00 | 0.00 | 0.01 |
| New Zealand | 0.21 | 0.23 | 0.04 | 0.05 | 0.04 | 0.04 |
| Northern Ireland | 0.17 | 0.20 | 0.03 | 0.04 | 0.01 | 0.02 |
| Norway (5) | 0.18 | 0.18 | 0.03 | 0.03 | 0.02 | 0.02 |
| Oman | 0.17 | 0.20 | 0.03 | 0.04 | 0.02 | 0.03 |
| Poland | 0.13 | 0.13 | 0.02 | 0.02 | 0.01 | 0.01 |
| Portugal | 0.17 | 0.19 | 0.03 | 0.04 | 0.02 | 0.03 |
| Qatar | 0.23 | 0.23 | 0.05 | 0.05 | 0.04 | 0.04 |
| Russian Federation | 0.12 | 0.16 | 0.01 | 0.03 | 0.01 | 0.01 |
| Saudi Arabia | 0.05 | 0.09 | 0.00 | 0.01 | 0.00 | 0.01 |
| Serbia | 0.20 | 0.20 | 0.04 | 0.04 | 0.05 | 0.06 |
| Singapore | 0.19 | 0.22 | 0.04 | 0.05 | 0.03 | 0.04 |
| Slovak Republic | 0.14 | 0.12 | 0.02 | 0.02 | 0.02 | 0.02 |
| Slovenia | 0.10 | 0.11 | 0.01 | 0.01 | 0.01 | 0.01 |
| South Africa (5) | 0.23 | - | 0.05 | - | 0.05 | - |
| Spain | 0.18 | 0.20 | 0.03 | 0.04 | 0.03 | 0.03 |
| Sweden | 0.15 | 0.14 | 0.02 | 0.02 | 0.01 | 0.01 |
| Turkey | 0.38 | 0.38 | 0.15 | 0.15 | 0.13 | 0.13 |
| United Arab Emirates | 0.21 | 0.23 | 0.05 | 0.05 | 0.04 | 0.04 |
| United States | - | - | - | - | - | - |
| International Median | 0.17 | 0.18 | 0.03 | 0.03 | 0.02 | 0.03 |
| Benchmarking Participants | | | | | | |
| Buenos Aires, Argentina | 0.25 | 0.24 | 0.06 | 0.06 | 0.06 | 0.03 |
| Ontario, Canada | 0.15 | 0.19 | 0.02 | 0.04 | 0.02 | 0.03 |
| Quebec, Canada | 0.16 | 0.18 | 0.02 | 0.03 | 0.02 | 0.02 |
| Norway (4) | 0.17 | 0.15 | 0.03 | 0.02 | 0.03 | 0.03 |
| Abu Dhabi, UAE | 0.20 | 0.21 | 0.04 | 0.04 | 0.03 | 0.03 |
| Dubai, UAE | 0.22 | 0.23 | 0.05 | 0.05 | 0.04 | 0.04 |
| Florida, US | - | - | - | - | - | - |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

A dash (-) indicates comparable data not available.

Home Resources for Learning Scale, Fourth Grade

The Home Resources for Learning (HRL) scale was created based on students' and parents' responses concerning the availability of five resources described below.

Items in the TIMSS 2015 Home Resources for Learning Scale, Fourth Grade

| | | | |
|-------------------------|--|---|-------------------------|
| T ASBG04 | <p>Number of books in the home (students):</p> <p>1) 0-10 2) 11-25 3) 26-100 4) 101-200 5) More than 200</p> | <p>Number of children's books in the home (parents):</p> <p>1) 0-10 2) 11-25 3) 26-50 4) 51-100 5) More than 100</p> | T ASBH14 |
| T ASDG05S ¹ | <p>Number of home study supports (students):</p> <p>1) None 2) Internet connection or own room 3) Both</p> | <p>Highest level of education of either parent (parents):</p> <p>1) Finished some primary or lower secondary or did not go to school 2) Finished lower secondary 3) Finished upper secondary 4) Finished post-secondary education 5) Finished university or higher</p> | T ASDHEDUP ¹ |
| T ASDHOCCP ¹ | <p>Highest level of occupation of either parent (parents):</p> <p>1) Has never worked outside home for pay, general laborer, or semi-professional (skilled agricultural or fishery worker, craft or trade worker, plant or machine operator) 2) Clerical (clerk or service or sales worker) 3) Small business owner 4) Professional (corporate manager or senior official, professional, or technician or associate professional)</p> | | |
| | | | |

T Trend item—item was included in the same scale in TIMSS 2011 and was used for linking the TIMSS 2011 and TIMSS 2015 scales.

1 Derived variable. For more details, see Supplement 3 of the User Guide for the [TIMSS 2015 International Database](#).

Item Parameters for the TIMSS 2015 Home Resources for Learning Scale, Fourth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | tau_4 | Infit |
|----------|----------|----------|----------|----------|---------|-------|
| ASBG04 | 0.50877 | -1.25665 | -0.44740 | 0.93994 | 0.76411 | 1.01 |
| ASBH14 | 0.58514 | -0.74466 | -0.46122 | 0.43512 | 0.77076 | 0.96 |
| ASDG05S | -0.78604 | -0.78596 | 0.78596 | | | 1.08 |
| ASDHEDUP | -0.40313 | -0.37335 | -0.98713 | 0.84623 | 0.51425 | 0.94 |
| ASDHOCCP | 0.09526 | -0.32617 | 0.95244 | -0.62627 | | 1.02 |

Scale Transformation Constants for the TIMSS 2015 Home Resources for Learning Scale, Fourth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 9.487504 | Transformed Scale Score = 9.487504 + 1.844284 • Logit Scale Score |
| B = 1.844284 | |

IEA's Trends in International Mathematics and Science Study – TIMSS 2015

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Home Resources for Learning Scale, Fourth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 3.68952 | |
| 1 | 5.69990 | |
| 2 | 6.65832 | |
| 3 | 7.34373 | 7.4 |
| 4 | 7.90391 | |
| 5 | 8.38881 | |
| 6 | 8.82316 | |
| 7 | 9.21608 | |
| 8 | 9.57946 | |
| 9 | 9.92615 | |
| 10 | 10.27747 | |
| 11 | 10.63489 | |
| 12 | 11.01616 | |
| 13 | 11.43841 | |
| 14 | 11.92828 | 11.9 |
| 15 | 12.52570 | |
| 16 | 13.35902 | |
| 17 | 15.03850 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



**Cronbach's Alpha Reliability Coefficient and Principal Components
Analysis of the Items in the TIMSS 2015 Home Resources for Learning
Scale, Fourth Grade**

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|--------|--------|----------|----------|
| | | | ASB604 | ASBH14 | ASD025 | ASDHEDUP | ASDH0CCP |
| Australia | 0.62 | 41 | 0.66 | 0.66 | 0.33 | 0.74 | 0.73 |
| Bahrain | 0.55 | 36 | 0.50 | 0.64 | 0.26 | 0.75 | 0.71 |
| Belgium (Flemish) | 0.70 | 47 | 0.67 | 0.72 | 0.34 | 0.79 | 0.79 |
| Bulgaria | 0.83 | 60 | 0.78 | 0.82 | 0.48 | 0.89 | 0.82 |
| Canada | 0.56 | 37 | 0.70 | 0.70 | 0.33 | 0.61 | 0.62 |
| Chile | 0.66 | 43 | 0.52 | 0.68 | 0.41 | 0.82 | 0.76 |
| Chinese Taipei | 0.71 | 48 | 0.78 | 0.80 | 0.21 | 0.77 | 0.72 |
| Croatia | 0.68 | 46 | 0.68 | 0.75 | 0.22 | 0.79 | 0.76 |
| Cyprus | 0.62 | 41 | 0.65 | 0.73 | 0.25 | 0.76 | 0.67 |
| Czech Republic | 0.67 | 44 | 0.71 | 0.74 | 0.20 | 0.76 | 0.73 |
| Denmark | 0.64 | 42 | 0.71 | 0.72 | 0.29 | 0.68 | 0.72 |
| England | - | - | - | - | - | - | - |
| Finland | 0.60 | 39 | 0.65 | 0.69 | 0.10 | 0.75 | 0.72 |
| France | 0.72 | 48 | 0.72 | 0.76 | 0.32 | 0.81 | 0.74 |
| Georgia | 0.66 | 44 | 0.68 | 0.75 | 0.36 | 0.74 | 0.70 |
| Germany | 0.65 | 43 | 0.73 | 0.74 | 0.09 | 0.76 | 0.69 |
| Hong Kong SAR | 0.76 | 52 | 0.75 | 0.82 | 0.29 | 0.82 | 0.78 |
| Hungary | 0.80 | 57 | 0.78 | 0.84 | 0.27 | 0.87 | 0.83 |
| Indonesia | 0.58 | 37 | 0.46 | 0.55 | 0.37 | 0.79 | 0.76 |
| Iran, Islamic Rep. of | 0.74 | 49 | 0.69 | 0.72 | 0.57 | 0.79 | 0.70 |
| Ireland | 0.68 | 45 | 0.72 | 0.75 | 0.17 | 0.77 | 0.75 |
| Italy | 0.67 | 44 | 0.66 | 0.74 | 0.11 | 0.80 | 0.77 |
| Japan | 0.61 | 40 | 0.68 | 0.74 | 0.30 | 0.71 | 0.62 |
| Jordan | 0.55 | 36 | 0.50 | 0.49 | 0.50 | 0.74 | 0.71 |
| Kazakhstan | 0.61 | 40 | 0.63 | 0.63 | 0.54 | 0.68 | 0.65 |
| Korea, Rep. of | 0.63 | 41 | 0.72 | 0.72 | 0.38 | 0.73 | 0.59 |
| Kuwait | 0.42 | 31 | 0.45 | 0.56 | 0.12 | 0.71 | 0.70 |
| Lithuania | 0.72 | 48 | 0.70 | 0.76 | 0.39 | 0.78 | 0.75 |
| Morocco | 0.71 | 45 | 0.68 | 0.63 | 0.62 | 0.77 | 0.65 |
| Netherlands | 0.62 | 41 | 0.63 | 0.68 | 0.01 | 0.81 | 0.72 |
| New Zealand | 0.65 | 42 | 0.68 | 0.72 | 0.34 | 0.73 | 0.71 |
| Northern Ireland | 0.70 | 46 | 0.72 | 0.75 | 0.17 | 0.80 | 0.76 |
| Norway (5) | 0.65 | 43 | 0.66 | 0.73 | 0.25 | 0.78 | 0.73 |
| Oman | 0.59 | 38 | 0.42 | 0.59 | 0.36 | 0.82 | 0.76 |
| Poland | 0.73 | 49 | 0.68 | 0.74 | 0.32 | 0.84 | 0.80 |
| Portugal | 0.75 | 50 | 0.72 | 0.78 | 0.24 | 0.82 | 0.80 |
| Qatar | 0.53 | 35 | 0.46 | 0.66 | 0.26 | 0.73 | 0.71 |
| Russian Federation | 0.65 | 42 | 0.65 | 0.72 | 0.31 | 0.75 | 0.72 |
| Saudi Arabia | 0.50 | 33 | 0.36 | 0.51 | 0.33 | 0.79 | 0.74 |
| Serbia | 0.71 | 47 | 0.67 | 0.77 | 0.26 | 0.80 | 0.77 |
| Singapore | 0.68 | 45 | 0.69 | 0.71 | 0.33 | 0.78 | 0.72 |
| Slovak Republic | 0.77 | 53 | 0.78 | 0.82 | 0.28 | 0.82 | 0.79 |
| Slovenia | 0.65 | 43 | 0.62 | 0.72 | 0.06 | 0.80 | 0.77 |
| South Africa (5) | 0.62 | 39 | 0.57 | 0.55 | 0.58 | 0.69 | 0.70 |
| Spain | 0.69 | 46 | 0.67 | 0.74 | 0.15 | 0.83 | 0.78 |
| Sweden | 0.67 | 46 | 0.71 | 0.76 | 0.42 | 0.74 | 0.70 |
| Turkey | 0.74 | 49 | 0.67 | 0.74 | 0.59 | 0.80 | 0.69 |
| United Arab Emirates | 0.58 | 37 | 0.58 | 0.71 | 0.33 | 0.68 | 0.66 |
| United States | - | - | - | - | - | - | - |
| Benchmarking Participants | | | | | | | |
| Buenos Aires, Argentina | 0.70 | 46 | 0.60 | 0.75 | 0.31 | 0.80 | 0.81 |
| Ontario, Canada | 0.55 | 36 | 0.65 | 0.66 | 0.35 | 0.62 | 0.65 |
| Quebec, Canada | 0.62 | 40 | 0.74 | 0.75 | 0.34 | 0.66 | 0.60 |
| Norway (4) | 0.64 | 43 | 0.65 | 0.69 | 0.27 | 0.80 | 0.75 |
| Abu Dhabi, UAE | 0.59 | 38 | 0.56 | 0.70 | 0.30 | 0.72 | 0.69 |
| Dubai, UAE | 0.59 | 38 | 0.69 | 0.78 | 0.36 | 0.61 | 0.56 |
| Florida, US | - | - | - | - | - | - | - |

A dash (-) indicates comparable data not available.

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Home Resources for Learning Scale, Fourth Grade, and TIMSS 2015 Achievement

| Country | Pearson's Correlation with Achievement | | | | Variance in Achievement Accounted for by Difference Between Regions of the Scale (η^2) | |
|----------------------------------|--|-------------|-------------|-------------|---|-------------|
| | (r) | | (r) | | Mathematics | Science |
| | Mathematics | Science | Mathematics | Science | | |
| Australia | 0.38 | 0.40 | 0.15 | 0.16 | 0.11 | 0.12 |
| Bahrain | 0.30 | 0.28 | 0.09 | 0.08 | 0.05 | 0.04 |
| Belgium (Flemish) | 0.43 | 0.50 | 0.18 | 0.25 | 0.11 | 0.16 |
| Bulgaria | 0.35 | 0.46 | 0.13 | 0.22 | 0.10 | 0.16 |
| Canada | 0.33 | 0.39 | 0.11 | 0.15 | 0.07 | 0.09 |
| Chile | 0.34 | 0.37 | 0.11 | 0.13 | 0.06 | 0.07 |
| Chinese Taipei | 0.39 | 0.42 | 0.15 | 0.18 | 0.10 | 0.12 |
| Croatia | 0.40 | 0.41 | 0.16 | 0.16 | 0.08 | 0.09 |
| Cyprus | 0.34 | 0.39 | 0.12 | 0.15 | 0.07 | 0.08 |
| Czech Republic | 0.47 | 0.46 | 0.22 | 0.21 | 0.14 | 0.13 |
| Denmark | 0.35 | 0.37 | 0.12 | 0.13 | 0.09 | 0.10 |
| England | - | - | - | - | - | - |
| Finland | 0.33 | 0.36 | 0.11 | 0.13 | 0.08 | 0.08 |
| France | 0.46 | 0.46 | 0.21 | 0.21 | 0.15 | 0.15 |
| Georgia | 0.35 | 0.38 | 0.12 | 0.15 | 0.06 | 0.07 |
| Germany | 0.43 | 0.47 | 0.18 | 0.22 | 0.11 | 0.14 |
| Hong Kong SAR | 0.40 | 0.39 | 0.16 | 0.15 | 0.12 | 0.12 |
| Hungary | 0.57 | 0.56 | 0.33 | 0.32 | 0.25 | 0.24 |
| Indonesia | 0.29 | 0.30 | 0.08 | 0.09 | 0.05 | 0.06 |
| Iran, Islamic Rep. of | 0.46 | 0.45 | 0.21 | 0.20 | 0.14 | 0.14 |
| Ireland | 0.45 | 0.45 | 0.20 | 0.21 | 0.13 | 0.14 |
| Italy | 0.34 | 0.39 | 0.11 | 0.15 | 0.06 | 0.07 |
| Japan | 0.41 | 0.38 | 0.17 | 0.14 | 0.08 | 0.07 |
| Jordan | 0.38 | - | 0.14 | - | 0.06 | - |
| Kazakhstan | 0.19 | 0.21 | 0.04 | 0.04 | 0.02 | 0.02 |
| Korea, Rep. of | 0.47 | 0.46 | 0.23 | 0.22 | 0.16 | 0.15 |
| Kuwait | 0.24 | 0.24 | 0.06 | 0.06 | 0.02 | 0.02 |
| Lithuania | 0.45 | 0.46 | 0.21 | 0.21 | 0.11 | 0.11 |
| Morocco | 0.15 | 0.15 | 0.02 | 0.02 | 0.02 | 0.03 |
| Netherlands | 0.25 | 0.35 | 0.06 | 0.12 | 0.04 | 0.08 |
| New Zealand | 0.43 | 0.49 | 0.18 | 0.24 | 0.12 | 0.16 |
| Northern Ireland | 0.49 | 0.51 | 0.24 | 0.26 | 0.17 | 0.19 |
| Norway (5) | 0.35 | 0.37 | 0.12 | 0.14 | 0.09 | 0.10 |
| Oman | 0.24 | 0.24 | 0.06 | 0.06 | 0.03 | 0.03 |
| Poland | 0.44 | 0.44 | 0.19 | 0.19 | 0.13 | 0.13 |
| Portugal | 0.40 | 0.38 | 0.16 | 0.14 | 0.11 | 0.09 |
| Qatar | 0.39 | 0.37 | 0.15 | 0.14 | 0.08 | 0.07 |
| Russian Federation | 0.32 | 0.39 | 0.11 | 0.15 | 0.05 | 0.07 |
| Saudi Arabia | 0.12 | 0.17 | 0.01 | 0.03 | 0.01 | 0.02 |
| Serbia | 0.44 | 0.43 | 0.19 | 0.19 | 0.11 | 0.11 |
| Singapore | 0.48 | 0.52 | 0.23 | 0.28 | 0.15 | 0.18 |
| Slovak Republic | 0.53 | 0.55 | 0.28 | 0.31 | 0.19 | 0.21 |
| Slovenia | 0.41 | 0.39 | 0.17 | 0.15 | 0.10 | 0.09 |
| South Africa (5) | 0.41 | - | 0.17 | - | 0.12 | - |
| Spain | 0.40 | 0.40 | 0.16 | 0.16 | 0.10 | 0.11 |
| Sweden | 0.44 | 0.48 | 0.19 | 0.23 | 0.13 | 0.16 |
| Turkey | 0.51 | 0.48 | 0.26 | 0.23 | 0.19 | 0.17 |
| United Arab Emirates | 0.42 | 0.42 | 0.18 | 0.17 | 0.09 | 0.08 |
| United States | - | - | - | - | - | - |
| International Median | 0.40 | 0.39 | 0.16 | 0.16 | 0.10 | 0.10 |
| Benchmarking Participants | | | | | | |
| Buenos Aires, Argentina | 0.45 | 0.32 | 0.20 | 0.10 | 0.10 | 0.07 |
| Ontario, Canada | 0.35 | 0.38 | 0.12 | 0.14 | 0.08 | 0.10 |
| Quebec, Canada | 0.34 | 0.38 | 0.12 | 0.14 | 0.07 | 0.08 |
| Norway (4) | 0.40 | 0.45 | 0.16 | 0.20 | 0.10 | 0.13 |
| Abu Dhabi, UAE | 0.45 | 0.43 | 0.20 | 0.18 | 0.09 | 0.08 |
| Dubai, UAE | 0.41 | 0.39 | 0.17 | 0.15 | 0.10 | 0.08 |
| Florida, US | - | - | - | - | - | - |

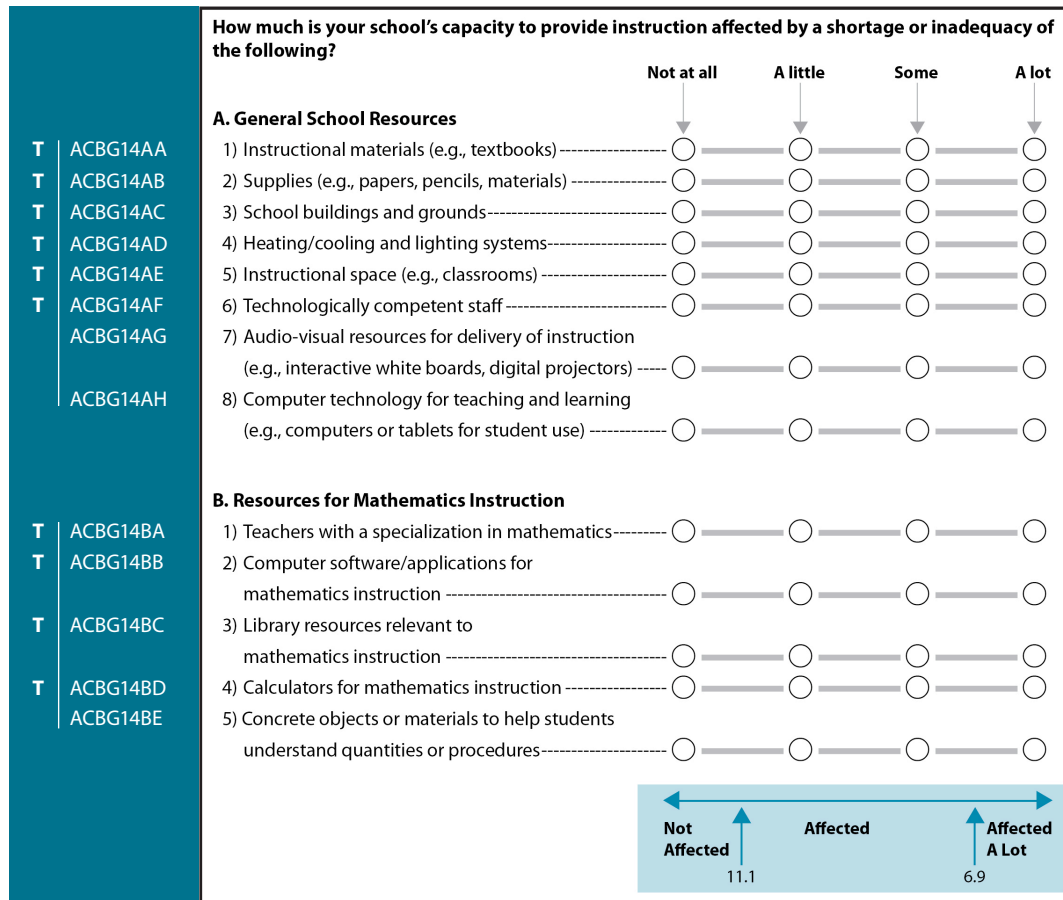
SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

A dash (-) indicates comparable data not available.

Instruction Affected by Mathematics Resource Shortages—Principals’ Reports Scale, Fourth Grade

The Instruction Affected by Mathematics Resource Shortages—Principals’ Reports (MRS) scale was created based on principals’ responses concerning thirteen school and classroom resources described below.

Items in the TIMSS 2015 Instruction Affected by Mathematics Resource Shortages—Principals’ Reports Scale, Fourth Grade



T Trend item—item was included in the same scale in TIMSS 2011 and was used for linking the TIMSS 2011 and TIMSS 2015 scales.

Item Parameters for the TIMSS 2015 Instruction Affected by Mathematics Resource Shortages – Principals' Reports Scale, Fourth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|----------|----------|----------|----------|---------|-------|
| ACBG14AA | -0.11368 | -0.14996 | -0.16025 | 0.31021 | 0.88 |
| ACBG14AB | -0.41885 | -0.32199 | 0.24004 | 0.08195 | 0.86 |
| ACBG14AC | 0.07784 | -0.85921 | 0.21812 | 0.64109 | 1.07 |
| ACBG14AD | -0.21398 | -0.48151 | 0.11638 | 0.36513 | 0.89 |
| ACBG14AE | 0.19673 | -0.49556 | -0.02468 | 0.52024 | 1.03 |
| ACBG14AF | 0.14704 | -1.22945 | -0.05377 | 1.28322 | 0.98 |
| ACBG14AG | 0.13794 | -1.04602 | 0.15706 | 0.88896 | 0.97 |
| ACBG14AH | 0.36809 | -1.19595 | 0.07061 | 1.12534 | 1.07 |
| ACBG14BA | -0.05349 | -0.40689 | -0.11097 | 0.51786 | 1.04 |
| ACBG14BB | 0.18965 | -1.45960 | 0.04141 | 1.41819 | 1.01 |
| ACBG14BC | 0.10994 | -1.52282 | 0.10727 | 1.41555 | 1.08 |
| ACBG14BD | -0.54492 | -0.79258 | 0.20495 | 0.58763 | 1.28 |
| ACBG14BE | 0.11769 | -1.09911 | -0.18316 | 1.28227 | 0.87 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Scale Transformation Constants for the TIMSS 2015 Instruction Affected by Mathematics Resource Shortages – Principals' Reports Scale, Fourth Grade

Scale Transformation Constants

A = 8.983616

B = 1.470593

Transformed Scale Score = 8.983616 + 1.470593 • Logit Scale Score

**Equivalence Table of Raw and Transformed Scale Scores for the
TIMSS 2015 Instruction Affected by Mathematics Resources Shortages -
Principals' Reports Scale, Fourth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 2.83270 | |
| 1 | 4.48826 | |
| 2 | 5.27602 | |
| 3 | 5.80449 | |
| 4 | 6.20549 | |
| 5 | 6.53026 | |
| 6 | 6.80414 | 6.9 |
| 7 | 7.04261 | |
| 8 | 7.25461 | |
| 9 | 7.44645 | |
| 10 | 7.62264 | |
| 11 | 7.78577 | |
| 12 | 7.94054 | |
| 13 | 8.08763 | |
| 14 | 8.22857 | |
| 15 | 8.36472 | |
| 16 | 8.49731 | |
| 17 | 8.62738 | |
| 18 | 8.75594 | |
| 19 | 8.88387 | |
| 20 | 9.01304 | |
| 21 | 9.14126 | |
| 22 | 9.27241 | |
| 23 | 9.40635 | |
| 24 | 9.54404 | |
| 25 | 9.68650 | |
| 26 | 9.83482 | |
| 27 | 9.99025 | |
| 28 | 10.15341 | |
| 29 | 10.32815 | |
| 30 | 10.51618 | |
| 31 | 10.72077 | |
| 32 | 10.94627 | |
| 33 | 11.19873 | 11.1 |
| 34 | 11.48704 | |
| 35 | 11.82627 | |
| 36 | 12.24151 | |
| 37 | 12.78364 | |
| 38 | 13.58356 | |
| 39 | 15.25009 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Instruction Affected by Mathematics Resource Shortages - Principals' Reports Scale, Fourth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| | | | ACBG14AA | ACBG14AB | ACBG14AC | ACBG14AD | ACBG14AE | ACBG14AF | ACBG14AG | ACBG14AH | ACBG14BA | ACBG14BB | ACBG14BC | ACBG14BD | ACBG14BE |
| Australia | 0.89 | 43 | 0.68 | 0.61 | 0.53 | 0.45 | 0.54 | 0.75 | 0.69 | 0.72 | 0.56 | 0.75 | 0.69 | 0.71 | 0.77 |
| Bahrain | 0.95 | 62 | 0.90 | 0.87 | 0.83 | 0.90 | 0.90 | 0.79 | 0.90 | 0.78 | 0.81 | 0.68 | 0.55 | 0.44 | 0.74 |
| Belgium (Flemish) | 0.86 | 40 | 0.57 | 0.57 | 0.68 | 0.62 | 0.59 | 0.65 | 0.78 | 0.79 | 0.52 | 0.67 | 0.55 | 0.49 | 0.66 |
| Bulgaria | 0.82 | 35 | 0.67 | 0.75 | 0.71 | 0.66 | 0.44 | 0.54 | 0.69 | 0.63 | 0.59 | 0.41 | 0.56 | 0.37 | 0.57 |
| Canada | 0.87 | 39 | 0.67 | 0.62 | 0.59 | 0.47 | 0.62 | 0.66 | 0.69 | 0.67 | 0.46 | 0.63 | 0.75 | 0.60 | 0.66 |
| Chile | 0.91 | 49 | 0.69 | 0.72 | 0.70 | 0.57 | 0.74 | 0.70 | 0.79 | 0.71 | 0.67 | 0.63 | 0.74 | 0.68 | 0.76 |
| Chinese Taipei | 0.90 | 47 | 0.69 | 0.68 | 0.67 | 0.81 | 0.70 | 0.71 | 0.71 | 0.71 | 0.68 | 0.66 | 0.64 | 0.50 | 0.68 |
| Croatia | 0.88 | 41 | 0.64 | 0.67 | 0.59 | 0.66 | 0.65 | 0.63 | 0.70 | 0.61 | 0.52 | 0.67 | 0.66 | 0.61 | 0.73 |
| Cyprus | 0.91 | 50 | 0.84 | 0.72 | 0.71 | 0.72 | 0.77 | 0.79 | 0.74 | 0.54 | 0.57 | 0.72 | 0.59 | 0.64 | 0.75 |
| Czech Republic | 0.76 | 28 | 0.57 | 0.57 | 0.46 | 0.48 | 0.52 | 0.57 | 0.64 | 0.61 | 0.46 | 0.49 | 0.27 | 0.45 | 0.62 |
| Denmark | 0.85 | 36 | 0.76 | 0.61 | 0.66 | 0.56 | 0.61 | 0.54 | 0.64 | 0.73 | 0.43 | 0.64 | 0.49 | 0.50 | 0.55 |
| England | 0.87 | 41 | 0.75 | 0.63 | 0.40 | 0.50 | 0.44 | 0.65 | 0.72 | 0.70 | 0.59 | 0.72 | 0.70 | 0.64 | 0.73 |
| Finland | 0.80 | 30 | 0.51 | 0.57 | 0.66 | 0.66 | 0.69 | 0.56 | 0.58 | 0.66 | 0.48 | 0.46 | 0.30 | 0.31 | 0.53 |
| France | 0.85 | 35 | 0.73 | 0.63 | 0.49 | 0.53 | 0.48 | 0.53 | 0.66 | 0.62 | 0.65 | 0.63 | 0.60 | 0.58 | 0.56 |
| Georgia | 0.88 | 43 | 0.54 | 0.76 | 0.63 | 0.58 | 0.66 | 0.69 | 0.68 | 0.73 | 0.70 | 0.71 | 0.69 | 0.43 | 0.62 |
| Germany | 0.83 | 34 | 0.65 | 0.65 | 0.63 | 0.45 | 0.66 | 0.52 | 0.71 | 0.65 | 0.29 | 0.60 | 0.52 | 0.44 | 0.63 |
| Hong Kong SAR | 0.91 | 50 | 0.77 | 0.80 | 0.64 | 0.78 | 0.74 | 0.74 | 0.77 | 0.64 | 0.63 | 0.75 | 0.65 | 0.48 | 0.75 |
| Hungary | 0.90 | 45 | 0.65 | 0.73 | 0.76 | 0.70 | 0.65 | 0.60 | 0.68 | 0.71 | 0.61 | 0.65 | 0.58 | 0.58 | 0.79 |
| Indonesia | 0.86 | 37 | 0.63 | 0.60 | 0.49 | 0.70 | 0.45 | 0.67 | 0.67 | 0.69 | 0.42 | 0.67 | 0.66 | 0.56 | 0.63 |
| Iran, Islamic Rep. of | 0.84 | 36 | 0.75 | 0.77 | 0.71 | 0.81 | 0.79 | 0.68 | 0.52 | 0.13 | 0.65 | 0.42 | 0.35 | 0.31 | 0.46 |
| Ireland | 0.86 | 39 | 0.67 | 0.60 | 0.55 | 0.59 | 0.56 | 0.52 | 0.64 | 0.54 | 0.61 | 0.72 | 0.69 | 0.72 | 0.67 |
| Italy | 0.79 | 29 | 0.60 | 0.60 | 0.58 | 0.54 | 0.64 | 0.48 | 0.51 | 0.54 | 0.34 | 0.43 | 0.46 | 0.55 | 0.61 |
| Japan | 0.92 | 52 | 0.76 | 0.76 | 0.76 | 0.74 | 0.83 | 0.66 | 0.66 | 0.72 | 0.59 | 0.59 | 0.69 | 0.75 | 0.84 |
| Jordan | 0.88 | 42 | 0.64 | 0.72 | 0.73 | 0.71 | 0.73 | 0.69 | 0.56 | 0.67 | 0.65 | 0.62 | 0.51 | 0.50 | 0.64 |
| Kazakhstan | 0.94 | 58 | 0.80 | 0.71 | 0.69 | 0.79 | 0.79 | 0.75 | 0.67 | 0.83 | 0.73 | 0.86 | 0.63 | 0.79 | 0.79 |
| Korea, Rep. of | 0.90 | 48 | 0.76 | 0.75 | 0.77 | 0.73 | 0.78 | 0.83 | 0.66 | 0.79 | 0.53 | 0.56 | 0.60 | 0.49 | 0.66 |
| Kuwait | 0.91 | 50 | 0.82 | 0.75 | 0.75 | 0.84 | 0.86 | 0.72 | 0.37 | 0.56 | 0.83 | 0.61 | 0.55 | 0.48 | 0.83 |
| Lithuania | 0.90 | 46 | 0.73 | 0.74 | 0.64 | 0.64 | 0.57 | 0.71 | 0.73 | 0.63 | 0.52 | 0.67 | 0.69 | 0.63 | 0.83 |
| Morocco | 0.84 | 39 | -0.05 | 0.29 | 0.46 | 0.57 | -0.11 | 0.75 | 0.66 | 0.75 | 0.78 | 0.75 | 0.79 | 0.82 | 0.56 |
| Netherlands | 0.82 | 33 | 0.50 | 0.50 | 0.55 | 0.66 | 0.52 | 0.56 | 0.62 | 0.63 | 0.42 | 0.71 | 0.60 | 0.55 | 0.55 |
| New Zealand | 0.87 | 39 | 0.70 | 0.65 | 0.58 | 0.52 | 0.50 | 0.57 | 0.62 | 0.66 | 0.59 | 0.72 | 0.65 | 0.67 | 0.66 |
| Northern Ireland | 0.85 | 38 | 0.74 | 0.72 | 0.59 | 0.59 | 0.62 | 0.68 | 0.51 | 0.60 | 0.61 | 0.65 | 0.54 | 0.43 | 0.62 |
| Norway (5) | 0.84 | 36 | 0.73 | 0.71 | 0.75 | 0.74 | 0.70 | 0.54 | 0.60 | 0.62 | 0.33 | 0.58 | 0.57 | 0.32 | 0.37 |
| Oman | 0.92 | 50 | 0.73 | 0.72 | 0.67 | 0.76 | 0.74 | 0.78 | 0.62 | 0.67 | 0.83 | 0.72 | 0.65 | 0.52 | 0.75 |
| Poland | 0.91 | 47 | 0.74 | 0.71 | 0.54 | 0.71 | 0.67 | 0.63 | 0.72 | 0.73 | 0.57 | 0.74 | 0.73 | 0.58 | 0.81 |
| Portugal | 0.89 | 43 | 0.53 | 0.54 | 0.58 | 0.54 | 0.50 | 0.60 | 0.76 | 0.71 | 0.70 | 0.75 | 0.75 | 0.68 | 0.78 |
| Qatar | 0.98 | 77 | 0.93 | 0.92 | 0.86 | 0.94 | 0.92 | 0.93 | 0.89 | 0.89 | 0.91 | 0.80 | 0.83 | 0.71 | 0.87 |
| Russian Federation | 0.91 | 50 | 0.83 | 0.77 | 0.61 | 0.73 | 0.67 | 0.66 | 0.75 | 0.68 | 0.70 | 0.73 | 0.78 | 0.47 | 0.78 |
| Saudi Arabia | 0.88 | 43 | 0.71 | 0.70 | 0.69 | 0.78 | 0.77 | 0.67 | 0.70 | 0.47 | 0.73 | 0.65 | 0.49 | 0.46 | 0.55 |
| Serbia | 0.91 | 47 | 0.79 | 0.69 | 0.63 | 0.68 | 0.69 | 0.70 | 0.75 | 0.77 | 0.63 | 0.62 | 0.64 | 0.57 | 0.72 |
| Singapore | 0.97 | 73 | 0.90 | 0.89 | 0.84 | 0.90 | 0.86 | 0.81 | 0.91 | 0.91 | 0.76 | 0.76 | 0.73 | 0.91 | 0.89 |
| Slovak Republic | 0.91 | 49 | 0.80 | 0.79 | 0.61 | 0.72 | 0.67 | 0.72 | 0.81 | 0.78 | 0.79 | 0.66 | 0.28 | 0.62 | 0.70 |
| Slovenia | 0.84 | 36 | 0.56 | 0.52 | 0.57 | 0.47 | 0.57 | 0.52 | 0.70 | 0.73 | 0.33 | 0.71 | 0.75 | 0.57 | 0.62 |
| South Africa (5) | 0.82 | 37 | -0.19 | -0.11 | 0.33 | 0.63 | 0.16 | 0.71 | 0.84 | 0.81 | 0.45 | 0.83 | 0.83 | 0.59 | 0.67 |
| Spain | 0.88 | 41 | 0.63 | 0.66 | 0.60 | 0.69 | 0.55 | 0.67 | 0.70 | 0.71 | 0.61 | 0.65 | 0.67 | 0.48 | 0.68 |
| Sweden | 0.83 | 34 | 0.65 | 0.63 | 0.48 | 0.52 | 0.52 | 0.65 | 0.61 | 0.69 | 0.45 | 0.69 | 0.44 | 0.57 | 0.64 |
| Turkey | 0.87 | 40 | 0.75 | 0.71 | 0.60 | 0.70 | 0.69 | 0.53 | 0.71 | 0.51 | 0.65 | 0.66 | 0.62 | 0.34 | 0.67 |
| United Arab Emirates | 0.96 | 65 | 0.87 | 0.85 | 0.83 | 0.87 | 0.86 | 0.87 | 0.83 | 0.81 | 0.80 | 0.70 | 0.68 | 0.65 | 0.82 |
| United States | 0.90 | 46 | 0.69 | 0.70 | 0.69 | 0.66 | 0.59 | 0.70 | 0.69 | 0.62 | 0.61 | 0.74 | 0.70 | 0.67 | 0.74 |
| Benchmarking Participants | | | | | | | | | | | | | | | |
| Buenos Aires, Argentina | 0.93 | 54 | 0.74 | 0.78 | 0.69 | 0.67 | 0.83 | 0.78 | 0.74 | 0.69 | 0.59 | 0.74 | 0.77 | 0.75 | 0.75 |
| Ontario, Canada | 0.87 | 40 | 0.59 | 0.58 | 0.53 | 0.42 | 0.64 | 0.72 | 0.68 | 0.73 | 0.50 | 0.66 | 0.76 | 0.64 | 0.65 |
| Quebec, Canada | 0.89 | 44 | 0.79 | 0.77 | 0.67 | 0.50 | 0.76 | 0.59 | 0.71 | 0.64 | 0.36 | 0.54 | 0.75 | 0.56 | 0.79 |
| Norway (4) | 0.84 | 36 | 0.73 | 0.71 | 0.75 | 0.74 | 0.68 | 0.51 | 0.64 | 0.62 | 0.34 | 0.59 | 0.53 | 0.31 | 0.40 |
| Abu Dhabi, UAE | 0.95 | 63 | 0.84 | 0.84 | 0.84 | 0.83 | 0.85 | 0.84 | 0.81 | 0.77 | 0.79 | 0.61 | 0.69 | 0.75 | 0.85 |
| Dubai, UAE | 0.97 | 76 | 0.90 | 0.91 | 0.84 | 0.93 | 0.86 | 0.93 | 0.89 | 0.89 | 0.89 | 0.86 | 0.80 | 0.66 | 0.91 |
| Florida, US | 0.93 | 55 | 0.83 | 0.56 | 0.79 | 0.79 | 0.84 | 0.74 | 0.77 | 0.69 | 0.76 | 0.78 | 0.70 | 0.46 | 0.85 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Instruction Affected by Mathematics Resource Shortages - Principals' Reports Scale, Fourth Grade, and TIMSS 2015 Mathematics Achievement

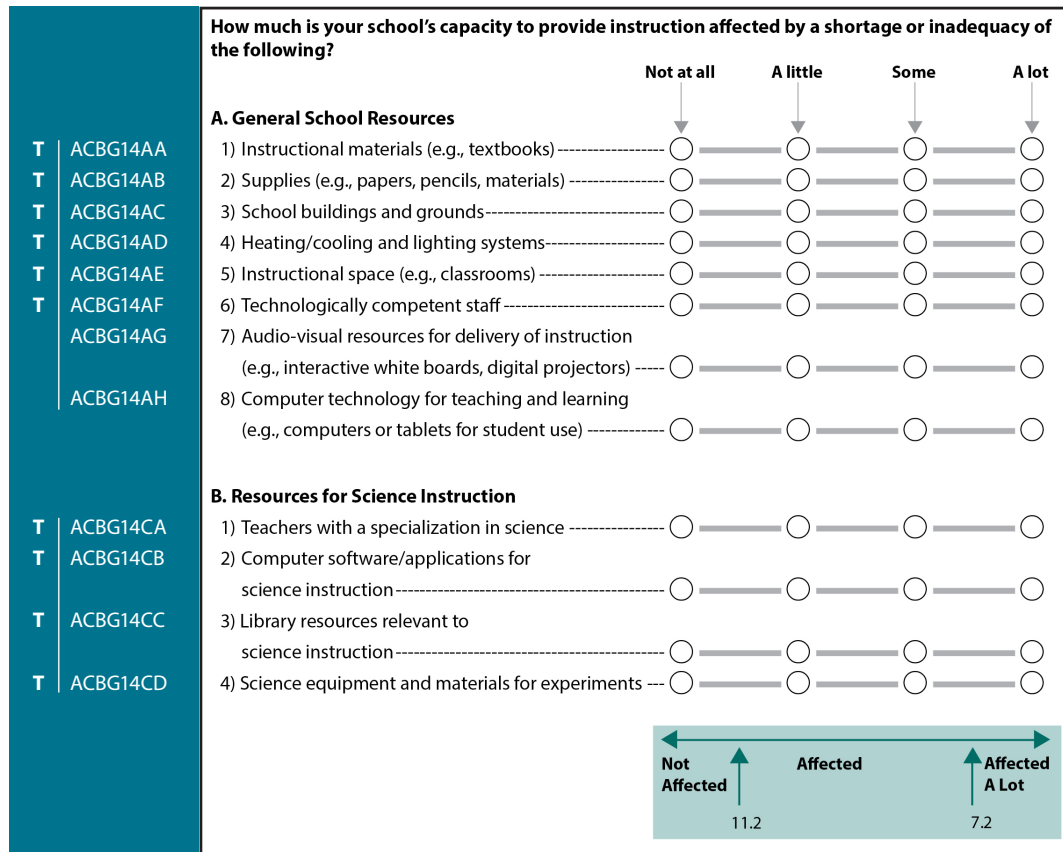
| Country | Pearson's Correlation with Mathematics Achievement | | Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|----------------------------------|--|-------------|---|
| | (r) | (r^2) | |
| Australia | 0.12 | 0.01 | 0.01 |
| Bahrain | 0.08 | 0.01 | 0.01 |
| Belgium (Flemish) | 0.03 | 0.00 | 0.00 |
| Bulgaria | 0.10 | 0.01 | 0.01 |
| Canada | 0.08 | 0.01 | 0.01 |
| Chile | 0.14 | 0.02 | 0.02 |
| Chinese Taipei | 0.11 | 0.01 | 0.01 |
| Croatia | 0.03 | 0.00 | 0.00 |
| Cyprus | 0.08 | 0.01 | 0.01 |
| Czech Republic | 0.01 | 0.00 | 0.00 |
| Denmark | -0.06 | 0.00 | 0.00 |
| England | 0.08 | 0.01 | 0.00 |
| Finland | 0.01 | 0.00 | 0.00 |
| France | 0.07 | 0.00 | 0.01 |
| Georgia | 0.09 | 0.01 | 0.01 |
| Germany | 0.04 | 0.00 | 0.00 |
| Hong Kong SAR | 0.19 | 0.04 | 0.04 |
| Hungary | 0.00 | 0.00 | 0.00 |
| Indonesia | -0.25 | 0.06 | 0.02 |
| Iran, Islamic Rep. of | -0.02 | 0.00 | 0.01 |
| Ireland | 0.04 | 0.00 | 0.00 |
| Italy | 0.05 | 0.00 | 0.01 |
| Japan | 0.00 | 0.00 | 0.00 |
| Jordan | -0.07 | 0.01 | 0.04 |
| Kazakhstan | -0.06 | 0.00 | 0.00 |
| Korea, Rep. of | -0.05 | 0.00 | 0.00 |
| Kuwait | 0.06 | 0.00 | 0.02 |
| Lithuania | -0.10 | 0.01 | 0.00 |
| Morocco | -0.12 | 0.01 | 0.00 |
| Netherlands | -0.01 | 0.00 | 0.00 |
| New Zealand | 0.07 | 0.01 | 0.01 |
| Northern Ireland | 0.02 | 0.00 | 0.00 |
| Norway (5) | 0.06 | 0.00 | 0.00 |
| Oman | -0.02 | 0.00 | 0.01 |
| Poland | 0.02 | 0.00 | 0.01 |
| Portugal | 0.05 | 0.00 | 0.01 |
| Qatar | 0.20 | 0.04 | 0.04 |
| Russian Federation | 0.07 | 0.01 | 0.01 |
| Saudi Arabia | 0.04 | 0.00 | 0.01 |
| Serbia | 0.04 | 0.00 | 0.01 |
| Singapore | -0.07 | 0.01 | 0.01 |
| Slovak Republic | -0.03 | 0.00 | 0.00 |
| Slovenia | -0.08 | 0.01 | 0.00 |
| South Africa (5) | 0.17 | 0.03 | 0.04 |
| Spain | 0.11 | 0.01 | 0.00 |
| Sweden | 0.01 | 0.00 | 0.00 |
| Turkey | -0.08 | 0.01 | 0.02 |
| United Arab Emirates | 0.26 | 0.07 | 0.10 |
| United States | 0.11 | 0.01 | 0.01 |
| International Median | 0.04 | 0.00 | 0.01 |
| Benchmarking Participants | | | |
| Buenos Aires, Argentina | 0.10 | 0.01 | 0.01 |
| Ontario, Canada | 0.06 | 0.00 | 0.00 |
| Quebec, Canada | 0.15 | 0.02 | 0.01 |
| Norway (4) | 0.04 | 0.00 | 0.00 |
| Abu Dhabi, UAE | 0.20 | 0.04 | 0.10 |
| Dubai, UAE | 0.28 | 0.08 | 0.08 |
| Florida, US | -0.07 | 0.00 | 0.02 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Instruction Affected by Science Resource Shortages—Principals’ Reports Scale, Fourth Grade

The Instruction Affected by Science Resource Shortages—Principals’ Reports (SRS) scale was created based on principals’ responses concerning twelve school and classroom resources described below.

Items in the TIMSS 2015 Instruction Affected by Science Resource Shortages—Principals’ Reports Scale, Fourth Grade



T Trend item—item was included in the same scale in TIMSS 2011 and was used for linking the TIMSS 2011 and TIMSS 2015 scales.

Item Parameters for the TIMSS 2015 Instruction Affected by Science Resource Shortages – Principals' Reports Scale, Fourth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|----------|----------|----------|----------|---------|-------|
| ACBG14AA | -0.24271 | -0.15468 | -0.15689 | 0.31157 | 0.88 |
| ACBG14AB | -0.54779 | -0.32899 | 0.24385 | 0.08514 | 0.89 |
| ACBG14AC | -0.04867 | -0.86218 | 0.22062 | 0.64156 | 1.04 |
| ACBG14AD | -0.34143 | -0.48719 | 0.12016 | 0.36703 | 0.88 |
| ACBG14AE | 0.06971 | -0.49816 | -0.02197 | 0.52013 | 1.02 |
| ACBG14AF | 0.01673 | -1.23646 | -0.04988 | 1.28634 | 0.96 |
| ACBG14AG | 0.00728 | -1.05224 | 0.16138 | 0.89086 | 1.01 |
| ACBG14AH | 0.23712 | -1.20141 | 0.07412 | 1.12729 | 1.06 |
| ACBG14CA | 0.01564 | -0.59589 | 0.05252 | 0.54337 | 1.14 |
| ACBG14CB | 0.27596 | -1.48062 | 0.01306 | 1.46756 | 1.02 |
| ACBG14CC | -0.00723 | -1.52053 | 0.04353 | 1.47700 | 0.99 |
| ACBG14CD | 0.56539 | -1.15196 | -0.06683 | 1.21879 | 0.99 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Scale Transformation Constants for the TIMSS 2015 Instruction Affected by Science Resource Shortages – Principals' Reports Scale, Fourth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 9.169706 | Transformed Scale Score = 9.169706 + 1.448865 • Logit Scale Score |
| B = 1.448865 | |

Equivalence Table of Raw and Transformed Scale Scores for the TIMSS 2015 Instruction Affected by Science Resource Shortages – Principals' Reports Scale, Fourth Grade

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 3.19089 | |
| 1 | 4.82763 | |
| 2 | 5.60806 | |
| 3 | 6.13220 | |
| 4 | 6.52977 | |
| 5 | 6.85141 | |
| 6 | 7.12344 | 7.2 |
| 7 | 7.36033 | |
| 8 | 7.57143 | |
| 9 | 7.76318 | |
| 10 | 7.93955 | |
| 11 | 8.10599 | |
| 12 | 8.26361 | |
| 13 | 8.41441 | |
| 14 | 8.56013 | |
| 15 | 8.70226 | |
| 16 | 8.84212 | |
| 17 | 8.98089 | |
| 18 | 9.11966 | |
| 19 | 9.25946 | |
| 20 | 9.40134 | |
| 21 | 9.54635 | |
| 22 | 9.69564 | |
| 23 | 9.85047 | |
| 24 | 10.01218 | |
| 25 | 10.18145 | |
| 26 | 10.36189 | |
| 27 | 10.55547 | |
| 28 | 10.76551 | |
| 29 | 10.99648 | |
| 30 | 11.25452 | 11.2 |
| 31 | 11.54832 | |
| 32 | 11.89305 | |
| 33 | 12.31351 | |
| 34 | 12.86021 | |
| 35 | 13.66164 | |
| 36 | 15.31821 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Instruction Affected by Science Resource Shortages – Principals' Reports Scale, Fourth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| | | | ACBG14AA | ACBG14AB | ACBG14AC | ACBG14AD | ACBG14AE | ACBG14AF | ACBG14AG | ACBG14AH | ACBG14CA | ACBG14CB | ACBG14CC | ACBG14CD |
| Australia | 0.87 | 42 | 0.64 | 0.54 | 0.58 | 0.46 | 0.58 | 0.75 | 0.70 | 0.72 | 0.59 | 0.69 | 0.74 | 0.68 |
| Bahrain | 0.96 | 68 | 0.90 | 0.87 | 0.83 | 0.91 | 0.90 | 0.78 | 0.89 | 0.78 | 0.83 | 0.71 | 0.64 | 0.77 |
| Belgium (Flemish) | 0.86 | 42 | 0.56 | 0.53 | 0.64 | 0.60 | 0.58 | 0.73 | 0.79 | 0.79 | 0.56 | 0.71 | 0.63 | 0.62 |
| Bulgaria | 0.83 | 36 | 0.67 | 0.75 | 0.72 | 0.65 | 0.49 | 0.54 | 0.71 | 0.63 | 0.60 | 0.36 | 0.55 | 0.42 |
| Canada | 0.85 | 38 | 0.65 | 0.55 | 0.60 | 0.48 | 0.62 | 0.68 | 0.69 | 0.69 | 0.51 | 0.62 | 0.71 | 0.58 |
| Chile | 0.91 | 50 | 0.67 | 0.68 | 0.71 | 0.62 | 0.76 | 0.69 | 0.77 | 0.72 | 0.64 | 0.70 | 0.78 | 0.69 |
| Chinese Taipei | 0.91 | 50 | 0.74 | 0.71 | 0.68 | 0.83 | 0.71 | 0.70 | 0.73 | 0.72 | 0.71 | 0.64 | 0.63 | 0.69 |
| Croatia | 0.87 | 41 | 0.64 | 0.68 | 0.63 | 0.68 | 0.66 | 0.65 | 0.68 | 0.58 | 0.59 | 0.62 | 0.62 | 0.69 |
| Cyprus | 0.91 | 52 | 0.86 | 0.71 | 0.72 | 0.70 | 0.79 | 0.80 | 0.75 | 0.57 | 0.64 | 0.73 | 0.64 | 0.74 |
| Czech Republic | 0.78 | 30 | 0.51 | 0.53 | 0.46 | 0.47 | 0.53 | 0.60 | 0.63 | 0.62 | 0.39 | 0.71 | 0.45 | 0.63 |
| Denmark | 0.86 | 40 | 0.80 | 0.60 | 0.65 | 0.54 | 0.60 | 0.54 | 0.63 | 0.73 | 0.44 | 0.71 | 0.63 | 0.69 |
| England | 0.87 | 43 | 0.71 | 0.52 | 0.39 | 0.46 | 0.46 | 0.75 | 0.70 | 0.70 | 0.69 | 0.76 | 0.76 | 0.77 |
| Finland | 0.81 | 33 | 0.51 | 0.56 | 0.67 | 0.66 | 0.71 | 0.57 | 0.53 | 0.64 | 0.46 | 0.46 | 0.46 | 0.54 |
| France | 0.85 | 37 | 0.69 | 0.57 | 0.55 | 0.50 | 0.48 | 0.62 | 0.64 | 0.64 | 0.65 | 0.67 | 0.67 | 0.57 |
| Georgia | 0.88 | 44 | 0.54 | 0.74 | 0.59 | 0.60 | 0.66 | 0.70 | 0.69 | 0.73 | 0.66 | 0.66 | 0.72 | 0.63 |
| Germany | 0.83 | 36 | 0.68 | 0.67 | 0.66 | 0.43 | 0.66 | 0.53 | 0.67 | 0.59 | 0.34 | 0.51 | 0.62 | 0.72 |
| Hong Kong SAR | 0.91 | 52 | 0.76 | 0.77 | 0.63 | 0.77 | 0.73 | 0.80 | 0.82 | 0.70 | 0.57 | 0.65 | 0.65 | 0.74 |
| Hungary | 0.89 | 46 | 0.65 | 0.73 | 0.78 | 0.70 | 0.68 | 0.59 | 0.70 | 0.72 | 0.66 | 0.64 | 0.61 | 0.68 |
| Indonesia | 0.85 | 38 | 0.66 | 0.59 | 0.49 | 0.73 | 0.44 | 0.69 | 0.66 | 0.70 | 0.41 | 0.61 | 0.64 | 0.65 |
| Iran, Islamic Rep. of | 0.85 | 39 | 0.77 | 0.79 | 0.69 | 0.83 | 0.79 | 0.67 | 0.49 | 0.12 | 0.59 | 0.43 | 0.41 | 0.50 |
| Ireland | 0.85 | 38 | 0.61 | 0.57 | 0.51 | 0.57 | 0.51 | 0.58 | 0.60 | 0.57 | 0.65 | 0.76 | 0.74 | 0.65 |
| Italy | 0.76 | 28 | 0.56 | 0.52 | 0.53 | 0.48 | 0.67 | 0.52 | 0.56 | 0.59 | 0.41 | 0.49 | 0.45 | 0.49 |
| Japan | 0.92 | 55 | 0.73 | 0.73 | 0.77 | 0.74 | 0.83 | 0.68 | 0.68 | 0.75 | 0.68 | 0.70 | 0.73 | 0.83 |
| Jordan | 0.89 | 47 | 0.69 | 0.75 | 0.76 | 0.71 | 0.76 | 0.68 | 0.51 | 0.64 | 0.71 | 0.61 | 0.53 | 0.79 |
| Kazakhstan | 0.93 | 58 | 0.80 | 0.69 | 0.69 | 0.81 | 0.80 | 0.81 | 0.74 | 0.64 | 0.82 | 0.75 | 0.80 | 0.75 |
| Korea, Rep. of | 0.91 | 53 | 0.79 | 0.77 | 0.79 | 0.74 | 0.80 | 0.84 | 0.66 | 0.80 | 0.60 | 0.54 | 0.60 | 0.72 |
| Kuwait | 0.93 | 58 | 0.85 | 0.77 | 0.76 | 0.85 | 0.89 | 0.72 | 0.31 | 0.53 | 0.87 | 0.78 | 0.78 | 0.87 |
| Lithuania | 0.89 | 47 | 0.74 | 0.72 | 0.67 | 0.62 | 0.59 | 0.74 | 0.75 | 0.66 | 0.49 | 0.74 | 0.76 | 0.69 |
| Morocco | 0.81 | 38 | -0.10 | 0.25 | 0.46 | 0.56 | -0.15 | 0.74 | 0.71 | 0.77 | 0.80 | 0.77 | 0.80 | 0.68 |
| Netherlands | 0.81 | 32 | 0.47 | 0.38 | 0.63 | 0.58 | 0.60 | 0.53 | 0.61 | 0.70 | 0.44 | 0.66 | 0.58 | 0.53 |
| New Zealand | 0.86 | 40 | 0.68 | 0.61 | 0.59 | 0.55 | 0.53 | 0.64 | 0.66 | 0.64 | 0.58 | 0.63 | 0.68 | 0.74 |
| Northern Ireland | 0.84 | 37 | 0.67 | 0.67 | 0.64 | 0.64 | 0.59 | 0.65 | 0.53 | 0.63 | 0.64 | 0.55 | 0.50 | 0.54 |
| Norway (5) | 0.85 | 39 | 0.73 | 0.73 | 0.75 | 0.75 | 0.70 | 0.54 | 0.61 | 0.62 | 0.28 | 0.52 | 0.51 | 0.59 |
| Oman | 0.92 | 53 | 0.74 | 0.73 | 0.66 | 0.77 | 0.75 | 0.78 | 0.62 | 0.68 | 0.83 | 0.75 | 0.66 | 0.78 |
| Poland | 0.90 | 48 | 0.76 | 0.74 | 0.59 | 0.69 | 0.68 | 0.62 | 0.70 | 0.70 | 0.60 | 0.75 | 0.78 | 0.67 |
| Portugal | 0.88 | 43 | 0.51 | 0.52 | 0.62 | 0.57 | 0.54 | 0.59 | 0.76 | 0.71 | 0.68 | 0.76 | 0.75 | 0.78 |
| Qatar | 0.98 | 80 | 0.93 | 0.92 | 0.87 | 0.95 | 0.93 | 0.93 | 0.89 | 0.89 | 0.90 | 0.80 | 0.85 | 0.88 |
| Russian Federation | 0.91 | 52 | 0.80 | 0.75 | 0.58 | 0.73 | 0.66 | 0.68 | 0.75 | 0.70 | 0.69 | 0.73 | 0.79 | 0.74 |
| Saudi Arabia | 0.88 | 45 | 0.69 | 0.69 | 0.70 | 0.78 | 0.75 | 0.68 | 0.71 | 0.49 | 0.67 | 0.62 | 0.52 | 0.66 |
| Serbia | 0.90 | 49 | 0.78 | 0.68 | 0.65 | 0.69 | 0.71 | 0.72 | 0.76 | 0.78 | 0.63 | 0.67 | 0.64 | 0.62 |
| Singapore | 0.96 | 71 | 0.88 | 0.87 | 0.84 | 0.89 | 0.86 | 0.83 | 0.92 | 0.92 | 0.60 | 0.78 | 0.80 | 0.90 |
| Slovak Republic | 0.90 | 49 | 0.79 | 0.80 | 0.63 | 0.73 | 0.66 | 0.70 | 0.82 | 0.81 | 0.81 | 0.65 | 0.44 | 0.40 |
| Slovenia | 0.84 | 37 | 0.51 | 0.53 | 0.56 | 0.49 | 0.57 | 0.52 | 0.75 | 0.75 | 0.19 | 0.74 | 0.74 | 0.73 |
| South Africa (5) | 0.70 | 36 | -0.22 | -0.17 | 0.42 | 0.68 | 0.22 | 0.80 | 0.87 | 0.84 | 0.00 | 0.00 | 0.00 | 0.00 |
| Spain | 0.88 | 43 | 0.62 | 0.66 | 0.59 | 0.68 | 0.55 | 0.69 | 0.73 | 0.73 | 0.65 | 0.64 | 0.68 | 0.65 |
| Sweden | 0.83 | 36 | 0.66 | 0.62 | 0.50 | 0.56 | 0.58 | 0.66 | 0.59 | 0.69 | 0.38 | 0.64 | 0.52 | 0.74 |
| Turkey | 0.88 | 43 | 0.76 | 0.69 | 0.60 | 0.71 | 0.70 | 0.51 | 0.71 | 0.52 | 0.67 | 0.66 | 0.63 | 0.64 |
| United Arab Emirates | 0.96 | 69 | 0.86 | 0.85 | 0.84 | 0.88 | 0.87 | 0.87 | 0.82 | 0.82 | 0.82 | 0.74 | 0.76 | 0.83 |
| United States | 0.89 | 46 | 0.67 | 0.68 | 0.68 | 0.63 | 0.62 | 0.70 | 0.70 | 0.62 | 0.67 | 0.69 | 0.76 | 0.68 |
| Benchmarking Participants | | | | | | | | | | | | | | |
| Buenos Aires, Argentina | 0.91 | 51 | 0.74 | 0.79 | 0.69 | 0.65 | 0.82 | 0.78 | 0.75 | 0.72 | 0.58 | 0.71 | 0.71 | 0.62 |
| Ontario, Canada | 0.86 | 40 | 0.59 | 0.46 | 0.56 | 0.45 | 0.66 | 0.72 | 0.64 | 0.71 | 0.61 | 0.74 | 0.71 | 0.61 |
| Quebec, Canada | 0.85 | 40 | 0.80 | 0.74 | 0.67 | 0.52 | 0.74 | 0.58 | 0.72 | 0.67 | 0.31 | 0.33 | 0.72 | 0.53 |
| Norway (4) | 0.84 | 38 | 0.73 | 0.73 | 0.78 | 0.76 | 0.71 | 0.50 | 0.63 | 0.60 | 0.28 | 0.47 | 0.48 | 0.55 |
| Abu Dhabi, UAE | 0.95 | 65 | 0.84 | 0.83 | 0.84 | 0.84 | 0.86 | 0.83 | 0.79 | 0.78 | 0.80 | 0.66 | 0.77 | 0.82 |
| Dubai, UAE | 0.98 | 80 | 0.90 | 0.91 | 0.85 | 0.93 | 0.87 | 0.93 | 0.89 | 0.89 | 0.89 | 0.88 | 0.87 | 0.91 |
| Florida, US | 0.94 | 59 | 0.81 | 0.50 | 0.80 | 0.80 | 0.82 | 0.75 | 0.78 | 0.72 | 0.74 | 0.81 | 0.80 | 0.86 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Instruction Affected by Science Resource Shortages – Principals' Reports Scale, Fourth Grade, and TIMSS 2015 Science Achievement

| Country | Pearson's Correlation with Science Achievement | | Variance in Science Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|----------------------------------|--|-------------------|---|
| | (r) | (r ²) | |
| Australia | 0.11 | 0.01 | 0.01 |
| Bahrain | 0.06 | 0.00 | 0.01 |
| Belgium (Flemish) | 0.04 | 0.00 | 0.01 |
| Bulgaria | 0.10 | 0.01 | 0.01 |
| Canada | 0.05 | 0.00 | 0.00 |
| Chile | 0.14 | 0.02 | 0.02 |
| Chinese Taipei | 0.14 | 0.02 | 0.02 |
| Croatia | 0.03 | 0.00 | 0.00 |
| Cyprus | 0.06 | 0.00 | 0.01 |
| Czech Republic | -0.02 | 0.00 | 0.00 |
| Denmark | -0.03 | 0.00 | 0.00 |
| England | 0.11 | 0.01 | 0.01 |
| Finland | 0.01 | 0.00 | 0.00 |
| France | 0.05 | 0.00 | 0.00 |
| Georgia | 0.13 | 0.02 | 0.01 |
| Germany | 0.05 | 0.00 | 0.00 |
| Hong Kong SAR | 0.16 | 0.03 | 0.03 |
| Hungary | 0.01 | 0.00 | 0.00 |
| Indonesia | -0.28 | 0.08 | 0.03 |
| Iran, Islamic Rep. of | 0.01 | 0.00 | 0.00 |
| Ireland | 0.01 | 0.00 | 0.00 |
| Italy | 0.04 | 0.00 | 0.00 |
| Japan | 0.01 | 0.00 | 0.00 |
| Jordan | - | - | - |
| Kazakhstan | -0.06 | 0.00 | 0.00 |
| Korea, Rep. of | -0.03 | 0.00 | 0.00 |
| Kuwait | 0.02 | 0.00 | 0.02 |
| Lithuania | -0.09 | 0.01 | 0.01 |
| Morocco | -0.11 | 0.01 | 0.00 |
| Netherlands | -0.01 | 0.00 | 0.00 |
| New Zealand | 0.06 | 0.00 | 0.01 |
| Northern Ireland | 0.04 | 0.00 | 0.01 |
| Norway (5) | 0.03 | 0.00 | 0.00 |
| Oman | -0.01 | 0.00 | 0.00 |
| Poland | 0.01 | 0.00 | 0.00 |
| Portugal | 0.05 | 0.00 | 0.01 |
| Qatar | 0.15 | 0.02 | 0.02 |
| Russian Federation | 0.09 | 0.01 | 0.01 |
| Saudi Arabia | 0.06 | 0.00 | 0.03 |
| Serbia | 0.02 | 0.00 | 0.01 |
| Singapore | -0.07 | 0.01 | 0.01 |
| Slovak Republic | -0.07 | 0.00 | 0.00 |
| Slovenia | -0.09 | 0.01 | 0.01 |
| South Africa (5) | - | - | - |
| Spain | 0.13 | 0.02 | 0.01 |
| Sweden | 0.01 | 0.00 | 0.00 |
| Turkey | -0.05 | 0.00 | 0.01 |
| United Arab Emirates | 0.22 | 0.05 | 0.07 |
| United States | 0.08 | 0.01 | 0.01 |
| International Median | 0.03 | 0.00 | 0.01 |
| Benchmarking Participants | | | |
| Buenos Aires, Argentina | 0.11 | 0.01 | 0.04 |
| Ontario, Canada | 0.04 | 0.00 | 0.00 |
| Quebec, Canada | 0.14 | 0.02 | 0.02 |
| Norway (4) | 0.03 | 0.00 | 0.00 |
| Abu Dhabi, UAE | 0.19 | 0.04 | 0.07 |
| Dubai, UAE | 0.22 | 0.05 | 0.05 |
| Florida, US | -0.09 | 0.01 | 0.03 |

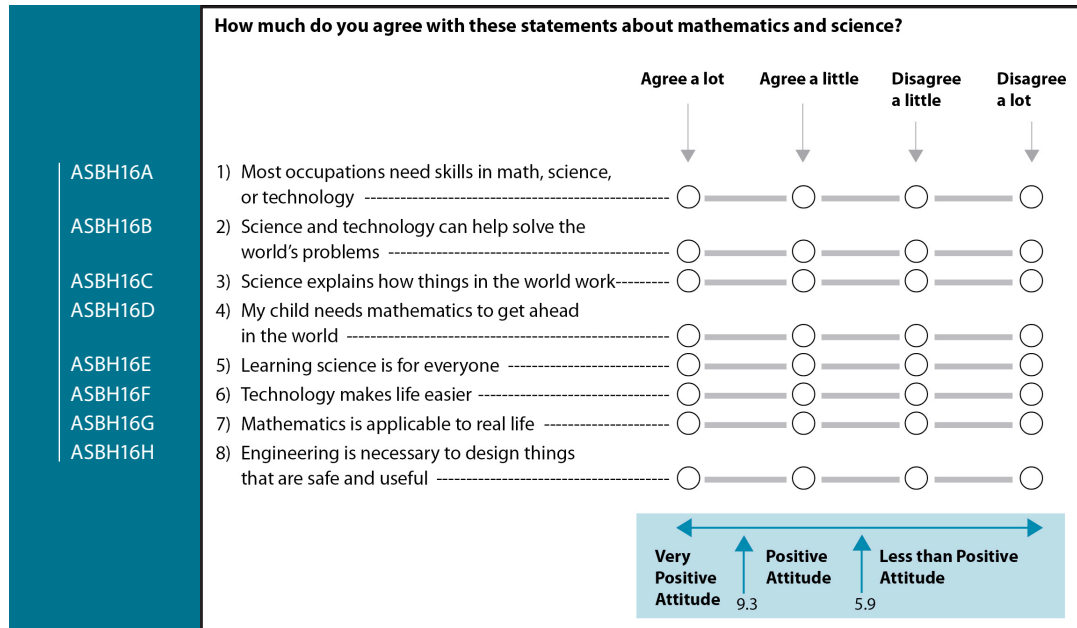
SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

A dash (-) indicates comparable data not available.

Parental Attitude Toward Mathematics and Science Scale, Fourth Grade

The Parental Attitude Toward Mathematics and Science (AMS) scale was created based on parents' responses to the eight statements described below.

Items in the TIMSS 2015 Parental Attitude Toward Mathematics and Science Scale, Fourth Grade¹



¹ For the purpose of scaling, categories in which there were very few respondents were combined. The categories "Disagree a little" and "Disagree a lot" were combined for all variables. The scale statistics that are reported herein reflect analysis of the items following collapsing.

Item Parameters for the TIMSS 2015 Parental Attitude Towards Mathematics and Science Scale, Fourth Grade

| Item | delta | tau_1 | tau_2 | Infit |
|---------|----------|----------|---------|-------|
| ASBH16A | -0.13348 | -1.30430 | 1.30430 | 1.06 |
| ASBH16B | 0.46466 | -1.45183 | 1.45183 | 1.02 |
| ASBH16C | -0.14365 | -1.51755 | 1.51755 | 0.98 |
| ASBH16D | 0.26093 | -1.15860 | 1.15860 | 0.98 |
| ASBH16E | 0.49246 | -1.14023 | 1.14023 | 1.07 |
| ASBH16F | -0.23279 | -1.41401 | 1.41401 | 1.07 |
| ASBH16G | -0.42471 | -1.32106 | 1.32106 | 0.97 |
| ASBH16H | -0.28342 | -1.41733 | 1.41733 | 1.02 |

Scale Transformation Constants for the TIMSS 2015 Parental Attitude Towards Mathematics and Science Scale, Fourth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 7.585537 | Transformed Scale Score = 7.585537 + 1.203307 • Logit Scale Score |
| B = 1.203307 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Parental Attitude Towards Mathematics and Science Scale, Fourth
Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 2.47515 | |
| 1 | 3.94784 | |
| 2 | 4.73109 | |
| 3 | 5.31751 | |
| 4 | 5.81902 | 5.9 |
| 5 | 6.28412 | |
| 6 | 6.72991 | |
| 7 | 7.16815 | |
| 8 | 7.60318 | |
| 9 | 8.03458 | |
| 10 | 8.46408 | |
| 11 | 8.89768 | |
| 12 | 9.34946 | 9.3 |
| 13 | 9.84146 | |
| 14 | 10.41768 | |
| 15 | 11.19234 | |
| 16 | 12.66016 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Parental Attitude Towards Mathematics and Science Scale, Fourth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|---------|---------|
| | | | ASBH16A | ASBH16B | ASBH16C | ASBH16D | ASBH16E | ASBH16F | ASBH16G | ASBH16H |
| Australia | 0.81 | 44 | 0.58 | 0.70 | 0.67 | 0.71 | 0.71 | 0.57 | 0.68 | 0.67 |
| Bahrain | 0.80 | 41 | 0.58 | 0.69 | 0.66 | 0.69 | 0.65 | 0.53 | 0.68 | 0.64 |
| Belgium (Flemish) | 0.84 | 47 | 0.61 | 0.69 | 0.68 | 0.75 | 0.67 | 0.67 | 0.71 | 0.69 |
| Bulgaria | 0.85 | 49 | 0.71 | 0.72 | 0.72 | 0.73 | 0.66 | 0.62 | 0.73 | 0.71 |
| Canada | 0.83 | 47 | 0.63 | 0.71 | 0.72 | 0.72 | 0.66 | 0.61 | 0.72 | 0.69 |
| Chile | 0.80 | 42 | 0.42 | 0.68 | 0.71 | 0.70 | 0.67 | 0.62 | 0.65 | 0.66 |
| Chinese Taipei | 0.87 | 53 | 0.72 | 0.77 | 0.77 | 0.67 | 0.73 | 0.73 | 0.73 | 0.70 |
| Croatia | 0.80 | 42 | 0.59 | 0.65 | 0.66 | 0.74 | 0.55 | 0.58 | 0.70 | 0.66 |
| Cyprus | 0.75 | 38 | 0.60 | 0.68 | 0.69 | 0.63 | 0.50 | 0.55 | 0.64 | 0.61 |
| Czech Republic | 0.82 | 45 | 0.66 | 0.68 | 0.67 | 0.70 | 0.70 | 0.63 | 0.64 | 0.68 |
| Denmark | 0.77 | 40 | 0.62 | 0.66 | 0.66 | 0.71 | 0.50 | 0.60 | 0.64 | 0.63 |
| England | - | - | - | - | - | - | - | - | - | - |
| Finland | 0.83 | 46 | 0.66 | 0.70 | 0.67 | 0.73 | 0.72 | 0.58 | 0.70 | 0.67 |
| France | 0.84 | 48 | 0.69 | 0.73 | 0.68 | 0.70 | 0.72 | 0.62 | 0.70 | 0.69 |
| Georgia | 0.80 | 42 | 0.54 | 0.58 | 0.65 | 0.70 | 0.67 | 0.69 | 0.70 | 0.63 |
| Germany | 0.80 | 42 | 0.60 | 0.60 | 0.63 | 0.70 | 0.63 | 0.67 | 0.69 | 0.65 |
| Hong Kong SAR | 0.83 | 47 | 0.67 | 0.72 | 0.72 | 0.68 | 0.69 | 0.66 | 0.65 | 0.69 |
| Hungary | 0.79 | 42 | 0.63 | 0.69 | 0.68 | 0.69 | 0.68 | 0.62 | 0.67 | 0.50 |
| Indonesia | 0.83 | 46 | 0.59 | 0.72 | 0.73 | 0.68 | 0.65 | 0.70 | 0.67 | 0.71 |
| Iran, Islamic Rep. of | 0.79 | 41 | 0.60 | 0.65 | 0.65 | 0.68 | 0.64 | 0.59 | 0.70 | 0.59 |
| Ireland | 0.79 | 42 | 0.57 | 0.68 | 0.65 | 0.71 | 0.64 | 0.58 | 0.70 | 0.63 |
| Italy | 0.80 | 42 | 0.58 | 0.69 | 0.67 | 0.69 | 0.54 | 0.62 | 0.67 | 0.69 |
| Japan | 0.85 | 49 | 0.66 | 0.73 | 0.71 | 0.73 | 0.76 | 0.66 | 0.65 | 0.70 |
| Jordan | 0.81 | 44 | 0.60 | 0.68 | 0.70 | 0.71 | 0.60 | 0.62 | 0.68 | 0.69 |
| Kazakhstan | 0.78 | 40 | 0.62 | 0.69 | 0.64 | 0.63 | 0.57 | 0.62 | 0.61 | 0.64 |
| Korea, Rep. of | 0.87 | 53 | 0.65 | 0.76 | 0.74 | 0.73 | 0.78 | 0.69 | 0.70 | 0.77 |
| Kuwait | 0.81 | 43 | 0.59 | 0.68 | 0.70 | 0.72 | 0.65 | 0.59 | 0.68 | 0.64 |
| Lithuania | 0.76 | 38 | 0.62 | 0.65 | 0.62 | 0.64 | 0.50 | 0.62 | 0.64 | 0.64 |
| Morocco | 0.84 | 47 | 0.63 | 0.71 | 0.70 | 0.70 | 0.65 | 0.70 | 0.68 | 0.71 |
| Netherlands | 0.80 | 43 | 0.65 | 0.67 | 0.70 | 0.69 | 0.51 | 0.61 | 0.71 | 0.71 |
| New Zealand | 0.83 | 46 | 0.64 | 0.73 | 0.67 | 0.74 | 0.70 | 0.56 | 0.72 | 0.67 |
| Northern Ireland | 0.81 | 43 | 0.59 | 0.71 | 0.65 | 0.65 | 0.68 | 0.62 | 0.69 | 0.67 |
| Norway (5) | 0.81 | 44 | 0.62 | 0.69 | 0.69 | 0.70 | 0.65 | 0.65 | 0.63 | 0.64 |
| Oman | 0.77 | 39 | 0.56 | 0.66 | 0.63 | 0.65 | 0.62 | 0.57 | 0.65 | 0.62 |
| Poland | 0.83 | 47 | 0.67 | 0.72 | 0.64 | 0.69 | 0.67 | 0.70 | 0.69 | 0.68 |
| Portugal | 0.76 | 38 | 0.48 | 0.64 | 0.66 | 0.62 | 0.57 | 0.58 | 0.65 | 0.68 |
| Qatar | 0.84 | 47 | 0.60 | 0.70 | 0.73 | 0.72 | 0.69 | 0.65 | 0.70 | 0.67 |
| Russian Federation | 0.82 | 44 | 0.64 | 0.70 | 0.67 | 0.71 | 0.69 | 0.59 | 0.66 | 0.67 |
| Saudi Arabia | 0.84 | 47 | 0.59 | 0.72 | 0.70 | 0.73 | 0.67 | 0.65 | 0.71 | 0.71 |
| Serbia | 0.84 | 48 | 0.65 | 0.72 | 0.73 | 0.75 | 0.63 | 0.62 | 0.70 | 0.71 |
| Singapore | 0.86 | 50 | 0.68 | 0.73 | 0.72 | 0.72 | 0.72 | 0.66 | 0.72 | 0.71 |
| Slovak Republic | 0.82 | 44 | 0.65 | 0.67 | 0.67 | 0.72 | 0.66 | 0.61 | 0.68 | 0.64 |
| Slovenia | 0.85 | 50 | 0.70 | 0.73 | 0.72 | 0.73 | 0.63 | 0.66 | 0.70 | 0.76 |
| South Africa (5) | 0.83 | 46 | 0.64 | 0.72 | 0.70 | 0.70 | 0.60 | 0.69 | 0.71 | 0.69 |
| Spain | 0.80 | 42 | 0.59 | 0.70 | 0.71 | 0.69 | 0.55 | 0.62 | 0.66 | 0.67 |
| Sweden | 0.82 | 45 | 0.60 | 0.70 | 0.70 | 0.72 | 0.61 | 0.69 | 0.64 | 0.70 |
| Turkey | 0.81 | 44 | 0.64 | 0.68 | 0.67 | 0.70 | 0.67 | 0.61 | 0.68 | 0.64 |
| United Arab Emirates | 0.85 | 49 | 0.65 | 0.71 | 0.73 | 0.71 | 0.71 | 0.65 | 0.73 | 0.67 |
| United States | - | - | - | - | - | - | - | - | - | - |
| Benchmarking Participants | | | | | | | | | | |
| Buenos Aires, Argentina | 0.80 | 42 | 0.70 | 0.59 | 0.63 | 0.71 | 0.59 | 0.58 | 0.73 | 0.65 |
| Ontario, Canada | 0.82 | 45 | 0.57 | 0.70 | 0.68 | 0.72 | 0.67 | 0.62 | 0.71 | 0.64 |
| Quebec, Canada | 0.84 | 48 | 0.62 | 0.73 | 0.73 | 0.73 | 0.60 | 0.64 | 0.72 | 0.74 |
| Norway (4) | 0.81 | 44 | 0.66 | 0.72 | 0.69 | 0.72 | 0.65 | 0.60 | 0.61 | 0.65 |
| Abu Dhabi, UAE | 0.87 | 52 | 0.67 | 0.72 | 0.76 | 0.72 | 0.74 | 0.68 | 0.75 | 0.71 |
| Dubai, UAE | 0.83 | 45 | 0.62 | 0.68 | 0.72 | 0.72 | 0.69 | 0.60 | 0.70 | 0.65 |
| Florida, US | - | - | - | - | - | - | - | - | - | - |

A dash (-) indicates comparable data not available.

SOURCE: IEA's Trends in International Mathematics and Science Study - TIMSS 2015

Relationship Between the TIMSS 2015 Parental Attitude Towards Mathematics and Science Scale, Fourth Grade, and TIMSS 2015 Achievement

| Country | Pearson's Correlation with Achievement | | | | Variance in Achievement Accounted for by Difference Between Regions of the Scale (η^2) | |
|----------------------------------|--|-------------|-------------|-------------|---|-------------|
| | (r) | | (r) | | Mathematics | Science |
| | Mathematics | Science | Mathematics | Science | | |
| Australia | 0.15 | 0.13 | 0.02 | 0.02 | 0.02 | 0.02 |
| Bahrain | 0.13 | 0.17 | 0.02 | 0.03 | 0.01 | 0.02 |
| Belgium (Flemish) | 0.08 | 0.08 | 0.01 | 0.01 | 0.01 | 0.01 |
| Bulgaria | 0.08 | 0.10 | 0.01 | 0.01 | 0.01 | 0.02 |
| Canada | 0.10 | 0.13 | 0.01 | 0.02 | 0.01 | 0.01 |
| Chile | 0.09 | 0.06 | 0.01 | 0.00 | 0.00 | 0.00 |
| Chinese Taipei | 0.09 | 0.10 | 0.01 | 0.01 | 0.01 | 0.01 |
| Croatia | 0.06 | 0.05 | 0.00 | 0.00 | 0.01 | 0.00 |
| Cyprus | 0.03 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| Czech Republic | 0.05 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 |
| Denmark | 0.09 | 0.08 | 0.01 | 0.01 | 0.01 | 0.01 |
| England | - | - | - | - | - | - |
| Finland | 0.17 | 0.16 | 0.03 | 0.03 | 0.02 | 0.02 |
| France | 0.16 | 0.15 | 0.03 | 0.02 | 0.02 | 0.02 |
| Georgia | 0.02 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| Germany | 0.07 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 |
| Hong Kong SAR | 0.15 | 0.18 | 0.02 | 0.03 | 0.02 | 0.02 |
| Hungary | 0.08 | 0.07 | 0.01 | 0.00 | 0.01 | 0.01 |
| Indonesia | 0.02 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| Iran, Islamic Rep. of | 0.10 | 0.12 | 0.01 | 0.01 | 0.01 | 0.01 |
| Ireland | 0.13 | 0.12 | 0.02 | 0.01 | 0.01 | 0.01 |
| Italy | 0.04 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Japan | 0.17 | 0.18 | 0.03 | 0.03 | 0.03 | 0.03 |
| Jordan | 0.18 | - | 0.03 | - | 0.03 | - |
| Kazakhstan | 0.01 | -0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Korea, Rep. of | 0.20 | 0.18 | 0.04 | 0.03 | 0.03 | 0.03 |
| Kuwait | 0.13 | 0.14 | 0.02 | 0.02 | 0.02 | 0.02 |
| Lithuania | 0.06 | 0.02 | 0.00 | 0.00 | 0.01 | 0.00 |
| Morocco | 0.10 | 0.12 | 0.01 | 0.02 | 0.01 | 0.02 |
| Netherlands | 0.17 | 0.20 | 0.03 | 0.04 | 0.02 | 0.04 |
| New Zealand | 0.16 | 0.15 | 0.03 | 0.02 | 0.02 | 0.02 |
| Northern Ireland | 0.08 | 0.10 | 0.01 | 0.01 | 0.00 | 0.01 |
| Norway (5) | 0.14 | 0.15 | 0.02 | 0.02 | 0.01 | 0.01 |
| Oman | 0.11 | 0.13 | 0.01 | 0.02 | 0.01 | 0.01 |
| Poland | 0.13 | 0.14 | 0.02 | 0.02 | 0.02 | 0.02 |
| Portugal | 0.08 | 0.11 | 0.01 | 0.01 | 0.00 | 0.01 |
| Qatar | 0.19 | 0.18 | 0.03 | 0.03 | 0.03 | 0.02 |
| Russian Federation | -0.01 | -0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Saudi Arabia | 0.07 | 0.07 | 0.01 | 0.01 | 0.01 | 0.01 |
| Serbia | 0.04 | 0.05 | 0.00 | 0.00 | 0.01 | 0.01 |
| Singapore | 0.13 | 0.13 | 0.02 | 0.02 | 0.01 | 0.02 |
| Slovak Republic | -0.05 | -0.06 | 0.00 | 0.00 | 0.00 | 0.00 |
| Slovenia | 0.10 | 0.10 | 0.01 | 0.01 | 0.01 | 0.01 |
| South Africa (5) | 0.04 | - | 0.00 | - | 0.00 | - |
| Spain | 0.10 | 0.10 | 0.01 | 0.01 | 0.01 | 0.01 |
| Sweden | 0.14 | 0.14 | 0.02 | 0.02 | 0.02 | 0.02 |
| Turkey | 0.07 | 0.07 | 0.00 | 0.00 | 0.01 | 0.01 |
| United Arab Emirates | 0.20 | 0.23 | 0.04 | 0.05 | 0.04 | 0.05 |
| United States | - | - | - | - | - | - |
| International Median | 0.10 | 0.10 | 0.01 | 0.01 | 0.01 | 0.01 |
| Benchmarking Participants | | | | | | |
| Buenos Aires, Argentina | 0.16 | 0.08 | 0.02 | 0.01 | 0.01 | 0.01 |
| Ontario, Canada | 0.14 | 0.12 | 0.02 | 0.01 | 0.01 | 0.01 |
| Quebec, Canada | 0.16 | 0.14 | 0.02 | 0.02 | 0.02 | 0.01 |
| Norway (4) | 0.06 | 0.15 | 0.00 | 0.02 | 0.00 | 0.02 |
| Abu Dhabi, UAE | 0.22 | 0.25 | 0.05 | 0.06 | 0.05 | 0.06 |
| Dubai, UAE | 0.15 | 0.18 | 0.02 | 0.03 | 0.02 | 0.03 |
| Florida, US | - | - | - | - | - | - |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

A dash (-) indicates comparable data not available.

Parents' Perceptions of School Performance Scale, Fourth Grade

The Parents' Perceptions of School Performance (PSP) scale was created based on parents' responses to the eight statements described below.

Items in the TIMSS 2015 Parents' Perceptions of School Performance Scale, Fourth Grade¹

| | | What do you think of your child's school? | | | |
|---------|--|---|----------------|-------------------|----------------|
| | | Agree a lot | Agree a little | Disagree a little | Disagree a lot |
| | | ↓ | ↓ | ↓ | ↓ |
| ASBH11A | 1) My child's school does a good job including me in my child's education ----- | ○ | ○ | ○ | ○ |
| ASBH11B | 2) My child's school provides a safe environment ----- | ○ | ○ | ○ | ○ |
| ASBH11C | 3) My child's school cares about my child's progress in school ----- | ○ | ○ | ○ | ○ |
| ASBH11D | 4) My child's school does a good job informing me of his/her progress ----- | ○ | ○ | ○ | ○ |
| ASBH11E | 5) My child's school promotes high academic standards ----- | ○ | ○ | ○ | ○ |
| ASBH11F | 6) My child's school does a good job in helping him/her become better in reading ----- | ○ | ○ | ○ | ○ |
| ASBH11G | 7) My child's school does a good job in helping him/her become better in mathematics ----- | ○ | ○ | ○ | ○ |
| ASBH11H | 8) My child's school does a good job in helping him/her become better in science ----- | ○ | ○ | ○ | ○ |

¹ For the purpose of scaling, categories in which there were very few respondents were combined. The categories "Disagree a little" and "Disagree a lot" were combined for all variables. The scale statistics that are reported herein reflect analysis of the items following collapsing.

Item Parameters for the TIMSS 2015 Parents' Perceptions of School Performance Scale, Fourth Grade

| Item | delta | tau_1 | tau_2 | Infit |
|---------|----------|----------|---------|-------|
| ASBH11A | 0.11460 | -1.73494 | 1.73494 | 1.12 |
| ASBH11B | -0.67540 | -1.75855 | 1.75855 | 1.32 |
| ASBH11C | -0.56176 | -1.77592 | 1.77592 | 0.86 |
| ASBH11D | 0.01006 | -1.43467 | 1.43467 | 1.02 |
| ASBH11E | 0.89136 | -1.72307 | 1.72307 | 1.18 |
| ASBH11F | -0.12622 | -1.56127 | 1.56127 | 0.87 |
| ASBH11G | 0.02192 | -1.62039 | 1.62039 | 0.86 |
| ASBH11H | 0.32544 | -1.66119 | 1.66119 | 0.95 |

Scale Transformation Constants for the TIMSS 2015 Parents' Perceptions of School Performance Scale, Fourth Grade

Scale Transformation Constants

A = 8.205877

B = 0.922019

Transformed Scale Score = 8.205877 + 0.922019 • Logit Scale Score

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Parents' Perceptions of School Performance Scale, Fourth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 3.94852 | |
| 1 | 5.10034 | |
| 2 | 5.72134 | |
| 3 | 6.19579 | |
| 4 | 6.61062 | 6.7 |
| 5 | 7.00360 | |
| 6 | 7.39360 | |
| 7 | 7.79675 | |
| 8 | 8.21220 | |
| 9 | 8.62605 | |
| 10 | 9.02464 | |
| 11 | 9.41083 | |
| 12 | 9.79839 | 9.7 |
| 13 | 10.20989 | |
| 14 | 10.68380 | |
| 15 | 11.30495 | |
| 16 | 12.45977 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Parents' Perceptions of School Performance Scale, Fourth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|---------|---------|
| | | | ASBHT1A | ASBHT1B | ASBHT1C | ASBHT1D | ASBHT1E | ASBHT1F | ASBHT1G | ASBHT1H |
| Australia | 0.90 | 60 | 0.78 | 0.51 | 0.81 | 0.81 | 0.74 | 0.83 | 0.84 | 0.81 |
| Bahrain | 0.90 | 60 | 0.74 | 0.67 | 0.82 | 0.76 | 0.79 | 0.81 | 0.81 | 0.79 |
| Belgium (Flemish) | 0.88 | 55 | 0.76 | 0.62 | 0.80 | 0.79 | 0.59 | 0.77 | 0.81 | 0.78 |
| Bulgaria | 0.91 | 63 | 0.71 | 0.71 | 0.84 | 0.78 | 0.78 | 0.84 | 0.83 | 0.84 |
| Canada | 0.91 | 61 | 0.77 | 0.59 | 0.83 | 0.80 | 0.78 | 0.80 | 0.84 | 0.82 |
| Chile | 0.91 | 61 | 0.78 | 0.64 | 0.82 | 0.80 | 0.75 | 0.80 | 0.82 | 0.79 |
| Chinese Taipei | 0.91 | 62 | 0.77 | 0.67 | 0.84 | 0.84 | 0.72 | 0.77 | 0.86 | 0.83 |
| Croatia | 0.91 | 62 | 0.73 | 0.69 | 0.82 | 0.74 | 0.76 | 0.85 | 0.85 | 0.85 |
| Cyprus | 0.89 | 57 | 0.68 | 0.60 | 0.82 | 0.73 | 0.76 | 0.82 | 0.83 | 0.77 |
| Czech Republic | 0.90 | 60 | 0.70 | 0.57 | 0.81 | 0.78 | 0.76 | 0.84 | 0.87 | 0.86 |
| Denmark | 0.90 | 60 | 0.78 | 0.64 | 0.82 | 0.80 | 0.80 | 0.77 | 0.81 | 0.76 |
| England | - | - | - | - | - | - | - | - | - | - |
| Finland | 0.89 | 57 | 0.70 | 0.58 | 0.80 | 0.72 | 0.68 | 0.82 | 0.86 | 0.84 |
| France | 0.89 | 58 | 0.74 | 0.63 | 0.80 | 0.78 | 0.71 | 0.80 | 0.83 | 0.78 |
| Georgia | 0.87 | 54 | 0.61 | 0.63 | 0.77 | 0.74 | 0.64 | 0.80 | 0.82 | 0.81 |
| Germany | 0.89 | 57 | 0.79 | 0.60 | 0.79 | 0.79 | 0.59 | 0.80 | 0.83 | 0.82 |
| Hong Kong SAR | 0.89 | 57 | 0.76 | 0.55 | 0.79 | 0.80 | 0.75 | 0.80 | 0.80 | 0.76 |
| Hungary | 0.90 | 58 | 0.73 | 0.61 | 0.78 | 0.77 | 0.73 | 0.82 | 0.83 | 0.82 |
| Indonesia | 0.83 | 48 | 0.64 | 0.54 | 0.72 | 0.72 | 0.58 | 0.72 | 0.80 | 0.78 |
| Iran, Islamic Rep. of | 0.86 | 51 | 0.67 | 0.62 | 0.74 | 0.70 | 0.65 | 0.78 | 0.78 | 0.77 |
| Ireland | 0.88 | 56 | 0.78 | 0.58 | 0.80 | 0.79 | 0.78 | 0.76 | 0.79 | 0.70 |
| Italy | 0.90 | 59 | 0.77 | 0.55 | 0.79 | 0.78 | 0.74 | 0.81 | 0.82 | 0.83 |
| Japan | 0.86 | 51 | 0.61 | 0.58 | 0.70 | 0.70 | 0.74 | 0.80 | 0.78 | 0.77 |
| Jordan | 0.93 | 66 | 0.78 | 0.71 | 0.85 | 0.82 | 0.82 | 0.85 | 0.84 | 0.83 |
| Kazakhstan | 0.88 | 54 | 0.68 | 0.60 | 0.76 | 0.69 | 0.77 | 0.80 | 0.78 | 0.78 |
| Korea, Rep. of | 0.91 | 62 | 0.64 | 0.67 | 0.79 | 0.78 | 0.85 | 0.82 | 0.86 | 0.85 |
| Kuwait | 0.92 | 65 | 0.77 | 0.72 | 0.83 | 0.81 | 0.83 | 0.83 | 0.82 | 0.81 |
| Lithuania | 0.89 | 57 | 0.64 | 0.63 | 0.78 | 0.72 | 0.69 | 0.84 | 0.85 | 0.83 |
| Morocco | 0.88 | 55 | 0.68 | 0.66 | 0.80 | 0.72 | 0.69 | 0.80 | 0.81 | 0.77 |
| Netherlands | 0.89 | 56 | 0.76 | 0.56 | 0.80 | 0.78 | 0.70 | 0.83 | 0.85 | 0.70 |
| New Zealand | 0.91 | 61 | 0.81 | 0.56 | 0.82 | 0.82 | 0.78 | 0.81 | 0.83 | 0.77 |
| Northern Ireland | 0.89 | 58 | 0.79 | 0.55 | 0.83 | 0.81 | 0.75 | 0.80 | 0.81 | 0.69 |
| Norway (5) | 0.91 | 63 | 0.79 | 0.65 | 0.83 | 0.79 | 0.79 | 0.82 | 0.84 | 0.83 |
| Oman | 0.88 | 55 | 0.72 | 0.64 | 0.77 | 0.71 | 0.73 | 0.76 | 0.80 | 0.80 |
| Poland | 0.90 | 58 | 0.69 | 0.68 | 0.83 | 0.73 | 0.75 | 0.80 | 0.80 | 0.80 |
| Portugal | 0.90 | 59 | 0.78 | 0.59 | 0.81 | 0.76 | 0.71 | 0.83 | 0.85 | 0.81 |
| Qatar | 0.92 | 63 | 0.77 | 0.68 | 0.82 | 0.79 | 0.80 | 0.82 | 0.82 | 0.83 |
| Russian Federation | 0.89 | 58 | 0.62 | 0.66 | 0.79 | 0.70 | 0.70 | 0.85 | 0.87 | 0.86 |
| Saudi Arabia | 0.92 | 65 | 0.75 | 0.73 | 0.82 | 0.80 | 0.81 | 0.84 | 0.84 | 0.83 |
| Serbia | 0.92 | 66 | 0.81 | 0.70 | 0.86 | 0.82 | 0.77 | 0.84 | 0.84 | 0.85 |
| Singapore | 0.89 | 58 | 0.77 | 0.58 | 0.82 | 0.78 | 0.72 | 0.77 | 0.81 | 0.79 |
| Slovak Republic | 0.90 | 59 | 0.69 | 0.62 | 0.80 | 0.72 | 0.77 | 0.82 | 0.85 | 0.84 |
| Slovenia | 0.91 | 61 | 0.65 | 0.70 | 0.82 | 0.76 | 0.72 | 0.85 | 0.86 | 0.87 |
| South Africa (5) | 0.85 | 50 | 0.67 | 0.58 | 0.74 | 0.70 | 0.70 | 0.75 | 0.76 | 0.73 |
| Spain | 0.90 | 60 | 0.77 | 0.64 | 0.80 | 0.79 | 0.71 | 0.79 | 0.84 | 0.83 |
| Sweden | 0.91 | 63 | 0.77 | 0.65 | 0.82 | 0.80 | 0.81 | 0.81 | 0.83 | 0.84 |
| Turkey | 0.90 | 60 | 0.71 | 0.67 | 0.78 | 0.75 | 0.81 | 0.81 | 0.82 | 0.81 |
| United Arab Emirates | 0.91 | 62 | 0.78 | 0.67 | 0.83 | 0.79 | 0.80 | 0.80 | 0.81 | 0.81 |
| United States | - | - | - | - | - | - | - | - | - | - |
| Benchmarking Participants | | | | | | | | | | |
| Buenos Aires, Argentina | 0.91 | 61 | 0.71 | 0.65 | 0.83 | 0.76 | 0.77 | 0.81 | 0.85 | 0.81 |
| Ontario, Canada | 0.91 | 61 | 0.79 | 0.56 | 0.84 | 0.80 | 0.79 | 0.79 | 0.84 | 0.83 |
| Quebec, Canada | 0.90 | 59 | 0.70 | 0.65 | 0.82 | 0.81 | 0.75 | 0.81 | 0.84 | 0.77 |
| Norway (4) | 0.91 | 62 | 0.79 | 0.62 | 0.84 | 0.80 | 0.76 | 0.80 | 0.84 | 0.81 |
| Abu Dhabi, UAE | 0.92 | 63 | 0.78 | 0.69 | 0.83 | 0.80 | 0.82 | 0.82 | 0.80 | 0.82 |
| Dubai, UAE | 0.90 | 59 | 0.76 | 0.61 | 0.83 | 0.78 | 0.79 | 0.77 | 0.80 | 0.80 |
| Florida, US | - | - | - | - | - | - | - | - | - | - |

A dash (-) indicates comparable data not available.

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Parents' Perceptions of School Performance Scale, Fourth Grade, and TIMSS 2015 Achievement

| Country | Pearson's Correlation with Achievement | | | | Variance in Achievement Accounted for by Difference Between Regions of the Scale (η^2) | |
|----------------------------------|--|-------------|-------------|-------------|---|-------------|
| | (r) | | (r) | | Mathematics | Science |
| | Mathematics | Science | Mathematics | Science | | |
| Australia | 0.10 | 0.05 | 0.01 | 0.00 | 0.01 | 0.01 |
| Bahrain | 0.13 | 0.17 | 0.02 | 0.03 | 0.02 | 0.03 |
| Belgium (Flemish) | -0.03 | -0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| Bulgaria | -0.01 | -0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| Canada | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Chile | 0.04 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| Chinese Taipei | -0.02 | -0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| Croatia | -0.02 | -0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cyprus | -0.02 | -0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| Czech Republic | -0.09 | -0.10 | 0.01 | 0.01 | 0.01 | 0.01 |
| Denmark | 0.05 | 0.04 | 0.00 | 0.00 | 0.01 | 0.00 |
| England | - | - | - | - | - | - |
| Finland | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| France | 0.01 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Georgia | 0.04 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| Germany | 0.06 | 0.02 | 0.00 | 0.00 | 0.01 | 0.01 |
| Hong Kong SAR | 0.11 | 0.09 | 0.01 | 0.01 | 0.01 | 0.01 |
| Hungary | 0.04 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| Indonesia | 0.03 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 |
| Iran, Islamic Rep. of | -0.01 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Ireland | -0.03 | -0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Italy | 0.01 | -0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Japan | 0.02 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| Jordan | 0.16 | - | 0.03 | - | 0.03 | - |
| Kazakhstan | 0.05 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Korea, Rep. of | 0.05 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Kuwait | 0.06 | 0.07 | 0.00 | 0.00 | 0.00 | 0.01 |
| Lithuania | 0.04 | -0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Morocco | 0.15 | 0.22 | 0.02 | 0.05 | 0.02 | 0.04 |
| Netherlands | 0.06 | 0.05 | 0.00 | 0.00 | 0.01 | 0.01 |
| New Zealand | 0.04 | -0.01 | 0.00 | 0.00 | 0.01 | 0.00 |
| Northern Ireland | -0.03 | -0.07 | 0.00 | 0.01 | 0.00 | 0.01 |
| Norway (5) | 0.12 | 0.03 | 0.02 | 0.00 | 0.01 | 0.00 |
| Oman | 0.14 | 0.14 | 0.02 | 0.02 | 0.02 | 0.02 |
| Poland | -0.04 | -0.06 | 0.00 | 0.00 | 0.00 | 0.00 |
| Portugal | 0.09 | 0.06 | 0.01 | 0.00 | 0.01 | 0.00 |
| Qatar | 0.13 | 0.14 | 0.02 | 0.02 | 0.02 | 0.02 |
| Russian Federation | -0.02 | -0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| Saudi Arabia | 0.05 | 0.03 | 0.00 | 0.00 | 0.01 | 0.00 |
| Serbia | -0.07 | -0.10 | 0.00 | 0.01 | 0.01 | 0.01 |
| Singapore | 0.08 | 0.06 | 0.01 | 0.00 | 0.01 | 0.01 |
| Slovak Republic | -0.08 | -0.11 | 0.01 | 0.01 | 0.01 | 0.01 |
| Slovenia | 0.01 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| South Africa (5) | 0.13 | - | 0.02 | - | 0.01 | - |
| Spain | 0.03 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Sweden | 0.03 | -0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Turkey | -0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| United Arab Emirates | 0.16 | 0.17 | 0.03 | 0.03 | 0.03 | 0.03 |
| United States | - | - | - | - | - | - |
| International Median | 0.04 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Benchmarking Participants | | | | | | |
| Buenos Aires, Argentina | 0.07 | 0.09 | 0.00 | 0.01 | 0.00 | 0.01 |
| Ontario, Canada | 0.08 | 0.05 | 0.01 | 0.00 | 0.01 | 0.01 |
| Quebec, Canada | -0.04 | -0.06 | 0.00 | 0.00 | 0.00 | 0.00 |
| Norway (4) | 0.03 | -0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Abu Dhabi, UAE | 0.17 | 0.19 | 0.03 | 0.03 | 0.03 | 0.03 |
| Dubai, UAE | 0.15 | 0.15 | 0.02 | 0.02 | 0.02 | 0.02 |
| Florida, US | - | - | - | - | - | - |

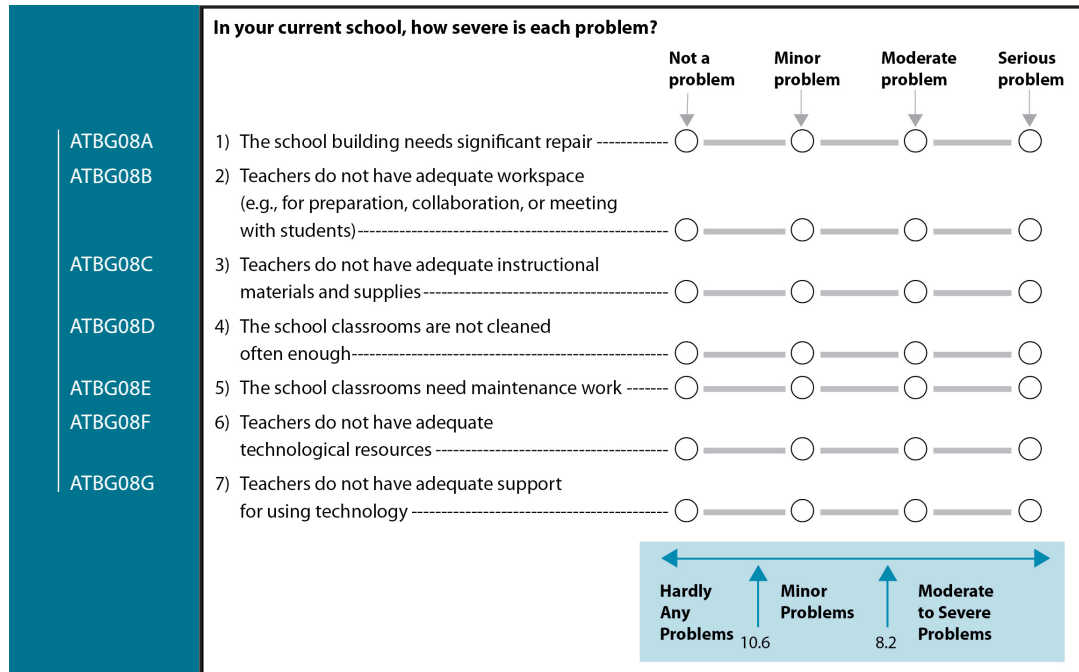
SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

A dash (-) indicates comparable data not available.

Problems with School Conditions and Resources–Teachers’ Reports Scale, Fourth Grade

The Problems with School Conditions and Resources–Teachers’ Reports (SCR) scale was created based on teachers’ responses concerning seven conditions and resources described below.

Items in the Problems with School Conditions and Resources–Teachers’ Reports Scale, Fourth Grade



Item Parameters for the TIMSS 2015 Problems with School Conditions and Resources – Teachers' Reports Scale, Fourth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|---------|----------|----------|----------|---------|-------|
| ATBG08A | 0.25146 | -1.10267 | -0.04789 | 1.15056 | 1.15 |
| ATBG08B | 0.10778 | -0.98715 | 0.06755 | 0.91960 | 1.14 |
| ATBG08C | -0.00295 | -1.33876 | 0.01594 | 1.32282 | 0.95 |
| ATBG08D | -0.67894 | -0.79406 | 0.02136 | 0.77270 | 1.14 |
| ATBG08E | -0.05211 | -1.13587 | -0.15567 | 1.29154 | 0.97 |
| ATBG08F | 0.24992 | -1.09700 | -0.04657 | 1.14357 | 0.90 |
| ATBG08G | 0.12484 | -1.05906 | -0.07924 | 1.13830 | 1.02 |

Scale Transformation Constants for the TIMSS 2015 Problems with School Conditions and Resources – Teachers' Reports Scale, Fourth Grade

Scale Transformation Constants

A = 8.325487

B = 1.363794

Transformed Scale Score = 8.325487 + 1.363794 • Logit Scale Score

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Problems with School Conditions and Resources – Teachers’
Reports Scale, Fourth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 3.19241 | |
| 1 | 4.74715 | |
| 2 | 5.50395 | |
| 3 | 6.02702 | |
| 4 | 6.44003 | |
| 5 | 6.78968 | |
| 6 | 7.10030 | |
| 7 | 7.38690 | |
| 8 | 7.65644 | |
| 9 | 7.91569 | |
| 10 | 8.17000 | 8.2 |
| 11 | 8.42379 | |
| 12 | 8.68129 | |
| 13 | 8.94698 | |
| 14 | 9.22610 | |
| 15 | 9.52520 | |
| 16 | 9.85013 | |
| 17 | 10.21875 | |
| 18 | 10.65400 | 10.6 |
| 19 | 11.20171 | |
| 20 | 11.98622 | |
| 21 | 13.57043 | |

SOURCE: IEA’s Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Problems with School Conditions and Resources – Teachers' Reports Scale, Fourth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|---------|
| | | | ATB608A | ATB608B | ATB608C | ATB608D | ATB608E | ATB608F | ATB608G |
| Australia | 0.83 | 51 | 0.76 | 0.68 | 0.77 | 0.50 | 0.75 | 0.73 | 0.75 |
| Bahrain | 0.85 | 54 | 0.61 | 0.74 | 0.79 | 0.70 | 0.68 | 0.84 | 0.76 |
| Belgium (Flemish) | 0.80 | 46 | 0.73 | 0.67 | 0.70 | 0.49 | 0.71 | 0.73 | 0.70 |
| Bulgaria | 0.87 | 57 | 0.71 | 0.65 | 0.82 | 0.66 | 0.79 | 0.81 | 0.80 |
| Canada | 0.80 | 47 | 0.73 | 0.56 | 0.69 | 0.64 | 0.75 | 0.67 | 0.72 |
| Chile | 0.85 | 53 | 0.75 | 0.77 | 0.75 | 0.56 | 0.72 | 0.76 | 0.77 |
| Chinese Taipei | 0.84 | 52 | 0.54 | 0.67 | 0.75 | 0.69 | 0.77 | 0.80 | 0.79 |
| Croatia | 0.88 | 59 | 0.72 | 0.75 | 0.83 | 0.52 | 0.84 | 0.86 | 0.78 |
| Cyprus | 0.86 | 54 | 0.76 | 0.70 | 0.77 | 0.56 | 0.83 | 0.75 | 0.73 |
| Czech Republic | 0.81 | 49 | 0.50 | 0.69 | 0.75 | 0.53 | 0.73 | 0.82 | 0.82 |
| Denmark | 0.82 | 49 | 0.76 | 0.53 | 0.69 | 0.58 | 0.81 | 0.77 | 0.70 |
| England | 0.86 | 55 | 0.71 | 0.68 | 0.79 | 0.64 | 0.80 | 0.81 | 0.72 |
| Finland | 0.83 | 51 | 0.75 | 0.75 | 0.78 | 0.56 | 0.79 | 0.71 | 0.62 |
| France | 0.78 | 44 | 0.76 | 0.68 | 0.68 | 0.46 | 0.73 | 0.70 | 0.60 |
| Georgia | 0.84 | 52 | 0.75 | 0.66 | 0.74 | 0.65 | 0.76 | 0.80 | 0.66 |
| Germany | 0.83 | 51 | 0.67 | 0.74 | 0.73 | 0.67 | 0.71 | 0.77 | 0.70 |
| Hong Kong SAR | 0.89 | 60 | 0.72 | 0.76 | 0.82 | 0.72 | 0.81 | 0.80 | 0.77 |
| Hungary | 0.84 | 51 | 0.60 | 0.66 | 0.79 | 0.61 | 0.75 | 0.86 | 0.71 |
| Indonesia | 0.88 | 59 | 0.79 | 0.72 | 0.75 | 0.66 | 0.80 | 0.81 | 0.81 |
| Iran, Islamic Rep. of | 0.83 | 49 | 0.78 | 0.81 | 0.71 | 0.50 | 0.80 | 0.68 | 0.57 |
| Ireland | 0.84 | 51 | 0.80 | 0.68 | 0.71 | 0.64 | 0.84 | 0.69 | 0.62 |
| Italy | 0.86 | 53 | 0.75 | 0.67 | 0.79 | 0.63 | 0.82 | 0.77 | 0.67 |
| Japan | 0.78 | 44 | 0.65 | 0.60 | 0.70 | 0.47 | 0.65 | 0.77 | 0.76 |
| Jordan | 0.90 | 62 | 0.78 | 0.79 | 0.82 | 0.69 | 0.80 | 0.82 | 0.80 |
| Kazakhstan | 0.86 | 56 | 0.63 | 0.83 | 0.78 | 0.67 | 0.78 | 0.80 | 0.69 |
| Korea, Rep. of | 0.87 | 57 | 0.69 | 0.67 | 0.80 | 0.61 | 0.78 | 0.86 | 0.86 |
| Kuwait | 0.87 | 56 | 0.67 | 0.69 | 0.82 | 0.68 | 0.78 | 0.79 | 0.79 |
| Lithuania | 0.84 | 51 | 0.65 | 0.75 | 0.80 | 0.33 | 0.75 | 0.81 | 0.79 |
| Morocco | 0.88 | 58 | 0.70 | 0.82 | 0.76 | 0.72 | 0.81 | 0.79 | 0.74 |
| Netherlands | 0.75 | 41 | 0.47 | 0.66 | 0.68 | 0.56 | 0.55 | 0.79 | 0.72 |
| New Zealand | 0.83 | 50 | 0.74 | 0.74 | 0.64 | 0.59 | 0.75 | 0.75 | 0.68 |
| Northern Ireland | 0.86 | 55 | 0.79 | 0.71 | 0.74 | 0.66 | 0.84 | 0.74 | 0.70 |
| Norway (5) | 0.81 | 48 | 0.72 | 0.69 | 0.75 | 0.50 | 0.72 | 0.73 | 0.69 |
| Oman | 0.85 | 53 | 0.67 | 0.65 | 0.74 | 0.72 | 0.75 | 0.81 | 0.73 |
| Poland | 0.84 | 51 | 0.70 | 0.72 | 0.78 | 0.57 | 0.74 | 0.79 | 0.70 |
| Portugal | 0.86 | 55 | 0.76 | 0.77 | 0.79 | 0.51 | 0.82 | 0.78 | 0.71 |
| Qatar | 0.87 | 56 | 0.62 | 0.62 | 0.68 | 0.76 | 0.83 | 0.86 | 0.84 |
| Russian Federation | 0.82 | 49 | 0.64 | 0.65 | 0.84 | 0.42 | 0.67 | 0.83 | 0.77 |
| Saudi Arabia | 0.88 | 58 | 0.69 | 0.76 | 0.82 | 0.67 | 0.77 | 0.83 | 0.79 |
| Serbia | 0.88 | 59 | 0.76 | 0.67 | 0.85 | 0.66 | 0.78 | 0.85 | 0.80 |
| Singapore | 0.87 | 56 | 0.70 | 0.75 | 0.78 | 0.67 | 0.79 | 0.77 | 0.77 |
| Slovak Republic | 0.85 | 54 | 0.61 | 0.70 | 0.85 | 0.59 | 0.76 | 0.84 | 0.76 |
| Slovenia | 0.85 | 54 | 0.71 | 0.69 | 0.85 | 0.59 | 0.76 | 0.80 | 0.72 |
| South Africa (5) | 0.90 | 62 | 0.79 | 0.75 | 0.82 | 0.70 | 0.83 | 0.84 | 0.77 |
| Spain | 0.85 | 54 | 0.72 | 0.72 | 0.82 | 0.58 | 0.75 | 0.80 | 0.72 |
| Sweden | 0.81 | 47 | 0.74 | 0.58 | 0.66 | 0.68 | 0.81 | 0.69 | 0.61 |
| Turkey | 0.89 | 60 | 0.69 | 0.76 | 0.80 | 0.64 | 0.79 | 0.85 | 0.85 |
| United Arab Emirates | 0.87 | 57 | 0.75 | 0.65 | 0.77 | 0.71 | 0.80 | 0.80 | 0.78 |
| United States | 0.83 | 50 | 0.72 | 0.66 | 0.69 | 0.65 | 0.78 | 0.74 | 0.71 |
| Benchmarking Participants | | | | | | | | | |
| Buenos Aires, Argentina | 0.88 | 58 | 0.80 | 0.77 | 0.77 | 0.72 | 0.85 | 0.71 | 0.71 |
| Ontario, Canada | 0.81 | 47 | 0.72 | 0.60 | 0.71 | 0.66 | 0.77 | 0.67 | 0.65 |
| Quebec, Canada | 0.82 | 50 | 0.73 | 0.39 | 0.71 | 0.64 | 0.76 | 0.74 | 0.86 |
| Norway (4) | 0.83 | 51 | 0.79 | 0.69 | 0.79 | 0.48 | 0.79 | 0.72 | 0.69 |
| Abu Dhabi, UAE | 0.87 | 57 | 0.77 | 0.65 | 0.76 | 0.71 | 0.78 | 0.81 | 0.77 |
| Dubai, UAE | 0.80 | 47 | 0.78 | 0.52 | 0.66 | 0.56 | 0.78 | 0.73 | 0.73 |
| Florida, US | 0.87 | 57 | 0.81 | 0.72 | 0.62 | 0.75 | 0.83 | 0.79 | 0.73 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Problems with School Conditions and Resources – Teachers' Reports Scale, Fourth Grade, and TIMSS 2015 Achievement

| Country | Pearson's Correlation with Achievement | | | | Variance in Achievement Accounted for by Difference Between Regions of the Scale (η^2) | |
|----------------------------------|--|-------------|-------------------|-------------|---|-------------|
| | (r) | | (r ²) | | Mathematics | Science |
| | Mathematics | Science | Mathematics | Science | | |
| Australia | 0.01 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Bahrain | 0.03 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Belgium (Flemish) | 0.02 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Bulgaria | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Canada | -0.05 | -0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Chile | 0.17 | 0.17 | 0.03 | 0.03 | 0.04 | 0.04 |
| Chinese Taipei | 0.06 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Croatia | -0.07 | -0.07 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cyprus | 0.06 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| Czech Republic | 0.02 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Denmark | -0.02 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| England | -0.02 | -0.02 | 0.00 | 0.00 | 0.00 | 0.01 |
| Finland | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| France | 0.08 | 0.07 | 0.01 | 0.01 | 0.01 | 0.00 |
| Georgia | 0.08 | 0.09 | 0.01 | 0.01 | 0.00 | 0.01 |
| Germany | 0.07 | 0.09 | 0.00 | 0.01 | 0.01 | 0.01 |
| Hong Kong SAR | 0.16 | 0.18 | 0.03 | 0.03 | 0.01 | 0.01 |
| Hungary | -0.10 | -0.08 | 0.01 | 0.01 | 0.01 | 0.00 |
| Indonesia | 0.13 | 0.13 | 0.02 | 0.02 | 0.02 | 0.04 |
| Iran, Islamic Rep. of | 0.22 | 0.20 | 0.05 | 0.04 | 0.03 | 0.03 |
| Ireland | 0.00 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Italy | 0.04 | 0.03 | 0.00 | 0.00 | 0.01 | 0.00 |
| Japan | -0.04 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Jordan | 0.20 | - | 0.04 | - | 0.03 | - |
| Kazakhstan | 0.09 | 0.09 | 0.01 | 0.01 | 0.00 | 0.00 |
| Korea, Rep. of | 0.09 | 0.04 | 0.01 | 0.00 | 0.01 | 0.00 |
| Kuwait | 0.06 | 0.10 | 0.00 | 0.01 | 0.00 | 0.00 |
| Lithuania | -0.02 | -0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Morocco | 0.19 | 0.25 | 0.04 | 0.06 | 0.05 | 0.07 |
| Netherlands | -0.05 | -0.06 | 0.00 | 0.00 | 0.01 | 0.01 |
| New Zealand | 0.05 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| Northern Ireland | 0.01 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Norway (5) | 0.09 | 0.09 | 0.01 | 0.01 | 0.02 | 0.01 |
| Oman | 0.01 | -0.02 | 0.00 | 0.00 | 0.01 | 0.00 |
| Poland | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Portugal | 0.04 | 0.05 | 0.00 | 0.00 | 0.01 | 0.01 |
| Qatar | -0.05 | -0.02 | 0.00 | 0.00 | 0.01 | 0.00 |
| Russian Federation | 0.06 | 0.08 | 0.00 | 0.01 | 0.00 | 0.00 |
| Saudi Arabia | 0.17 | 0.03 | 0.03 | 0.00 | 0.02 | 0.00 |
| Serbia | 0.00 | -0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Singapore | -0.04 | -0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| Slovak Republic | -0.04 | -0.02 | 0.00 | 0.00 | 0.01 | 0.00 |
| Slovenia | -0.04 | -0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| South Africa (5) | 0.39 | - | 0.15 | - | 0.14 | - |
| Spain | 0.05 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| Sweden | 0.11 | 0.11 | 0.01 | 0.01 | 0.00 | 0.00 |
| Turkey | 0.24 | 0.23 | 0.06 | 0.05 | 0.05 | 0.04 |
| United Arab Emirates | 0.15 | 0.18 | 0.02 | 0.03 | 0.03 | 0.04 |
| United States | 0.09 | 0.10 | 0.01 | 0.01 | 0.01 | 0.01 |
| International Median | 0.04 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Benchmarking Participants | | | | | | |
| Buenos Aires, Argentina | 0.23 | 0.20 | 0.05 | 0.04 | 0.04 | 0.04 |
| Ontario, Canada | 0.03 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Quebec, Canada | 0.01 | 0.02 | 0.00 | 0.00 | 0.01 | 0.01 |
| Norway (4) | 0.04 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| Abu Dhabi, UAE | -0.01 | 0.04 | 0.00 | 0.00 | 0.02 | 0.02 |
| Dubai, UAE | 0.15 | 0.23 | 0.02 | 0.05 | 0.02 | 0.04 |
| Florida, US | 0.07 | 0.04 | 0.00 | 0.00 | 0.01 | 0.01 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

A dash (-) indicates comparable data not available.

Safe and Orderly School–Teachers’ Reports Scale, Fourth Grade

The Safe and Orderly School – Teachers’ Reports (SOS) scale was created based on teachers’ degree of agreement with the eight statements described below.

Items in the TIMSS 2015 Safe and Orderly School–Teachers’ Reports Scale, Fourth Grade¹

| | | Thinking about your current school, indicate the extent to which you agree or disagree with each of the following statements. | | | |
|---|---------|---|----------------|-------------------|----------------|
| | | Agree a lot | Agree a little | Disagree a little | Disagree a lot |
| T | ATBG07A | 1) This school is located in a safe neighborhood ----- ○ ————— ○ ————— ○ ————— ○ | | | |
| T | ATBG07B | 2) I feel safe at this school ----- ○ ————— ○ ————— ○ ————— ○ | | | |
| T | ATBG07C | 3) This school's security policies and practices are sufficient ----- ○ ————— ○ ————— ○ ————— ○ | | | |
| T | ATBG07D | 4) The students behave in an orderly manner ----- ○ ————— ○ ————— ○ ————— ○ | | | |
| T | ATBG07E | 5) The students are respectful of the teachers ----- ○ ————— ○ ————— ○ ————— ○ | | | |
| | ATBG07F | 6) The students respect school property ----- ○ ————— ○ ————— ○ ————— ○ | | | |
| | ATBG07G | 7) This school has clear rules about student conduct ----- ○ ————— ○ ————— ○ ————— ○ | | | |
| | ATBG07H | 8) This school's rules are enforced in a fair and consistent manner ----- ○ ————— ○ ————— ○ ————— ○ | | | |

Very Safe and Orderly 10.0 Safe and Orderly Less than Safe and Orderly 6.7

¹ For the purpose of scaling, categories in which there were very few respondents were combined. The categories “Disagree a little” and “Disagree a lot” were combined for all variables. The scale statistics that are reported herein reflect analysis of the items following collapsing.

T Trend item—item was included in the same scale in TIMSS 2011 and was used for linking the TIMSS 2011 and TIMSS 2015 scales.

Item Parameters for the TIMSS 2015 Safe and Orderly School – Teachers' Reports Scale, Fourth Grade

| Item | delta | tau_1 | tau_2 | Infit |
|---------|----------|----------|---------|-------|
| ATBG07A | -0.40272 | -1.05787 | 1.05787 | 1.40 |
| ATBG07B | -1.33285 | -1.23553 | 1.23553 | 1.00 |
| ATBG07C | -0.54308 | -1.43816 | 1.43816 | 1.08 |
| ATBG07D | 0.97878 | -1.91297 | 1.91297 | 0.84 |
| ATBG07E | 0.55100 | -1.90039 | 1.90039 | 0.87 |
| ATBG07F | 1.18574 | -1.83791 | 1.83791 | 0.89 |
| ATBG07G | -0.48880 | -1.35559 | 1.35559 | 1.08 |
| ATBG07H | 0.05193 | -1.51487 | 1.51487 | 1.00 |

Scale Transformation Constants for the TIMSS 2015 Safe and Orderly School – Teachers' Reports Scale, Fourth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 8.379152 | Transformed Scale Score = 8.379152 + 1.021142 • Logit Scale Score |
| B = 1.021142 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Safe and Orderly School – Teachers' Reports Scale, Fourth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 3.75218 | |
| 1 | 5.02760 | |
| 2 | 5.71019 | |
| 3 | 6.22383 | |
| 4 | 6.66369 | 6.7 |
| 5 | 7.06780 | |
| 6 | 7.45682 | |
| 7 | 7.84491 | |
| 8 | 8.23956 | |
| 9 | 8.65006 | |
| 10 | 9.08289 | |
| 11 | 9.54538 | |
| 12 | 10.04965 | 10.0 |
| 13 | 10.61012 | |
| 14 | 11.25092 | |
| 15 | 12.04413 | |
| 16 | 13.41271 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Safe and Orderly School – Teachers' Reports Scale, Fourth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|---------|---------|
| | | | ATB607A | ATB607B | ATB607C | ATB607D | ATB607E | ATB607F | ATB607G | ATB607H |
| Australia | 0.86 | 52 | 0.64 | 0.66 | 0.66 | 0.83 | 0.81 | 0.81 | 0.62 | 0.71 |
| Bahrain | 0.89 | 57 | 0.51 | 0.65 | 0.73 | 0.86 | 0.78 | 0.82 | 0.81 | 0.82 |
| Belgium (Flemish) | 0.83 | 46 | 0.49 | 0.59 | 0.66 | 0.78 | 0.77 | 0.73 | 0.65 | 0.72 |
| Bulgaria | 0.83 | 46 | 0.55 | 0.68 | 0.64 | 0.78 | 0.76 | 0.75 | 0.58 | 0.66 |
| Canada | 0.86 | 51 | 0.52 | 0.60 | 0.64 | 0.81 | 0.79 | 0.80 | 0.73 | 0.76 |
| Chile | 0.88 | 54 | 0.59 | 0.70 | 0.72 | 0.79 | 0.83 | 0.81 | 0.66 | 0.77 |
| Chinese Taipei | 0.89 | 56 | 0.70 | 0.75 | 0.73 | 0.76 | 0.77 | 0.76 | 0.78 | 0.76 |
| Croatia | 0.88 | 55 | 0.63 | 0.72 | 0.73 | 0.77 | 0.78 | 0.74 | 0.74 | 0.81 |
| Cyprus | 0.87 | 53 | 0.70 | 0.67 | 0.70 | 0.77 | 0.77 | 0.79 | 0.72 | 0.69 |
| Czech Republic | 0.83 | 47 | 0.56 | 0.73 | 0.68 | 0.70 | 0.74 | 0.63 | 0.72 | 0.72 |
| Denmark | 0.83 | 47 | 0.54 | 0.51 | 0.63 | 0.78 | 0.77 | 0.76 | 0.68 | 0.74 |
| England | 0.86 | 52 | 0.48 | 0.64 | 0.61 | 0.83 | 0.80 | 0.77 | 0.71 | 0.85 |
| Finland | 0.82 | 45 | 0.43 | 0.63 | 0.55 | 0.79 | 0.78 | 0.69 | 0.70 | 0.74 |
| France | 0.84 | 48 | 0.73 | 0.78 | 0.72 | 0.74 | 0.70 | 0.71 | 0.50 | 0.58 |
| Georgia | 0.83 | 47 | 0.58 | 0.69 | 0.73 | 0.72 | 0.71 | 0.49 | 0.79 | 0.73 |
| Germany | 0.85 | 49 | 0.70 | 0.76 | 0.68 | 0.79 | 0.79 | 0.76 | 0.53 | 0.56 |
| Hong Kong SAR | 0.88 | 55 | 0.55 | 0.68 | 0.67 | 0.78 | 0.76 | 0.82 | 0.82 | 0.83 |
| Hungary | 0.86 | 51 | 0.50 | 0.67 | 0.74 | 0.77 | 0.80 | 0.77 | 0.71 | 0.69 |
| Indonesia | 0.85 | 50 | 0.62 | 0.70 | 0.67 | 0.81 | 0.74 | 0.81 | 0.59 | 0.70 |
| Iran, Islamic Rep. of | 0.84 | 47 | 0.62 | 0.70 | 0.69 | 0.80 | 0.74 | 0.77 | 0.65 | 0.47 |
| Ireland | 0.86 | 53 | 0.62 | 0.67 | 0.55 | 0.83 | 0.84 | 0.83 | 0.66 | 0.73 |
| Italy | 0.82 | 45 | 0.50 | 0.61 | 0.57 | 0.76 | 0.73 | 0.79 | 0.62 | 0.71 |
| Japan | 0.74 | 36 | 0.63 | 0.64 | 0.52 | 0.72 | 0.54 | 0.70 | 0.44 | 0.57 |
| Jordan | 0.87 | 53 | 0.55 | 0.62 | 0.76 | 0.79 | 0.75 | 0.78 | 0.75 | 0.77 |
| Kazakhstan | 0.88 | 54 | 0.67 | 0.76 | 0.62 | 0.73 | 0.74 | 0.79 | 0.80 | 0.79 |
| Korea, Rep. of | 0.89 | 57 | 0.60 | 0.70 | 0.75 | 0.82 | 0.80 | 0.80 | 0.77 | 0.79 |
| Kuwait | 0.86 | 51 | 0.49 | 0.57 | 0.72 | 0.80 | 0.81 | 0.79 | 0.72 | 0.75 |
| Lithuania | 0.83 | 46 | 0.46 | 0.70 | 0.72 | 0.71 | 0.75 | 0.72 | 0.53 | 0.73 |
| Morocco | 0.88 | 56 | 0.67 | 0.76 | 0.71 | 0.80 | 0.70 | 0.79 | 0.79 | 0.74 |
| Netherlands | 0.84 | 47 | 0.66 | 0.62 | 0.64 | 0.84 | 0.82 | 0.75 | 0.43 | 0.64 |
| New Zealand | 0.86 | 53 | 0.66 | 0.69 | 0.67 | 0.79 | 0.80 | 0.77 | 0.71 | 0.72 |
| Northern Ireland | 0.81 | 47 | 0.50 | 0.60 | 0.63 | 0.83 | 0.85 | 0.81 | 0.57 | 0.56 |
| Norway (5) | 0.87 | 53 | 0.60 | 0.61 | 0.67 | 0.83 | 0.82 | 0.78 | 0.72 | 0.76 |
| Oman | 0.84 | 47 | 0.46 | 0.52 | 0.63 | 0.77 | 0.76 | 0.74 | 0.78 | 0.75 |
| Poland | 0.83 | 46 | 0.54 | 0.64 | 0.68 | 0.72 | 0.77 | 0.72 | 0.65 | 0.67 |
| Portugal | 0.86 | 51 | 0.66 | 0.69 | 0.80 | 0.75 | 0.71 | 0.78 | 0.64 | 0.67 |
| Qatar | 0.85 | 49 | 0.39 | 0.55 | 0.62 | 0.75 | 0.82 | 0.81 | 0.77 | 0.79 |
| Russian Federation | 0.80 | 44 | 0.53 | 0.62 | 0.56 | 0.77 | 0.77 | 0.75 | 0.42 | 0.76 |
| Saudi Arabia | 0.85 | 51 | 0.33 | 0.42 | 0.63 | 0.83 | 0.82 | 0.84 | 0.82 | 0.83 |
| Serbia | 0.89 | 57 | 0.62 | 0.74 | 0.79 | 0.80 | 0.80 | 0.78 | 0.68 | 0.81 |
| Singapore | 0.89 | 56 | 0.58 | 0.63 | 0.74 | 0.81 | 0.81 | 0.82 | 0.78 | 0.80 |
| Slovak Republic | 0.85 | 49 | 0.37 | 0.68 | 0.65 | 0.76 | 0.80 | 0.79 | 0.72 | 0.75 |
| Slovenia | 0.84 | 47 | 0.61 | 0.62 | 0.74 | 0.72 | 0.71 | 0.66 | 0.65 | 0.76 |
| South Africa (5) | 0.88 | 55 | 0.66 | 0.74 | 0.70 | 0.80 | 0.74 | 0.79 | 0.72 | 0.75 |
| Spain | 0.85 | 49 | 0.57 | 0.66 | 0.71 | 0.78 | 0.78 | 0.79 | 0.59 | 0.70 |
| Sweden | 0.84 | 49 | 0.61 | 0.74 | 0.72 | 0.75 | 0.78 | 0.77 | 0.46 | 0.72 |
| Turkey | 0.89 | 57 | 0.76 | 0.76 | 0.74 | 0.75 | 0.76 | 0.75 | 0.75 | 0.76 |
| United Arab Emirates | 0.89 | 56 | 0.48 | 0.63 | 0.71 | 0.82 | 0.81 | 0.84 | 0.80 | 0.82 |
| United States | 0.88 | 55 | 0.62 | 0.67 | 0.70 | 0.85 | 0.81 | 0.82 | 0.70 | 0.75 |
| Benchmarking Participants | | | | | | | | | | |
| Buenos Aires, Argentina | 0.87 | 52 | 0.49 | 0.65 | 0.59 | 0.78 | 0.82 | 0.74 | 0.80 | 0.82 |
| Ontario, Canada | 0.86 | 51 | 0.53 | 0.59 | 0.63 | 0.79 | 0.80 | 0.78 | 0.75 | 0.80 |
| Quebec, Canada | 0.83 | 47 | 0.58 | 0.65 | 0.60 | 0.76 | 0.67 | 0.74 | 0.73 | 0.73 |
| Norway (4) | 0.87 | 54 | 0.74 | 0.71 | 0.70 | 0.81 | 0.79 | 0.79 | 0.70 | 0.65 |
| Abu Dhabi, UAE | 0.87 | 53 | 0.34 | 0.59 | 0.67 | 0.82 | 0.79 | 0.84 | 0.79 | 0.82 |
| Dubai, UAE | 0.88 | 54 | 0.39 | 0.56 | 0.66 | 0.79 | 0.82 | 0.85 | 0.84 | 0.85 |
| Florida, US | 0.90 | 60 | 0.64 | 0.71 | 0.70 | 0.88 | 0.85 | 0.92 | 0.77 | 0.67 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Safe and Orderly School – Teachers' Reports Scale, Fourth Grade, and TIMSS 2015 Achievement

| Country | Pearson's Correlation with Achievement | | | | Variance in Achievement Accounted for by Difference Between Regions of the Scale (η^2) | |
|----------------------------------|--|-------------|-------------|-------------|---|-------------|
| | (r) | | (r) | | Mathematics | Science |
| | Mathematics | Science | Mathematics | Science | | |
| Australia | 0.24 | 0.22 | 0.06 | 0.05 | 0.05 | 0.04 |
| Bahrain | 0.18 | 0.13 | 0.03 | 0.02 | 0.02 | 0.01 |
| Belgium (Flemish) | 0.16 | 0.17 | 0.03 | 0.03 | 0.01 | 0.01 |
| Bulgaria | 0.20 | 0.22 | 0.04 | 0.05 | 0.03 | 0.03 |
| Canada | 0.06 | 0.10 | 0.00 | 0.01 | 0.00 | 0.01 |
| Chile | 0.24 | 0.28 | 0.06 | 0.08 | 0.04 | 0.06 |
| Chinese Taipei | 0.01 | -0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Croatia | -0.03 | -0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cyprus | 0.08 | 0.07 | 0.01 | 0.00 | 0.01 | 0.00 |
| Czech Republic | 0.06 | 0.07 | 0.00 | 0.01 | 0.00 | 0.00 |
| Denmark | 0.12 | 0.13 | 0.01 | 0.02 | 0.02 | 0.03 |
| England | 0.13 | 0.12 | 0.02 | 0.02 | 0.01 | 0.01 |
| Finland | 0.06 | 0.07 | 0.00 | 0.00 | 0.01 | 0.01 |
| France | 0.18 | 0.17 | 0.03 | 0.03 | 0.04 | 0.04 |
| Georgia | 0.04 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| Germany | 0.16 | 0.18 | 0.03 | 0.03 | 0.02 | 0.02 |
| Hong Kong SAR | 0.06 | 0.14 | 0.00 | 0.02 | 0.00 | 0.01 |
| Hungary | 0.18 | 0.17 | 0.03 | 0.03 | 0.02 | 0.02 |
| Indonesia | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Iran, Islamic Rep. of | 0.09 | 0.09 | 0.01 | 0.01 | 0.01 | 0.01 |
| Ireland | 0.14 | 0.19 | 0.02 | 0.03 | 0.02 | 0.03 |
| Italy | 0.06 | 0.05 | 0.00 | 0.00 | 0.01 | 0.01 |
| Japan | 0.04 | 0.05 | 0.00 | 0.00 | 0.01 | 0.01 |
| Jordan | 0.13 | - | 0.02 | - | 0.01 | - |
| Kazakhstan | 0.07 | 0.08 | 0.01 | 0.01 | 0.00 | 0.00 |
| Korea, Rep. of | 0.10 | 0.08 | 0.01 | 0.01 | 0.01 | 0.01 |
| Kuwait | 0.04 | 0.11 | 0.00 | 0.01 | 0.00 | 0.00 |
| Lithuania | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Morocco | 0.13 | 0.13 | 0.02 | 0.02 | 0.02 | 0.02 |
| Netherlands | 0.10 | 0.14 | 0.01 | 0.02 | 0.01 | 0.02 |
| New Zealand | 0.25 | 0.23 | 0.06 | 0.05 | 0.05 | 0.04 |
| Northern Ireland | 0.11 | 0.10 | 0.01 | 0.01 | 0.01 | 0.01 |
| Norway (5) | 0.09 | 0.12 | 0.01 | 0.01 | 0.01 | 0.01 |
| Oman | 0.03 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Poland | 0.02 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| Portugal | 0.16 | 0.14 | 0.02 | 0.02 | 0.01 | 0.01 |
| Qatar | 0.08 | 0.14 | 0.01 | 0.02 | 0.01 | 0.03 |
| Russian Federation | 0.05 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Saudi Arabia | 0.18 | 0.14 | 0.03 | 0.02 | 0.03 | 0.02 |
| Serbia | 0.03 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Singapore | 0.10 | 0.12 | 0.01 | 0.02 | 0.00 | 0.02 |
| Slovak Republic | 0.13 | 0.13 | 0.02 | 0.02 | 0.02 | 0.03 |
| Slovenia | 0.04 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| South Africa (5) | 0.08 | - | 0.01 | - | 0.01 | - |
| Spain | 0.22 | 0.23 | 0.05 | 0.05 | 0.04 | 0.04 |
| Sweden | 0.22 | 0.24 | 0.05 | 0.06 | 0.05 | 0.06 |
| Turkey | 0.16 | 0.16 | 0.03 | 0.02 | 0.02 | 0.02 |
| United Arab Emirates | 0.33 | 0.34 | 0.11 | 0.11 | 0.08 | 0.07 |
| United States | 0.21 | 0.22 | 0.05 | 0.05 | 0.04 | 0.04 |
| International Median | 0.10 | 0.12 | 0.01 | 0.02 | 0.01 | 0.01 |
| Benchmarking Participants | | | | | | |
| Buenos Aires, Argentina | 0.20 | 0.19 | 0.04 | 0.04 | 0.03 | 0.03 |
| Ontario, Canada | 0.07 | 0.07 | 0.00 | 0.00 | 0.00 | 0.01 |
| Quebec, Canada | 0.09 | 0.08 | 0.01 | 0.01 | 0.00 | 0.00 |
| Norway (4) | 0.07 | 0.09 | 0.00 | 0.01 | 0.01 | 0.03 |
| Abu Dhabi, UAE | 0.24 | 0.22 | 0.06 | 0.05 | 0.06 | 0.02 |
| Dubai, UAE | 0.31 | 0.33 | 0.10 | 0.11 | 0.08 | 0.09 |
| Florida, US | 0.22 | 0.20 | 0.05 | 0.04 | 0.06 | 0.05 |

A dash (-) indicates comparable data not available.

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

School Discipline Problems–Principals’ Reports Scale, Fourth Grade

The School Discipline Problems–Principals’ Reports (DAS) scale was created based on principals’ responses concerning the ten potential school problems described below.

Items in the TIMSS 2015 School Discipline Problems–Principals’ Reports Scale, Fourth Grade

| | | To what degree is each of the following a problem among fourth grade students in your school? | | | | |
|---|---------|--|-----------------------|-----------------------|-----------------------|-----------------------|
| | | Not a problem | Minor problem | Moderate problem | Serious problem | |
| T | ACBG16A | 1) Arriving late at school ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| T | ACBG16B | 2) Absenteeism (i.e., unjustified absences) ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| T | ACBG16C | 3) Classroom disturbance ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| T | ACBG16D | 4) Cheating ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| T | ACBG16E | 5) Profanity ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| T | ACBG16F | 6) Vandalism ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| T | ACBG16G | 7) Theft ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| T | ACBG16H | 8) Intimidation or verbal abuse among students (including texting, emailing, etc.) ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| T | ACBG16I | 9) Physical fights among students ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| T | ACBG16J | 10) Intimidation or verbal abuse of teachers or staff (including texting, emailing, etc.) ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Hardly Any Problems Minor Problems (9.7) Moderate to Severe Problems (7.6)

T Trend item—item was included in the same scale in TIMSS 2011 and was used for linking the TIMSS 2011 and TIMSS 2015 scales.

Item Parameters for the TIMSS 2015 School Discipline Problems - Principals' Reports Scale, Fourth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|---------|----------|----------|----------|---------|-------|
| ACBG16A | -0.04434 | -2.20733 | -0.33916 | 2.54649 | 1.32 |
| ACBG16B | 0.26055 | -1.25742 | -0.52690 | 1.78432 | 1.23 |
| ACBG16C | 0.73852 | -2.23001 | -0.29453 | 2.52454 | 0.99 |
| ACBG16D | -0.48580 | -0.99657 | -0.85069 | 1.84726 | 0.96 |
| ACBG16E | 0.48637 | -1.57910 | -0.46416 | 2.04326 | 0.90 |
| ACBG16F | -0.25161 | -0.42885 | -0.69852 | 1.12737 | 0.80 |
| ACBG16G | -0.46856 | 0.19761 | -1.13779 | 0.94018 | 0.75 |
| ACBG16H | 0.20843 | -1.29153 | -0.75176 | 2.04329 | 0.93 |
| ACBG16I | 0.26742 | -1.29267 | -0.85001 | 2.14268 | 0.87 |
| ACBG16J | -0.71098 | 0.19104 | -0.78670 | 0.59566 | 0.85 |

Scale Transformation Constants for the TIMSS 2015 School Discipline Problems - Principals' Reports Scale, Fourth Grade

Scale Transformation Constants

A = 7.80934

B = 0.969053

Transformed Scale Score = 7.80934 + 0.969053 • Logit Scale Score

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 School Discipline Problems - Principals' Reports Scale, Fourth
Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 3.69215 | |
| 1 | 4.77953 | |
| 2 | 5.28846 | |
| 3 | 5.62589 | |
| 4 | 5.88225 | |
| 5 | 6.09144 | |
| 6 | 6.27112 | |
| 7 | 6.43124 | |
| 8 | 6.57814 | |
| 9 | 6.71457 | |
| 10 | 6.84760 | |
| 11 | 6.97770 | |
| 12 | 7.10707 | |
| 13 | 7.23779 | |
| 14 | 7.37193 | |
| 15 | 7.51249 | 7.6 |
| 16 | 7.65937 | |
| 17 | 7.81721 | |
| 18 | 7.98823 | |
| 19 | 8.17529 | |
| 20 | 8.38218 | |
| 21 | 8.61094 | |
| 22 | 8.86392 | |
| 23 | 9.14220 | |
| 24 | 9.44664 | |
| 25 | 9.77698 | 9.7 |
| 26 | 10.13829 | |
| 27 | 10.54381 | |
| 28 | 11.02588 | |
| 29 | 11.67067 | |
| 30 | 12.88232 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 School Discipline Problems - Principals' Reports Scale, Fourth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| | | | ACBG16A | ACBG16B | ACBG16C | ACBG16D | ACBG16E | ACBG16F | ACBG16G | ACBG16H | ACBG16I | ACBG16J |
| Australia | 0.92 | 62 | 0.71 | 0.79 | 0.78 | 0.74 | 0.84 | 0.82 | 0.76 | 0.77 | 0.85 | 0.77 |
| Bahrain | 0.97 | 78 | 0.80 | 0.84 | 0.82 | 0.92 | 0.90 | 0.93 | 0.91 | 0.92 | 0.87 | 0.93 |
| Belgium (Flemish) | 0.87 | 46 | 0.56 | 0.62 | 0.67 | 0.57 | 0.64 | 0.72 | 0.71 | 0.78 | 0.75 | 0.73 |
| Bulgaria | 0.93 | 61 | 0.79 | 0.71 | 0.82 | 0.74 | 0.84 | 0.83 | 0.69 | 0.78 | 0.83 | 0.75 |
| Canada | 0.86 | 49 | 0.63 | 0.55 | 0.69 | 0.69 | 0.78 | 0.80 | 0.76 | 0.68 | 0.76 | 0.58 |
| Chile | 0.86 | 46 | 0.52 | 0.65 | 0.72 | 0.67 | 0.82 | 0.68 | 0.72 | 0.66 | 0.75 | 0.52 |
| Chinese Taipei | 0.91 | 57 | 0.73 | 0.66 | 0.78 | 0.70 | 0.83 | 0.83 | 0.78 | 0.79 | 0.82 | 0.57 |
| Croatia | 0.81 | 38 | 0.44 | 0.39 | 0.62 | 0.56 | 0.70 | 0.71 | 0.61 | 0.78 | 0.72 | 0.47 |
| Cyprus | 0.93 | 62 | 0.71 | 0.74 | 0.84 | 0.77 | 0.78 | 0.80 | 0.81 | 0.80 | 0.85 | 0.78 |
| Czech Republic | 0.88 | 49 | 0.58 | 0.61 | 0.65 | 0.73 | 0.73 | 0.76 | 0.75 | 0.76 | 0.76 | 0.65 |
| Denmark | 0.83 | 40 | 0.63 | 0.69 | 0.63 | 0.36 | 0.68 | 0.70 | 0.61 | 0.69 | 0.63 | 0.63 |
| England | 0.82 | 41 | 0.58 | 0.57 | 0.69 | 0.42 | 0.71 | 0.70 | 0.52 | 0.69 | 0.75 | 0.72 |
| Finland | 0.83 | 43 | 0.62 | 0.62 | 0.61 | 0.69 | 0.74 | 0.67 | 0.74 | 0.61 | 0.67 | 0.58 |
| France | 0.90 | 53 | 0.61 | 0.65 | 0.71 | 0.67 | 0.80 | 0.79 | 0.76 | 0.77 | 0.76 | 0.75 |
| Georgia | 0.95 | 71 | 0.66 | 0.76 | 0.88 | 0.84 | 0.91 | 0.85 | 0.89 | 0.85 | 0.87 | 0.87 |
| Germany | 0.90 | 54 | 0.71 | 0.71 | 0.77 | 0.66 | 0.73 | 0.78 | 0.73 | 0.75 | 0.77 | 0.69 |
| Hong Kong SAR | 0.83 | 39 | 0.59 | 0.67 | 0.72 | 0.57 | 0.75 | 0.70 | 0.59 | 0.56 | 0.71 | 0.27 |
| Hungary | 0.92 | 60 | 0.71 | 0.80 | 0.79 | 0.77 | 0.69 | 0.80 | 0.78 | 0.84 | 0.80 | 0.73 |
| Indonesia | 0.97 | 80 | 0.78 | 0.89 | 0.83 | 0.89 | 0.94 | 0.89 | 0.93 | 0.93 | 0.92 | 0.92 |
| Iran, Islamic Rep. of | 0.92 | 58 | 0.57 | 0.67 | 0.65 | 0.75 | 0.85 | 0.82 | 0.85 | 0.82 | 0.79 | 0.77 |
| Ireland | 0.87 | 51 | 0.53 | 0.55 | 0.64 | 0.65 | 0.81 | 0.80 | 0.79 | 0.72 | 0.83 | 0.77 |
| Italy | 0.95 | 69 | 0.56 | 0.88 | 0.70 | 0.78 | 0.69 | 0.92 | 0.93 | 0.90 | 0.92 | 0.93 |
| Japan | 0.92 | 61 | 0.54 | 0.63 | 0.78 | 0.85 | 0.85 | 0.84 | 0.90 | 0.84 | 0.58 | 0.87 |
| Jordan | 0.94 | 67 | 0.62 | 0.71 | 0.68 | 0.86 | 0.87 | 0.84 | 0.90 | 0.87 | 0.90 | 0.86 |
| Kazakhstan | 0.98 | 81 | 0.85 | 0.89 | 0.89 | 0.74 | 0.95 | 0.95 | 0.94 | 0.94 | 0.92 | 0.94 |
| Korea, Rep. of | 0.96 | 76 | 0.75 | 0.88 | 0.76 | 0.92 | 0.84 | 0.93 | 0.93 | 0.88 | 0.92 | 0.91 |
| Kuwait | 0.94 | 67 | 0.68 | 0.78 | 0.85 | 0.80 | 0.86 | 0.89 | 0.82 | 0.83 | 0.85 | 0.79 |
| Lithuania | 0.82 | 39 | 0.47 | 0.52 | 0.65 | 0.72 | 0.73 | 0.58 | 0.73 | 0.67 | 0.66 | 0.43 |
| Morocco | 0.95 | 68 | 0.47 | 0.64 | 0.86 | 0.85 | 0.87 | 0.89 | 0.89 | 0.89 | 0.92 | 0.86 |
| Netherlands | 0.76 | 35 | 0.43 | 0.50 | 0.54 | 0.54 | 0.62 | 0.58 | 0.25 | 0.78 | 0.83 | 0.61 |
| New Zealand | 0.87 | 48 | 0.63 | 0.60 | 0.63 | 0.65 | 0.76 | 0.79 | 0.72 | 0.66 | 0.79 | 0.65 |
| Northern Ireland | 0.83 | 45 | 0.50 | 0.43 | 0.67 | 0.67 | 0.81 | 0.73 | 0.60 | 0.76 | 0.77 | 0.64 |
| Norway (5) | 0.84 | 43 | 0.73 | 0.69 | 0.60 | 0.60 | 0.77 | 0.77 | 0.54 | 0.64 | 0.65 | 0.52 |
| Oman | 0.95 | 69 | 0.75 | 0.80 | 0.78 | 0.87 | 0.88 | 0.90 | 0.90 | 0.85 | 0.75 | 0.79 |
| Poland | 0.84 | 41 | 0.61 | 0.40 | 0.66 | 0.64 | 0.70 | 0.72 | 0.71 | 0.68 | 0.67 | 0.58 |
| Portugal | 0.93 | 63 | 0.63 | 0.82 | 0.68 | 0.75 | 0.68 | 0.90 | 0.90 | 0.83 | 0.81 | 0.88 |
| Qatar | 0.96 | 75 | 0.67 | 0.76 | 0.78 | 0.92 | 0.90 | 0.90 | 0.89 | 0.93 | 0.93 | 0.91 |
| Russian Federation | 0.76 | 33 | 0.43 | 0.39 | 0.63 | 0.50 | 0.67 | 0.65 | 0.68 | 0.71 | 0.64 | 0.33 |
| Saudi Arabia | 0.96 | 73 | 0.59 | 0.63 | 0.82 | 0.91 | 0.90 | 0.93 | 0.93 | 0.92 | 0.92 | 0.92 |
| Serbia | 0.93 | 63 | 0.64 | 0.72 | 0.79 | 0.82 | 0.77 | 0.86 | 0.84 | 0.85 | 0.83 | 0.79 |
| Singapore | 0.88 | 49 | 0.64 | 0.67 | 0.71 | 0.74 | 0.72 | 0.72 | 0.73 | 0.80 | 0.70 | 0.52 |
| Slovak Republic | 0.88 | 48 | 0.57 | 0.66 | 0.59 | 0.75 | 0.77 | 0.76 | 0.74 | 0.71 | 0.72 | 0.64 |
| Slovenia | 0.88 | 49 | 0.71 | 0.72 | 0.68 | 0.68 | 0.69 | 0.75 | 0.63 | 0.70 | 0.70 | 0.71 |
| South Africa (5) | 0.87 | 47 | 0.54 | 0.60 | 0.69 | 0.71 | 0.68 | 0.74 | 0.76 | 0.72 | 0.79 | 0.56 |
| Spain | 0.94 | 68 | 0.66 | 0.80 | 0.77 | 0.78 | 0.79 | 0.90 | 0.89 | 0.86 | 0.86 | 0.92 |
| Sweden | 0.90 | 52 | 0.63 | 0.68 | 0.75 | 0.58 | 0.75 | 0.78 | 0.70 | 0.80 | 0.79 | 0.74 |
| Turkey | 0.96 | 73 | 0.71 | 0.82 | 0.82 | 0.89 | 0.83 | 0.89 | 0.92 | 0.91 | 0.85 | 0.87 |
| United Arab Emirates | 0.93 | 62 | 0.64 | 0.74 | 0.77 | 0.81 | 0.81 | 0.85 | 0.85 | 0.79 | 0.78 | 0.82 |
| United States | 0.88 | 49 | 0.62 | 0.68 | 0.72 | 0.67 | 0.78 | 0.67 | 0.74 | 0.71 | 0.73 | 0.67 |
| Benchmarking Participants | | | | | | | | | | | | |
| Buenos Aires, Argentina | 0.90 | 54 | 0.38 | 0.60 | 0.65 | 0.71 | 0.81 | 0.81 | 0.85 | 0.81 | 0.78 | 0.81 |
| Ontario, Canada | 0.88 | 52 | 0.57 | 0.46 | 0.73 | 0.74 | 0.84 | 0.84 | 0.78 | 0.74 | 0.80 | 0.62 |
| Quebec, Canada | 0.80 | 39 | 0.62 | 0.63 | 0.56 | 0.65 | 0.72 | 0.58 | 0.63 | 0.65 | 0.61 | 0.58 |
| Norway (4) | 0.86 | 45 | 0.57 | 0.62 | 0.73 | 0.48 | 0.81 | 0.64 | 0.62 | 0.79 | 0.73 | 0.66 |
| Abu Dhabi, UAE | 0.86 | 48 | 0.60 | 0.69 | 0.76 | 0.60 | 0.72 | 0.74 | 0.70 | 0.64 | 0.74 | 0.73 |
| Dubai, UAE | 0.94 | 67 | 0.66 | 0.75 | 0.83 | 0.85 | 0.86 | 0.83 | 0.89 | 0.83 | 0.77 | 0.87 |
| Florida, US | 0.87 | 54 | 0.29 | 0.33 | 0.74 | 0.86 | 0.83 | 0.85 | 0.80 | 0.82 | 0.78 | 0.80 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 School Discipline Problems - Principals' Reports Scale, Fourth Grade, and TIMSS 2015 Achievement

| Country | Pearson's Correlation with Achievement | | | | Variance in Achievement Accounted for by Difference Between Regions of the Scale (η^2) | |
|----------------------------------|--|-------------|-------------|-------------|---|-------------|
| | (r) | | (r) | | Mathematics | Science |
| | Mathematics | Science | Mathematics | Science | | |
| Australia | 0.28 | 0.25 | 0.08 | 0.06 | 0.07 | 0.06 |
| Bahrain | 0.11 | 0.15 | 0.01 | 0.02 | 0.01 | 0.02 |
| Belgium (Flemish) | 0.14 | 0.18 | 0.02 | 0.03 | 0.02 | 0.02 |
| Bulgaria | 0.20 | 0.25 | 0.04 | 0.06 | 0.04 | 0.05 |
| Canada | 0.16 | 0.13 | 0.03 | 0.02 | 0.02 | 0.02 |
| Chile | 0.15 | 0.15 | 0.02 | 0.02 | 0.02 | 0.02 |
| Chinese Taipei | 0.13 | 0.15 | 0.02 | 0.02 | 0.01 | 0.01 |
| Croatia | -0.04 | -0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cyprus | 0.07 | 0.09 | 0.01 | 0.01 | 0.01 | 0.01 |
| Czech Republic | 0.08 | 0.08 | 0.01 | 0.01 | 0.01 | 0.01 |
| Denmark | 0.13 | 0.14 | 0.02 | 0.02 | 0.02 | 0.02 |
| England | 0.18 | 0.19 | 0.03 | 0.03 | 0.02 | 0.02 |
| Finland | 0.04 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| France | 0.15 | 0.14 | 0.02 | 0.02 | 0.03 | 0.02 |
| Georgia | -0.01 | -0.03 | 0.00 | 0.00 | 0.02 | 0.02 |
| Germany | 0.17 | 0.18 | 0.03 | 0.03 | 0.02 | 0.02 |
| Hong Kong SAR | 0.17 | 0.14 | 0.03 | 0.02 | 0.00 | 0.00 |
| Hungary | 0.21 | 0.22 | 0.04 | 0.05 | 0.05 | 0.06 |
| Indonesia | 0.05 | 0.05 | 0.00 | 0.00 | 0.01 | 0.01 |
| Iran, Islamic Rep. of | 0.20 | 0.21 | 0.04 | 0.05 | 0.03 | 0.04 |
| Ireland | 0.17 | 0.17 | 0.03 | 0.03 | 0.02 | 0.02 |
| Italy | 0.04 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Japan | 0.03 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Jordan | 0.12 | - | 0.01 | - | 0.03 | - |
| Kazakhstan | 0.02 | 0.07 | 0.00 | 0.00 | 0.01 | 0.01 |
| Korea, Rep. of | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Kuwait | 0.12 | 0.13 | 0.01 | 0.02 | 0.02 | 0.02 |
| Lithuania | 0.07 | 0.07 | 0.01 | 0.00 | 0.01 | 0.01 |
| Morocco | 0.06 | 0.10 | 0.00 | 0.01 | 0.01 | 0.01 |
| Netherlands | 0.11 | 0.15 | 0.01 | 0.02 | 0.00 | 0.01 |
| New Zealand | 0.26 | 0.26 | 0.07 | 0.07 | 0.06 | 0.06 |
| Northern Ireland | 0.15 | 0.13 | 0.02 | 0.02 | 0.01 | 0.01 |
| Norway (5) | 0.12 | 0.10 | 0.01 | 0.01 | 0.01 | 0.01 |
| Oman | -0.06 | -0.06 | 0.00 | 0.00 | 0.01 | 0.00 |
| Poland | -0.03 | -0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Portugal | 0.07 | 0.06 | 0.00 | 0.00 | 0.01 | 0.00 |
| Qatar | 0.05 | 0.05 | 0.00 | 0.00 | 0.00 | 0.01 |
| Russian Federation | 0.09 | 0.10 | 0.01 | 0.01 | 0.00 | 0.00 |
| Saudi Arabia | 0.04 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| Serbia | -0.05 | -0.08 | 0.00 | 0.01 | 0.00 | 0.00 |
| Singapore | 0.07 | 0.08 | 0.01 | 0.01 | 0.00 | 0.00 |
| Slovak Republic | 0.20 | 0.22 | 0.04 | 0.05 | 0.04 | 0.05 |
| Slovenia | 0.02 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| South Africa (5) | 0.15 | - | 0.02 | - | 0.02 | - |
| Spain | 0.20 | 0.18 | 0.04 | 0.03 | 0.03 | 0.02 |
| Sweden | 0.21 | 0.24 | 0.04 | 0.06 | 0.05 | 0.07 |
| Turkey | 0.16 | 0.15 | 0.03 | 0.02 | 0.05 | 0.05 |
| United Arab Emirates | 0.28 | 0.28 | 0.08 | 0.08 | 0.06 | 0.06 |
| United States | 0.24 | 0.23 | 0.06 | 0.05 | 0.05 | 0.05 |
| International Median | 0.12 | 0.13 | 0.01 | 0.02 | 0.01 | 0.01 |
| Benchmarking Participants | | | | | | |
| Buenos Aires, Argentina | 0.16 | 0.22 | 0.03 | 0.05 | 0.02 | 0.05 |
| Ontario, Canada | 0.12 | 0.11 | 0.01 | 0.01 | 0.02 | 0.01 |
| Quebec, Canada | 0.22 | 0.20 | 0.05 | 0.04 | 0.02 | 0.02 |
| Norway (4) | 0.06 | 0.05 | 0.00 | 0.00 | 0.02 | 0.02 |
| Abu Dhabi, UAE | 0.12 | 0.12 | 0.01 | 0.01 | 0.02 | 0.02 |
| Dubai, UAE | 0.36 | 0.37 | 0.13 | 0.14 | 0.10 | 0.11 |
| Florida, US | 0.20 | 0.18 | 0.04 | 0.03 | 0.05 | 0.04 |

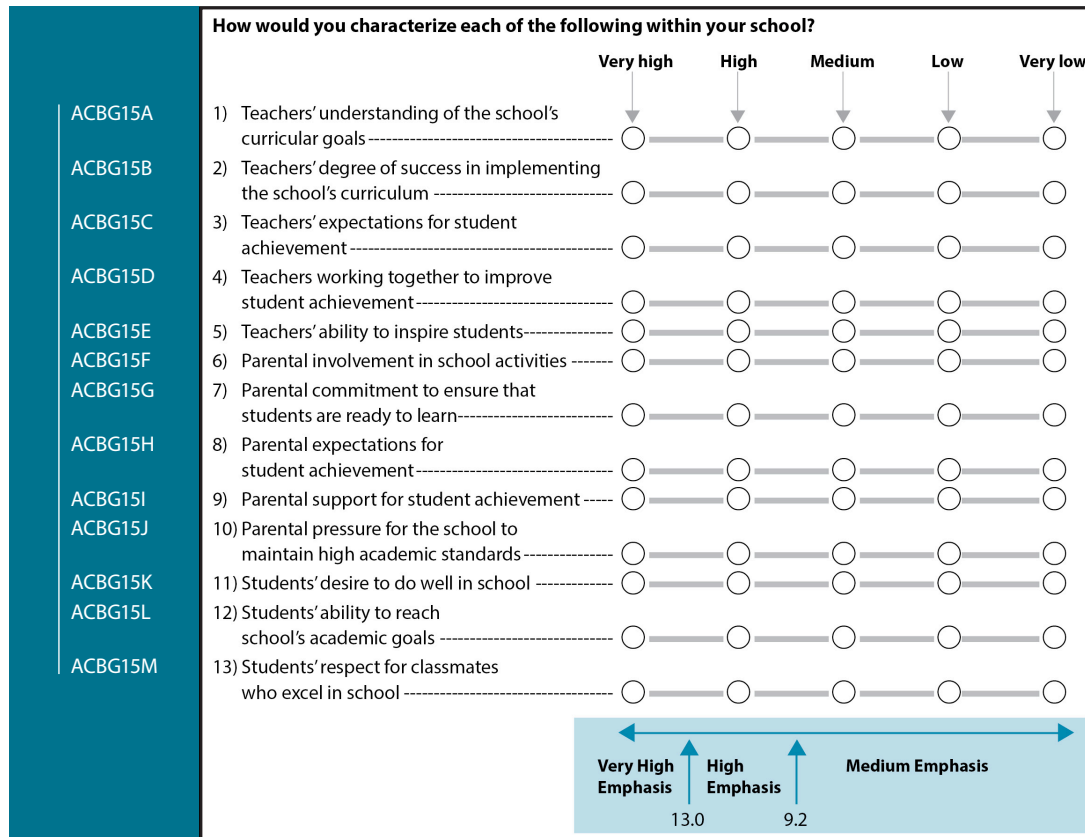
SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

A dash (-) indicates comparable data not available.

School Emphasis on Academic Success–Principals’ Reports Scale, Fourth Grade

The School Emphasis on Academic Success–Principals’ Reports (EAS) scale was created based on principals’ responses characterizing the thirteen aspects described below.

Items in the TIMSS 2015 School Emphasis on Academic Success–Principals’ Reports Scale, Fourth Grade¹



¹ For the purpose of scaling, categories in which there were very few respondents were combined. The categories “Low” and “Very low” were combined for all variables. The scale statistics that are reported herein reflect analysis of the items following collapsing.

Item Parameters for the TIMSS 2015 School Emphasis on Academic Success - Principals' Reports Scale, Fourth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|---------|----------|----------|----------|---------|-------|
| ACBG15A | -1.49153 | -3.26339 | 0.01543 | 3.24796 | 1.11 |
| ACBG15B | -1.14521 | -3.76020 | 0.21124 | 3.54896 | 0.95 |
| ACBG15C | -0.95253 | -3.19800 | -0.09325 | 3.29125 | 0.94 |
| ACBG15D | -0.84577 | -2.65178 | -0.07563 | 2.72741 | 1.11 |
| ACBG15E | -0.77543 | -3.34641 | 0.10015 | 3.24626 | 0.95 |
| ACBG15F | 1.23139 | -2.36291 | 0.07932 | 2.28359 | 1.08 |
| ACBG15G | 1.35745 | -2.55669 | 0.11018 | 2.44651 | 0.82 |
| ACBG15H | -0.12575 | -2.38828 | -0.21068 | 2.59896 | 1.05 |
| ACBG15I | 1.17337 | -2.68711 | 0.13967 | 2.54744 | 0.86 |
| ACBG15J | 0.95539 | -2.12628 | -0.10531 | 2.23159 | 1.30 |
| ACBG15K | 0.25637 | -3.18819 | 0.01950 | 3.16869 | 0.87 |
| ACBG15L | 0.45531 | -3.64831 | 0.12426 | 3.52405 | 0.87 |
| ACBG15M | -0.09306 | -2.86040 | -0.25037 | 3.11077 | 1.11 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Scale Transformation Constants for the TIMSS 2015 School Emphasis on Academic Success - Principals' Reports Scale, Fourth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 9.225455 | Transformed Scale Score = 9.225455 + 1.162825 • Logit Scale Score |
| B = 1.162825 | |

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 School Emphasis on Academic Success - Principals' Reports Scale,
Fourth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 1.11861 | |
| 2 | 3.38565 | |
| 3 | 3.98611 | |
| 4 | 4.49199 | |
| 5 | 4.94072 | |
| 6 | 5.35139 | |
| 7 | 5.73260 | |
| 8 | 6.08989 | |
| 9 | 6.42657 | |
| 10 | 6.74506 | |
| 11 | 7.04762 | |
| 12 | 7.33657 | |
| 13 | 7.61508 | |
| 14 | 7.88540 | |
| 15 | 8.15003 | |
| 16 | 8.41127 | |
| 17 | 8.67110 | |
| 18 | 8.93106 | |
| 19 | 9.19207 | 9.2 |
| 20 | 9.45487 | |
| 21 | 9.71913 | |
| 22 | 9.98452 | |
| 23 | 10.25046 | |
| 24 | 10.51641 | |
| 25 | 10.78212 | |
| 26 | 11.04771 | |
| 27 | 11.31374 | |
| 28 | 11.58121 | |
| 29 | 11.85159 | |
| 30 | 12.12605 | |
| 31 | 12.40830 | |
| 32 | 12.70126 | |
| 33 | 13.00978 | 13.0 |
| 34 | 13.34166 | |
| 35 | 13.70576 | |
| 36 | 14.12459 | |
| 37 | 14.63845 | |
| 38 | 15.34805 | |
| 39 | 16.73753 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 School Emphasis on Academic Success - Principals' Reports Scale, Fourth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--|
| | | | ACBG15A | ACBG15B | ACBG15C | ACBG15D | ACBG15E | ACBG15F | ACBG15G | ACBG15H | ACBG15I | ACBG15J | ACBG15K | ACBG15L | ACBG15M | |
| Australia | 0.93 | 57 | 0.68 | 0.75 | 0.74 | 0.66 | 0.72 | 0.66 | 0.83 | 0.79 | 0.80 | 0.76 | 0.84 | 0.81 | 0.72 | |
| Bahrain | 0.91 | 48 | 0.63 | 0.78 | 0.75 | 0.75 | 0.79 | 0.56 | 0.72 | 0.63 | 0.70 | 0.53 | 0.80 | 0.70 | 0.60 | |
| Belgium (Flemish) | 0.80 | 32 | 0.07 | 0.34 | 0.58 | 0.29 | 0.39 | 0.66 | 0.79 | 0.64 | 0.72 | 0.59 | 0.65 | 0.72 | 0.48 | |
| Bulgaria | 0.92 | 53 | 0.54 | 0.72 | 0.75 | 0.66 | 0.71 | 0.83 | 0.85 | 0.72 | 0.80 | 0.66 | 0.74 | 0.79 | 0.65 | |
| Canada | 0.94 | 58 | 0.71 | 0.77 | 0.82 | 0.71 | 0.75 | 0.76 | 0.84 | 0.78 | 0.82 | 0.70 | 0.77 | 0.76 | 0.65 | |
| Chile | 0.91 | 48 | 0.67 | 0.75 | 0.63 | 0.63 | 0.68 | 0.68 | 0.79 | 0.71 | 0.74 | 0.68 | 0.70 | 0.72 | 0.65 | |
| Chinese Taipei | 0.92 | 53 | 0.73 | 0.82 | 0.74 | 0.64 | 0.76 | 0.75 | 0.67 | 0.67 | 0.80 | 0.67 | 0.76 | 0.81 | 0.63 | |
| Croatia | 0.90 | 47 | 0.69 | 0.73 | 0.67 | 0.77 | 0.73 | 0.67 | 0.71 | 0.55 | 0.74 | 0.72 | 0.68 | 0.57 | 0.62 | |
| Cyprus | 0.91 | 50 | 0.40 | 0.64 | 0.72 | 0.53 | 0.65 | 0.78 | 0.86 | 0.79 | 0.82 | 0.73 | 0.76 | 0.76 | 0.61 | |
| Czech Republic | 0.84 | 35 | 0.41 | 0.48 | 0.51 | 0.52 | 0.67 | 0.63 | 0.67 | 0.64 | 0.61 | 0.69 | 0.66 | 0.64 | 0.52 | |
| Denmark | 0.89 | 44 | 0.74 | 0.70 | 0.77 | 0.67 | 0.63 | 0.59 | 0.76 | 0.72 | 0.68 | 0.37 | 0.72 | 0.62 | 0.60 | |
| England | 0.91 | 49 | 0.63 | 0.72 | 0.74 | 0.67 | 0.72 | 0.65 | 0.76 | 0.69 | 0.74 | 0.66 | 0.68 | 0.78 | 0.69 | |
| Finland | 0.85 | 36 | 0.54 | 0.63 | 0.66 | 0.57 | 0.67 | 0.59 | 0.70 | 0.65 | 0.60 | 0.45 | 0.63 | 0.52 | 0.57 | |
| France | 0.80 | 32 | 0.29 | 0.40 | 0.40 | 0.29 | 0.49 | 0.45 | 0.83 | 0.64 | 0.75 | 0.46 | 0.71 | 0.71 | 0.61 | |
| Georgia | 0.90 | 47 | 0.60 | 0.66 | 0.72 | 0.68 | 0.72 | 0.75 | 0.73 | 0.58 | 0.75 | 0.67 | 0.72 | 0.67 | 0.64 | |
| Germany | 0.80 | 32 | 0.23 | 0.39 | 0.61 | 0.30 | 0.41 | 0.64 | 0.80 | 0.63 | 0.78 | 0.51 | 0.54 | 0.71 | 0.40 | |
| Hong Kong SAR | 0.92 | 53 | 0.66 | 0.77 | 0.65 | 0.60 | 0.75 | 0.66 | 0.81 | 0.79 | 0.83 | 0.69 | 0.76 | 0.82 | 0.60 | |
| Hungary | 0.90 | 45 | 0.54 | 0.65 | 0.53 | 0.49 | 0.69 | 0.61 | 0.74 | 0.77 | 0.76 | 0.67 | 0.74 | 0.71 | 0.71 | |
| Indonesia | 0.92 | 51 | 0.63 | 0.70 | 0.55 | 0.69 | 0.67 | 0.77 | 0.79 | 0.76 | 0.79 | 0.71 | 0.77 | 0.72 | 0.69 | |
| Iran, Islamic Rep. of | 0.90 | 47 | 0.73 | 0.73 | 0.53 | 0.61 | 0.71 | 0.70 | 0.71 | 0.63 | 0.72 | 0.64 | 0.78 | 0.74 | 0.62 | |
| Ireland | 0.90 | 48 | 0.50 | 0.69 | 0.67 | 0.51 | 0.67 | 0.67 | 0.81 | 0.82 | 0.80 | 0.64 | 0.75 | 0.73 | 0.63 | |
| Italy | 0.85 | 37 | 0.56 | 0.65 | 0.65 | 0.57 | 0.73 | 0.71 | 0.66 | 0.51 | 0.60 | 0.57 | 0.69 | 0.62 | 0.27 | |
| Japan | 0.89 | 43 | 0.57 | 0.57 | 0.60 | 0.49 | 0.62 | 0.70 | 0.81 | 0.82 | 0.75 | 0.60 | 0.68 | 0.70 | 0.50 | |
| Jordan | 0.91 | 49 | 0.67 | 0.68 | 0.60 | 0.74 | 0.67 | 0.70 | 0.82 | 0.75 | 0.73 | 0.58 | 0.74 | 0.78 | 0.63 | |
| Kazakhstan | 0.92 | 51 | 0.59 | 0.65 | 0.63 | 0.68 | 0.78 | 0.71 | 0.82 | 0.68 | 0.83 | 0.73 | 0.76 | 0.73 | 0.66 | |
| Korea, Rep. of | 0.92 | 51 | 0.57 | 0.57 | 0.66 | 0.61 | 0.61 | 0.83 | 0.85 | 0.76 | 0.78 | 0.64 | 0.81 | 0.82 | 0.72 | |
| Kuwait | 0.93 | 56 | 0.75 | 0.79 | 0.85 | 0.81 | 0.78 | 0.61 | 0.79 | 0.77 | 0.63 | 0.52 | 0.75 | 0.84 | 0.75 | |
| Lithuania | 0.88 | 41 | 0.43 | 0.59 | 0.60 | 0.62 | 0.69 | 0.74 | 0.77 | 0.72 | 0.68 | 0.36 | 0.71 | 0.62 | 0.70 | |
| Morocco | 0.90 | 45 | 0.62 | 0.67 | 0.62 | 0.72 | 0.62 | 0.67 | 0.75 | 0.72 | 0.73 | 0.66 | 0.67 | 0.71 | 0.51 | |
| Netherlands | 0.81 | 32 | 0.45 | 0.59 | 0.58 | 0.20 | 0.56 | 0.49 | 0.61 | 0.64 | 0.71 | 0.63 | 0.64 | 0.52 | 0.58 | |
| New Zealand | 0.92 | 52 | 0.59 | 0.68 | 0.68 | 0.53 | 0.67 | 0.75 | 0.80 | 0.83 | 0.80 | 0.75 | 0.76 | 0.73 | 0.72 | |
| Northern Ireland | 0.87 | 39 | 0.27 | 0.42 | 0.51 | 0.48 | 0.48 | 0.68 | 0.74 | 0.77 | 0.76 | 0.68 | 0.68 | 0.75 | 0.66 | |
| Norway (5) | 0.88 | 43 | 0.54 | 0.64 | 0.64 | 0.58 | 0.59 | 0.74 | 0.75 | 0.67 | 0.79 | 0.68 | 0.65 | 0.64 | 0.52 | |
| Oman | 0.89 | 44 | 0.52 | 0.59 | 0.69 | 0.68 | 0.64 | 0.74 | 0.77 | 0.69 | 0.76 | 0.40 | 0.69 | 0.71 | 0.62 | |
| Poland | 0.87 | 40 | 0.52 | 0.56 | 0.57 | 0.48 | 0.70 | 0.65 | 0.79 | 0.64 | 0.77 | 0.62 | 0.71 | 0.61 | 0.58 | |
| Portugal | 0.89 | 45 | 0.55 | 0.70 | 0.73 | 0.57 | 0.68 | 0.68 | 0.81 | 0.77 | 0.80 | 0.55 | 0.68 | 0.62 | 0.52 | |
| Qatar | 0.92 | 55 | 0.66 | 0.76 | 0.80 | 0.71 | 0.82 | 0.68 | 0.78 | 0.69 | 0.82 | 0.58 | 0.80 | 0.78 | 0.71 | |
| Russian Federation | 0.82 | 36 | 0.57 | 0.63 | 0.60 | 0.53 | 0.62 | 0.75 | 0.67 | 0.38 | 0.77 | 0.00 | 0.71 | 0.65 | 0.51 | |
| Saudi Arabia | 0.91 | 48 | 0.68 | 0.70 | 0.64 | 0.72 | 0.67 | 0.72 | 0.74 | 0.74 | 0.72 | 0.60 | 0.74 | 0.70 | 0.61 | |
| Serbia | 0.87 | 41 | 0.64 | 0.65 | 0.54 | 0.68 | 0.76 | 0.69 | 0.77 | 0.28 | 0.73 | 0.47 | 0.69 | 0.67 | 0.53 | |
| Singapore | 0.93 | 55 | 0.66 | 0.78 | 0.79 | 0.67 | 0.71 | 0.73 | 0.81 | 0.74 | 0.83 | 0.66 | 0.80 | 0.79 | 0.62 | |
| Slovak Republic | 0.85 | 37 | 0.60 | 0.66 | 0.56 | 0.64 | 0.61 | 0.57 | 0.65 | 0.49 | 0.59 | 0.53 | 0.64 | 0.69 | 0.61 | |
| Slovenia | 0.83 | 35 | 0.75 | 0.79 | 0.63 | 0.76 | 0.74 | 0.48 | 0.53 | 0.46 | 0.57 | 0.46 | 0.46 | 0.35 | 0.43 | |
| South Africa (5) | 0.89 | 43 | 0.64 | 0.63 | 0.58 | 0.66 | 0.69 | 0.66 | 0.75 | 0.55 | 0.69 | 0.56 | 0.74 | 0.75 | 0.56 | |
| Spain | 0.91 | 49 | 0.54 | 0.74 | 0.77 | 0.65 | 0.59 | 0.74 | 0.82 | 0.80 | 0.78 | 0.61 | 0.68 | 0.70 | 0.61 | |
| Sweden | 0.90 | 46 | 0.60 | 0.65 | 0.76 | 0.57 | 0.68 | 0.64 | 0.74 | 0.74 | 0.72 | 0.66 | 0.74 | 0.71 | 0.51 | |
| Turkey | 0.90 | 46 | 0.56 | 0.69 | 0.61 | 0.48 | 0.62 | 0.71 | 0.79 | 0.73 | 0.79 | 0.73 | 0.72 | 0.77 | 0.50 | |
| United Arab Emirates | 0.93 | 54 | 0.73 | 0.75 | 0.77 | 0.75 | 0.74 | 0.71 | 0.79 | 0.68 | 0.77 | 0.62 | 0.75 | 0.79 | 0.71 | |
| United States | 0.94 | 59 | 0.64 | 0.74 | 0.74 | 0.67 | 0.75 | 0.85 | 0.86 | 0.81 | 0.85 | 0.80 | 0.80 | 0.75 | 0.67 | |
| Benchmarking Participants | | | | | | | | | | | | | | | | |
| Buenos Aires, Argentina | 0.92 | 53 | 0.71 | 0.80 | 0.74 | 0.63 | 0.65 | 0.72 | 0.82 | 0.73 | 0.84 | 0.74 | 0.68 | 0.71 | 0.62 | |
| Ontario, Canada | 0.92 | 52 | 0.60 | 0.68 | 0.80 | 0.60 | 0.66 | 0.76 | 0.82 | 0.78 | 0.85 | 0.70 | 0.75 | 0.77 | 0.54 | |
| Quebec, Canada | 0.90 | 47 | 0.63 | 0.78 | 0.75 | 0.75 | 0.71 | 0.63 | 0.80 | 0.64 | 0.66 | 0.64 | 0.63 | 0.59 | 0.62 | |
| Norway (4) | 0.88 | 43 | 0.60 | 0.66 | 0.69 | 0.57 | 0.61 | 0.72 | 0.74 | 0.66 | 0.76 | 0.69 | 0.65 | 0.64 | 0.46 | |
| Abu Dhabi, UAE | 0.92 | 51 | 0.73 | 0.82 | 0.78 | 0.73 | 0.70 | 0.65 | 0.74 | 0.56 | 0.70 | 0.59 | 0.75 | 0.79 | 0.69 | |
| Dubai, UAE | 0.94 | 60 | 0.75 | 0.73 | 0.82 | 0.76 | 0.78 | 0.79 | 0.80 | 0.77 | 0.82 | 0.65 | 0.84 | 0.83 | 0.76 | |
| Florida, US | 0.90 | 47 | 0.47 | 0.64 | 0.46 | 0.36 | 0.51 | 0.81 | 0.87 | 0.82 | 0.83 | 0.72 | 0.79 | 0.78 | 0.59 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 School Emphasis on Academic Success - Principals' Reports Scale, Fourth Grade, and TIMSS 2015 Achievement

| Country | Pearson's Correlation with Achievement | | | | Variance in Achievement Accounted for by Difference Between Regions of the Scale (η^2) | |
|----------------------------------|--|-------------|-------------------|-------------|---|-------------|
| | (r) | | (r ²) | | Mathematics | Science |
| | Mathematics | Science | Mathematics | Science | | |
| Australia | 0.30 | 0.28 | 0.09 | 0.08 | 0.06 | 0.06 |
| Bahrain | 0.15 | 0.16 | 0.02 | 0.03 | 0.02 | 0.02 |
| Belgium (Flemish) | 0.21 | 0.23 | 0.04 | 0.05 | 0.02 | 0.03 |
| Bulgaria | 0.26 | 0.32 | 0.07 | 0.10 | 0.06 | 0.10 |
| Canada | 0.22 | 0.12 | 0.05 | 0.02 | 0.04 | 0.01 |
| Chile | 0.25 | 0.23 | 0.06 | 0.06 | 0.03 | 0.02 |
| Chinese Taipei | 0.16 | 0.15 | 0.03 | 0.02 | 0.03 | 0.02 |
| Croatia | 0.05 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cyprus | 0.13 | 0.13 | 0.02 | 0.02 | 0.02 | 0.02 |
| Czech Republic | 0.11 | 0.10 | 0.01 | 0.01 | 0.01 | 0.00 |
| Denmark | 0.09 | 0.10 | 0.01 | 0.01 | 0.00 | 0.00 |
| England | 0.20 | 0.23 | 0.04 | 0.05 | 0.03 | 0.04 |
| Finland | 0.06 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| France | 0.19 | 0.19 | 0.04 | 0.04 | 0.01 | 0.01 |
| Georgia | 0.15 | 0.13 | 0.02 | 0.02 | 0.01 | 0.00 |
| Germany | 0.18 | 0.19 | 0.03 | 0.04 | 0.02 | 0.03 |
| Hong Kong SAR | 0.27 | 0.26 | 0.07 | 0.07 | 0.06 | 0.05 |
| Hungary | 0.32 | 0.33 | 0.10 | 0.11 | 0.06 | 0.06 |
| Indonesia | 0.09 | 0.11 | 0.01 | 0.01 | 0.02 | 0.02 |
| Iran, Islamic Rep. of | 0.11 | 0.11 | 0.01 | 0.01 | 0.01 | 0.01 |
| Ireland | 0.15 | 0.15 | 0.02 | 0.02 | 0.02 | 0.02 |
| Italy | 0.09 | 0.08 | 0.01 | 0.01 | 0.00 | 0.00 |
| Japan | 0.10 | 0.10 | 0.01 | 0.01 | 0.01 | 0.01 |
| Jordan | 0.23 | - | 0.05 | - | 0.02 | - |
| Kazakhstan | 0.14 | 0.12 | 0.02 | 0.01 | 0.00 | 0.00 |
| Korea, Rep. of | 0.14 | 0.13 | 0.02 | 0.02 | 0.02 | 0.01 |
| Kuwait | 0.19 | 0.20 | 0.04 | 0.04 | 0.04 | 0.04 |
| Lithuania | 0.20 | 0.17 | 0.04 | 0.03 | 0.02 | 0.01 |
| Morocco | 0.18 | 0.20 | 0.03 | 0.04 | 0.02 | 0.03 |
| Netherlands | 0.06 | 0.08 | 0.00 | 0.01 | 0.00 | 0.00 |
| New Zealand | 0.26 | 0.26 | 0.07 | 0.07 | 0.05 | 0.05 |
| Northern Ireland | 0.12 | 0.09 | 0.01 | 0.01 | 0.01 | 0.01 |
| Norway (5) | 0.15 | 0.14 | 0.02 | 0.02 | 0.01 | 0.01 |
| Oman | -0.01 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Poland | 0.12 | 0.11 | 0.01 | 0.01 | 0.01 | 0.01 |
| Portugal | 0.22 | 0.18 | 0.05 | 0.03 | 0.05 | 0.03 |
| Qatar | 0.20 | 0.21 | 0.04 | 0.05 | 0.03 | 0.04 |
| Russian Federation | 0.13 | 0.14 | 0.02 | 0.02 | 0.00 | 0.01 |
| Saudi Arabia | 0.12 | 0.14 | 0.02 | 0.02 | 0.01 | 0.01 |
| Serbia | 0.19 | 0.19 | 0.04 | 0.03 | 0.04 | 0.03 |
| Singapore | 0.22 | 0.23 | 0.05 | 0.05 | 0.04 | 0.05 |
| Slovak Republic | 0.23 | 0.23 | 0.05 | 0.05 | 0.04 | 0.04 |
| Slovenia | 0.02 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| South Africa (5) | 0.17 | - | 0.03 | - | 0.00 | - |
| Spain | 0.27 | 0.27 | 0.07 | 0.07 | 0.06 | 0.06 |
| Sweden | 0.22 | 0.22 | 0.05 | 0.05 | 0.03 | 0.03 |
| Turkey | 0.35 | 0.33 | 0.13 | 0.11 | 0.07 | 0.07 |
| United Arab Emirates | 0.35 | 0.35 | 0.12 | 0.12 | 0.11 | 0.11 |
| United States | 0.28 | 0.29 | 0.08 | 0.08 | 0.08 | 0.08 |
| International Median | 0.18 | 0.16 | 0.03 | 0.03 | 0.02 | 0.02 |
| Benchmarking Participants | | | | | | |
| Buenos Aires, Argentina | 0.28 | 0.30 | 0.08 | 0.09 | 0.06 | 0.08 |
| Ontario, Canada | 0.19 | 0.13 | 0.03 | 0.02 | 0.03 | 0.01 |
| Quebec, Canada | 0.12 | 0.07 | 0.01 | 0.01 | 0.01 | 0.00 |
| Norway (4) | 0.10 | 0.10 | 0.01 | 0.01 | 0.01 | 0.01 |
| Abu Dhabi, UAE | 0.34 | 0.34 | 0.11 | 0.12 | 0.09 | 0.09 |
| Dubai, UAE | 0.38 | 0.37 | 0.15 | 0.14 | 0.12 | 0.12 |
| Florida, US | 0.21 | 0.16 | 0.04 | 0.03 | 0.02 | 0.01 |

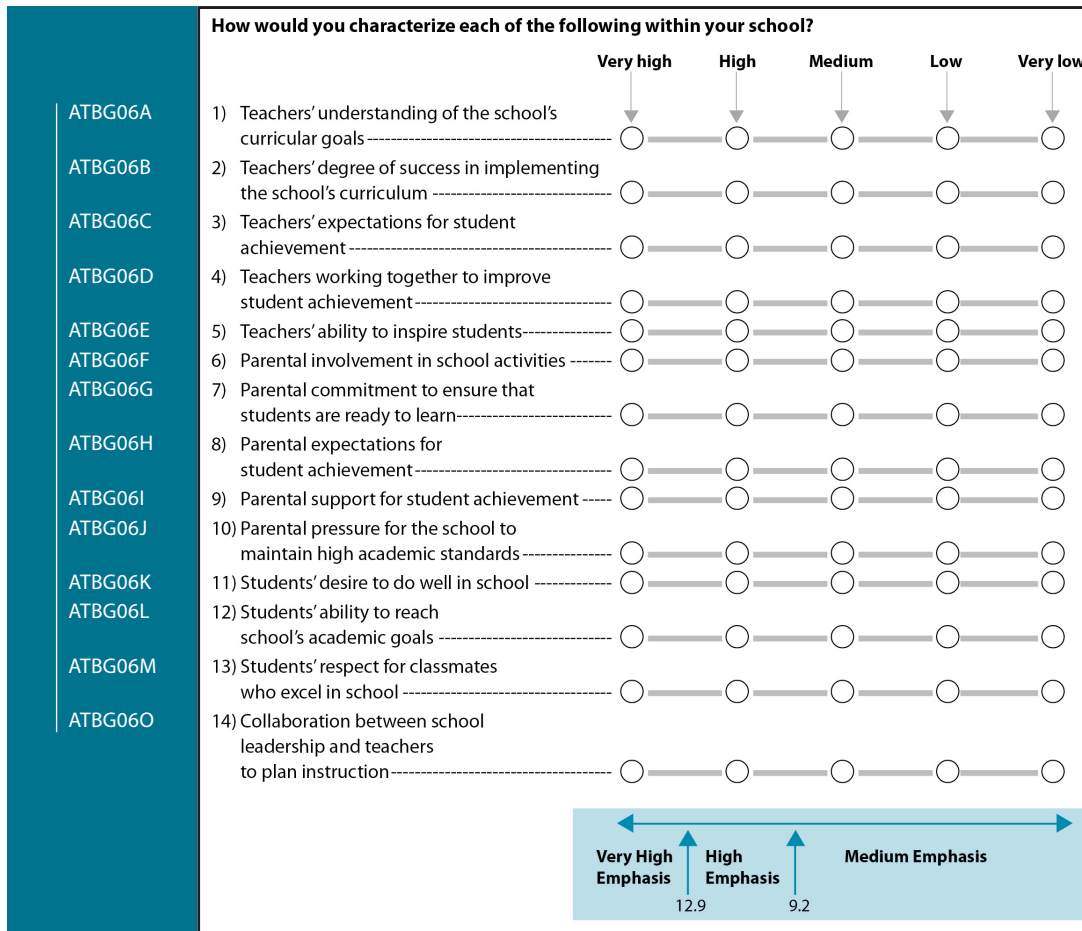
SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

A dash (-) indicates comparable data not available.

School Emphasis on Academic Success–Teachers’ Reports Scale, Fourth Grade

The School Emphasis on Academic Success–Teachers’ Reports (EAS) scale was created based on teachers’ responses characterizing the fourteen aspects described below.

Items in the TIMSS 2015 School Emphasis on Academic Success–Teachers’ Reports Scale, Fourth Grade¹



¹ For the purpose of scaling, categories in which there were very few respondents were combined. The categories “Low” and “Very low” were combined for all variables. The scale statistics that are reported herein reflect analysis of the items following collapsing.

Item Parameters for the TIMSS 2015 School Emphasis on Academic Success – Teachers' Reports Scale, Fourth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|---------|----------|----------|----------|---------|-------|
| ATBG06A | -1.44621 | -2.99618 | -0.10920 | 3.10538 | 1.03 |
| ATBG06B | -1.02745 | -3.33623 | -0.02415 | 3.36038 | 0.92 |
| ATBG06C | -0.80942 | -3.00204 | -0.03625 | 3.03829 | 0.97 |
| ATBG06D | -0.82375 | -2.16113 | -0.18841 | 2.34954 | 1.12 |
| ATBG06E | -1.03209 | -3.02365 | -0.12507 | 3.14872 | 0.94 |
| ATBG06F | 1.06140 | -2.19239 | 0.10160 | 2.09079 | 0.99 |
| ATBG06G | 1.33471 | -2.43171 | 0.10214 | 2.32957 | 0.84 |
| ATBG06H | 0.09125 | -2.39276 | -0.14839 | 2.54115 | 1.00 |
| ATBG06I | 1.18060 | -2.53725 | 0.11920 | 2.41805 | 0.81 |
| ATBG06J | 0.99194 | -2.19510 | 0.01274 | 2.18236 | 1.18 |
| ATBG06K | 0.18650 | -2.93168 | 0.00378 | 2.92790 | 0.91 |
| ATBG06L | 0.72569 | -3.47712 | 0.18892 | 3.28820 | 0.85 |
| ATBG06M | -0.16081 | -2.70547 | -0.18329 | 2.88876 | 1.11 |
| ATBG06O | -0.27236 | -1.68993 | -0.37720 | 2.06713 | 1.22 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Scale Transformation Constants for the TIMSS 2015 School Emphasis on Academic Success – Teachers' Reports Scale, Fourth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 9.063358 | Transformed Scale Score = 9.063358 + 1.313036 • Logit Scale Score |
| B = 1.313036 | |

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 School Emphasis on Academic Success – Teachers' Reports Scale,
Fourth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 0.32674 | |
| 1 | 1.95328 | |
| 2 | 2.81824 | |
| 3 | 3.45663 | |
| 4 | 3.98402 | |
| 5 | 4.44252 | |
| 6 | 4.85355 | |
| 7 | 5.22828 | |
| 8 | 5.57462 | |
| 9 | 5.89827 | |
| 10 | 6.20320 | |
| 11 | 6.49407 | |
| 12 | 6.77317 | |
| 13 | 7.04306 | |
| 14 | 7.30603 | |
| 15 | 7.56425 | |
| 16 | 7.81962 | |
| 17 | 8.07381 | |
| 18 | 8.32820 | |
| 19 | 8.58380 | |
| 20 | 8.84122 | |
| 21 | 9.10064 | 9.2 |
| 22 | 9.36202 | |
| 23 | 9.62473 | |
| 24 | 9.88825 | |
| 25 | 10.15200 | |
| 26 | 10.41565 | |
| 27 | 10.67922 | |
| 28 | 10.94307 | |
| 29 | 11.20798 | |
| 30 | 11.47508 | |
| 31 | 11.74519 | |
| 32 | 12.02119 | |
| 33 | 12.30494 | |
| 34 | 12.59942 | |
| 35 | 12.90857 | 12.9 |
| 36 | 13.23796 | |
| 37 | 13.59643 | |
| 38 | 13.99453 | |
| 39 | 14.45744 | |
| 40 | 15.03090 | |
| 41 | 15.82855 | |
| 42 | 17.39737 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 School Emphasis on Academic Success – Teachers' Reports Scale, Fourth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| | | | ATBG06A | ATBG06B | ATBG06C | ATBG06D | ATBG06E | ATBG06F | ATBG06G | ATBG06H | ATBG06I | ATBG06J | ATBG06K | ATBG06L | ATBG06M | ATBG06O |
| Australia | 0.90 | 45 | 0.57 | 0.63 | 0.68 | 0.59 | 0.71 | 0.71 | 0.77 | 0.68 | 0.80 | 0.63 | 0.73 | 0.71 | 0.64 | 0.49 |
| Bahrain | 0.90 | 46 | 0.54 | 0.64 | 0.75 | 0.57 | 0.65 | 0.67 | 0.78 | 0.70 | 0.76 | 0.62 | 0.74 | 0.74 | 0.67 | 0.55 |
| Belgium (Flemish) | 0.85 | 35 | 0.37 | 0.52 | 0.60 | 0.49 | 0.58 | 0.67 | 0.75 | 0.69 | 0.75 | 0.62 | 0.66 | 0.55 | 0.48 | 0.44 |
| Bulgaria | 0.89 | 43 | 0.63 | 0.73 | 0.68 | 0.58 | 0.60 | 0.77 | 0.73 | 0.65 | 0.69 | 0.59 | 0.71 | 0.69 | 0.54 | 0.54 |
| Canada | 0.91 | 47 | 0.59 | 0.62 | 0.65 | 0.56 | 0.64 | 0.74 | 0.83 | 0.75 | 0.82 | 0.65 | 0.72 | 0.73 | 0.61 | 0.58 |
| Chile | 0.90 | 44 | 0.52 | 0.59 | 0.58 | 0.53 | 0.53 | 0.72 | 0.82 | 0.76 | 0.78 | 0.69 | 0.72 | 0.70 | 0.71 | 0.58 |
| Chinese Taipei | 0.90 | 43 | 0.64 | 0.57 | 0.63 | 0.65 | 0.72 | 0.65 | 0.72 | 0.66 | 0.71 | 0.47 | 0.71 | 0.73 | 0.61 | 0.66 |
| Croatia | 0.90 | 44 | 0.56 | 0.60 | 0.57 | 0.70 | 0.68 | 0.75 | 0.71 | 0.57 | 0.80 | 0.80 | 0.59 | 0.62 | 0.61 | 0.61 |
| Cyprus | 0.87 | 39 | 0.44 | 0.57 | 0.68 | 0.40 | 0.53 | 0.68 | 0.79 | 0.70 | 0.77 | 0.64 | 0.73 | 0.69 | 0.60 | 0.37 |
| Czech Republic | 0.88 | 40 | 0.60 | 0.64 | 0.68 | 0.71 | 0.64 | 0.65 | 0.72 | 0.62 | 0.67 | 0.54 | 0.71 | 0.65 | 0.51 | 0.50 |
| Denmark | 0.86 | 37 | 0.45 | 0.52 | 0.55 | 0.40 | 0.63 | 0.68 | 0.76 | 0.69 | 0.75 | 0.56 | 0.68 | 0.65 | 0.62 | 0.34 |
| England | 0.92 | 49 | 0.63 | 0.66 | 0.66 | 0.66 | 0.62 | 0.75 | 0.81 | 0.76 | 0.81 | 0.64 | 0.75 | 0.73 | 0.66 | 0.67 |
| Finland | 0.85 | 36 | 0.53 | 0.64 | 0.59 | 0.57 | 0.58 | 0.61 | 0.71 | 0.64 | 0.67 | 0.42 | 0.66 | 0.61 | 0.53 | 0.51 |
| France | 0.78 | 29 | 0.21 | 0.27 | 0.35 | 0.21 | 0.32 | 0.61 | 0.80 | 0.72 | 0.79 | 0.45 | 0.68 | 0.80 | 0.49 | 0.19 |
| Georgia | 0.90 | 45 | 0.63 | 0.62 | 0.64 | 0.66 | 0.63 | 0.72 | 0.75 | 0.75 | 0.73 | 0.68 | 0.60 | 0.61 | 0.69 | 0.68 |
| Germany | 0.85 | 36 | 0.59 | 0.63 | 0.64 | 0.45 | 0.56 | 0.75 | 0.79 | 0.57 | 0.75 | 0.47 | 0.47 | 0.66 | 0.39 | 0.50 |
| Hong Kong SAR | 0.90 | 44 | 0.61 | 0.69 | 0.70 | 0.58 | 0.67 | 0.66 | 0.75 | 0.74 | 0.72 | 0.56 | 0.68 | 0.77 | 0.47 | 0.57 |
| Hungary | 0.89 | 42 | 0.42 | 0.67 | 0.57 | 0.49 | 0.60 | 0.71 | 0.80 | 0.67 | 0.77 | 0.70 | 0.78 | 0.73 | 0.61 | 0.41 |
| Indonesia | 0.91 | 47 | 0.60 | 0.65 | 0.57 | 0.65 | 0.62 | 0.76 | 0.78 | 0.74 | 0.81 | 0.59 | 0.69 | 0.73 | 0.72 | 0.64 |
| Iran, Islamic Rep. of | 0.89 | 43 | 0.67 | 0.62 | 0.45 | 0.54 | 0.64 | 0.76 | 0.78 | 0.63 | 0.76 | 0.69 | 0.70 | 0.72 | 0.60 | 0.57 |
| Ireland | 0.91 | 47 | 0.58 | 0.70 | 0.76 | 0.57 | 0.70 | 0.66 | 0.80 | 0.71 | 0.80 | 0.60 | 0.78 | 0.69 | 0.59 | 0.62 |
| Italy | 0.88 | 41 | 0.63 | 0.69 | 0.61 | 0.53 | 0.72 | 0.66 | 0.73 | 0.59 | 0.73 | 0.57 | 0.63 | 0.71 | 0.48 | 0.64 |
| Japan | 0.87 | 39 | 0.45 | 0.54 | 0.69 | 0.49 | 0.59 | 0.64 | 0.79 | 0.74 | 0.81 | 0.53 | 0.59 | 0.72 | 0.45 | 0.54 |
| Jordan | 0.89 | 42 | 0.55 | 0.59 | 0.55 | 0.65 | 0.64 | 0.65 | 0.78 | 0.61 | 0.73 | 0.71 | 0.63 | 0.73 | 0.60 | 0.63 |
| Kazakhstan | 0.93 | 52 | 0.70 | 0.72 | 0.67 | 0.73 | 0.74 | 0.74 | 0.82 | 0.71 | 0.82 | 0.66 | 0.72 | 0.76 | 0.55 | 0.69 |
| Korea, Rep. of | 0.91 | 48 | 0.63 | 0.64 | 0.70 | 0.66 | 0.66 | 0.75 | 0.78 | 0.75 | 0.76 | 0.67 | 0.71 | 0.69 | 0.62 | 0.62 |
| Kuwait | 0.88 | 39 | 0.57 | 0.53 | 0.65 | 0.55 | 0.60 | 0.67 | 0.76 | 0.64 | 0.67 | 0.54 | 0.67 | 0.70 | 0.62 | 0.51 |
| Lithuania | 0.89 | 42 | 0.49 | 0.62 | 0.64 | 0.58 | 0.67 | 0.69 | 0.75 | 0.78 | 0.76 | 0.61 | 0.64 | 0.65 | 0.52 | 0.58 |
| Morocco | 0.91 | 47 | 0.61 | 0.63 | 0.60 | 0.68 | 0.60 | 0.76 | 0.80 | 0.69 | 0.78 | 0.71 | 0.71 | 0.73 | 0.55 | 0.66 |
| Netherlands | 0.77 | 28 | 0.08 | 0.25 | 0.19 | 0.25 | 0.49 | 0.65 | 0.75 | 0.66 | 0.78 | 0.60 | 0.59 | 0.66 | 0.48 | 0.38 |
| New Zealand | 0.89 | 42 | 0.57 | 0.63 | 0.60 | 0.55 | 0.61 | 0.60 | 0.75 | 0.72 | 0.74 | 0.66 | 0.73 | 0.72 | 0.57 | 0.53 |
| Northern Ireland | 0.90 | 45 | 0.58 | 0.60 | 0.65 | 0.61 | 0.60 | 0.75 | 0.83 | 0.76 | 0.83 | 0.65 | 0.69 | 0.72 | 0.39 | 0.57 |
| Norway (5) | 0.87 | 39 | 0.49 | 0.53 | 0.67 | 0.55 | 0.53 | 0.80 | 0.72 | 0.74 | 0.75 | 0.55 | 0.60 | 0.60 | 0.52 | 0.58 |
| Oman | 0.89 | 42 | 0.50 | 0.62 | 0.61 | 0.60 | 0.59 | 0.71 | 0.81 | 0.71 | 0.74 | 0.49 | 0.62 | 0.71 | 0.62 | 0.62 |
| Poland | 0.87 | 39 | 0.53 | 0.68 | 0.61 | 0.55 | 0.62 | 0.71 | 0.76 | 0.58 | 0.77 | 0.54 | 0.61 | 0.67 | 0.57 | 0.47 |
| Portugal | 0.87 | 41 | 0.62 | 0.72 | 0.62 | 0.44 | 0.53 | 0.74 | 0.81 | 0.72 | 0.79 | 0.55 | 0.65 | 0.59 | 0.49 | 0.49 |
| Qatar | 0.88 | 40 | 0.57 | 0.59 | 0.66 | 0.48 | 0.64 | 0.69 | 0.77 | 0.64 | 0.73 | 0.42 | 0.69 | 0.75 | 0.57 | 0.53 |
| Russian Federation | 0.82 | 34 | 0.58 | 0.59 | 0.63 | 0.66 | 0.71 | 0.65 | 0.67 | 0.52 | 0.57 | -0.07 | 0.60 | 0.65 | 0.49 | 0.53 |
| Saudi Arabia | 0.92 | 50 | 0.65 | 0.67 | 0.70 | 0.70 | 0.71 | 0.71 | 0.76 | 0.74 | 0.80 | 0.65 | 0.77 | 0.77 | 0.59 | 0.61 |
| Serbia | 0.87 | 40 | 0.59 | 0.60 | 0.68 | 0.66 | 0.70 | 0.73 | 0.73 | 0.43 | 0.78 | 0.46 | 0.62 | 0.61 | 0.41 | 0.67 |
| Singapore | 0.90 | 45 | 0.56 | 0.56 | 0.60 | 0.58 | 0.62 | 0.68 | 0.80 | 0.73 | 0.80 | 0.68 | 0.76 | 0.77 | 0.56 | 0.58 |
| Slovak Republic | 0.88 | 40 | 0.54 | 0.64 | 0.62 | 0.58 | 0.61 | 0.72 | 0.76 | 0.47 | 0.73 | 0.57 | 0.74 | 0.66 | 0.62 | 0.51 |
| Slovenia | 0.81 | 31 | 0.57 | 0.66 | 0.63 | 0.64 | 0.69 | 0.62 | 0.64 | 0.29 | 0.62 | 0.15 | 0.54 | 0.54 | 0.33 | 0.60 |
| South Africa (5) | 0.89 | 42 | 0.49 | 0.41 | 0.51 | 0.60 | 0.58 | 0.69 | 0.78 | 0.68 | 0.76 | 0.73 | 0.74 | 0.73 | 0.71 | 0.57 |
| Spain | 0.90 | 43 | 0.47 | 0.71 | 0.71 | 0.56 | 0.55 | 0.73 | 0.81 | 0.71 | 0.80 | 0.70 | 0.69 | 0.68 | 0.43 | 0.50 |
| Sweden | 0.88 | 41 | 0.62 | 0.60 | 0.68 | 0.52 | 0.69 | 0.66 | 0.76 | 0.65 | 0.72 | 0.66 | 0.60 | 0.69 | 0.53 | 0.46 |
| Turkey | 0.90 | 45 | 0.60 | 0.70 | 0.62 | 0.51 | 0.57 | 0.77 | 0.79 | 0.71 | 0.78 | 0.66 | 0.71 | 0.79 | 0.49 | 0.58 |
| United Arab Emirates | 0.91 | 47 | 0.59 | 0.68 | 0.68 | 0.68 | 0.72 | 0.69 | 0.77 | 0.63 | 0.76 | 0.56 | 0.75 | 0.77 | 0.61 | 0.61 |
| United States | 0.91 | 48 | 0.54 | 0.65 | 0.65 | 0.55 | 0.66 | 0.77 | 0.82 | 0.81 | 0.82 | 0.72 | 0.75 | 0.71 | 0.63 | 0.55 |
| Benchmarking Participants | | | | | | | | | | | | | | | | |
| Buenos Aires, Argentina | 0.90 | 43 | 0.60 | 0.62 | 0.64 | 0.72 | 0.55 | 0.63 | 0.73 | 0.73 | 0.69 | 0.64 | 0.64 | 0.72 | 0.53 | 0.67 |
| Ontario, Canada | 0.90 | 46 | 0.55 | 0.51 | 0.64 | 0.43 | 0.51 | 0.76 | 0.83 | 0.78 | 0.84 | 0.74 | 0.75 | 0.73 | 0.62 | 0.59 |
| Quebec, Canada | 0.88 | 42 | 0.74 | 0.71 | 0.62 | 0.69 | 0.73 | 0.66 | 0.80 | 0.65 | 0.72 | 0.43 | 0.60 | 0.65 | 0.42 | 0.54 |
| Norway (4) | 0.87 | 38 | 0.55 | 0.64 | 0.69 | 0.54 | 0.60 | 0.71 | 0.72 | 0.67 | 0.62 | 0.44 | 0.64 | 0.64 | 0.63 | 0.52 |
| Abu Dhabi, UAE | 0.90 | 45 | 0.53 | 0.69 | 0.63 | 0.68 | 0.78 | 0.74 | 0.79 | 0.57 | 0.76 | 0.49 | 0.74 | 0.77 | 0.49 | 0.60 |
| Dubai, UAE | 0.89 | 42 | 0.61 | 0.64 | 0.72 | 0.62 | 0.62 | 0.61 | 0.74 | 0.62 | 0.75 | 0.45 | 0.75 | 0.71 | 0.62 | 0.61 |
| Florida, US | 0.93 | 54 | 0.69 | 0.80 | 0.64 | 0.71 | 0.74 | 0.81 | 0.81 | 0.81 | 0.83 | 0.79 | 0.68 | 0.67 | 0.63 | 0.63 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 School Emphasis on Academic Success – Teachers' Reports Scale, Fourth Grade, and TIMSS 2015 Achievement

| Country | Pearson's Correlation with Achievement | | | | Variance in Achievement Accounted for by Difference Between Regions of the Scale (η^2) | |
|----------------------------------|--|-------------|-------------------|-------------|---|-------------|
| | (r) | | (r ²) | | Mathematics | Science |
| | Mathematics | Science | Mathematics | Science | | |
| Australia | 0.24 | 0.22 | 0.06 | 0.05 | 0.05 | 0.04 |
| Bahrain | 0.11 | 0.02 | 0.01 | 0.00 | 0.02 | 0.03 |
| Belgium (Flemish) | 0.20 | 0.22 | 0.04 | 0.05 | 0.03 | 0.03 |
| Bulgaria | 0.23 | 0.28 | 0.05 | 0.08 | 0.04 | 0.06 |
| Canada | 0.14 | 0.06 | 0.02 | 0.00 | 0.03 | 0.01 |
| Chile | 0.24 | 0.25 | 0.06 | 0.06 | 0.03 | 0.03 |
| Chinese Taipei | 0.07 | 0.02 | 0.01 | 0.00 | 0.01 | 0.00 |
| Croatia | 0.02 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cyprus | 0.15 | 0.16 | 0.02 | 0.03 | 0.02 | 0.02 |
| Czech Republic | 0.08 | 0.10 | 0.01 | 0.01 | 0.00 | 0.01 |
| Denmark | 0.15 | 0.16 | 0.02 | 0.02 | 0.01 | 0.01 |
| England | 0.20 | 0.21 | 0.04 | 0.04 | 0.05 | 0.04 |
| Finland | 0.05 | 0.06 | 0.00 | 0.00 | 0.00 | 0.01 |
| France | 0.20 | 0.18 | 0.04 | 0.03 | 0.04 | 0.03 |
| Georgia | 0.14 | 0.17 | 0.02 | 0.03 | 0.02 | 0.02 |
| Germany | 0.18 | 0.21 | 0.03 | 0.04 | 0.02 | 0.03 |
| Hong Kong SAR | 0.25 | 0.18 | 0.06 | 0.03 | 0.05 | 0.03 |
| Hungary | 0.25 | 0.26 | 0.06 | 0.07 | 0.05 | 0.05 |
| Indonesia | 0.14 | 0.14 | 0.02 | 0.02 | 0.02 | 0.02 |
| Iran, Islamic Rep. of | 0.15 | 0.14 | 0.02 | 0.02 | 0.03 | 0.03 |
| Ireland | 0.17 | 0.19 | 0.03 | 0.04 | 0.03 | 0.04 |
| Italy | 0.07 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| Japan | 0.11 | 0.14 | 0.01 | 0.02 | 0.00 | 0.01 |
| Jordan | 0.21 | - | 0.04 | - | 0.02 | - |
| Kazakhstan | 0.09 | 0.08 | 0.01 | 0.01 | 0.01 | 0.00 |
| Korea, Rep. of | 0.22 | 0.17 | 0.05 | 0.03 | 0.03 | 0.02 |
| Kuwait | 0.17 | 0.12 | 0.03 | 0.01 | 0.03 | 0.01 |
| Lithuania | 0.12 | 0.12 | 0.02 | 0.01 | 0.03 | 0.02 |
| Morocco | 0.24 | 0.23 | 0.06 | 0.05 | 0.07 | 0.05 |
| Netherlands | 0.12 | 0.17 | 0.01 | 0.03 | 0.00 | 0.01 |
| New Zealand | 0.23 | 0.22 | 0.05 | 0.05 | 0.04 | 0.04 |
| Northern Ireland | 0.15 | 0.13 | 0.02 | 0.02 | 0.02 | 0.01 |
| Norway (5) | 0.15 | 0.13 | 0.02 | 0.02 | 0.03 | 0.02 |
| Oman | 0.08 | 0.06 | 0.01 | 0.00 | 0.01 | 0.00 |
| Poland | 0.13 | 0.12 | 0.02 | 0.01 | 0.02 | 0.01 |
| Portugal | 0.23 | 0.19 | 0.05 | 0.04 | 0.03 | 0.02 |
| Qatar | 0.12 | 0.18 | 0.01 | 0.03 | 0.02 | 0.02 |
| Russian Federation | 0.07 | 0.11 | 0.01 | 0.01 | 0.01 | 0.01 |
| Saudi Arabia | 0.21 | 0.16 | 0.04 | 0.03 | 0.03 | 0.01 |
| Serbia | 0.10 | 0.11 | 0.01 | 0.01 | 0.01 | 0.02 |
| Singapore | 0.26 | 0.28 | 0.07 | 0.08 | 0.06 | 0.07 |
| Slovak Republic | 0.20 | 0.22 | 0.04 | 0.05 | 0.03 | 0.03 |
| Slovenia | 0.01 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| South Africa (5) | 0.05 | - | 0.00 | - | 0.00 | - |
| Spain | 0.25 | 0.25 | 0.06 | 0.06 | 0.06 | 0.06 |
| Sweden | 0.17 | 0.15 | 0.03 | 0.02 | 0.02 | 0.01 |
| Turkey | 0.28 | 0.26 | 0.08 | 0.07 | 0.06 | 0.05 |
| United Arab Emirates | 0.34 | 0.35 | 0.11 | 0.13 | 0.09 | 0.10 |
| United States | 0.23 | 0.24 | 0.05 | 0.06 | 0.04 | 0.05 |
| International Median | 0.15 | 0.16 | 0.02 | 0.03 | 0.03 | 0.02 |
| Benchmarking Participants | | | | | | |
| Buenos Aires, Argentina | 0.18 | 0.20 | 0.03 | 0.04 | 0.03 | 0.04 |
| Ontario, Canada | 0.11 | 0.07 | 0.01 | 0.01 | 0.02 | 0.02 |
| Quebec, Canada | 0.03 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Norway (4) | 0.10 | 0.13 | 0.01 | 0.02 | 0.01 | 0.01 |
| Abu Dhabi, UAE | 0.37 | 0.37 | 0.13 | 0.14 | 0.09 | 0.08 |
| Dubai, UAE | 0.28 | 0.29 | 0.08 | 0.08 | 0.05 | 0.07 |
| Florida, US | 0.34 | 0.28 | 0.11 | 0.08 | 0.08 | 0.06 |

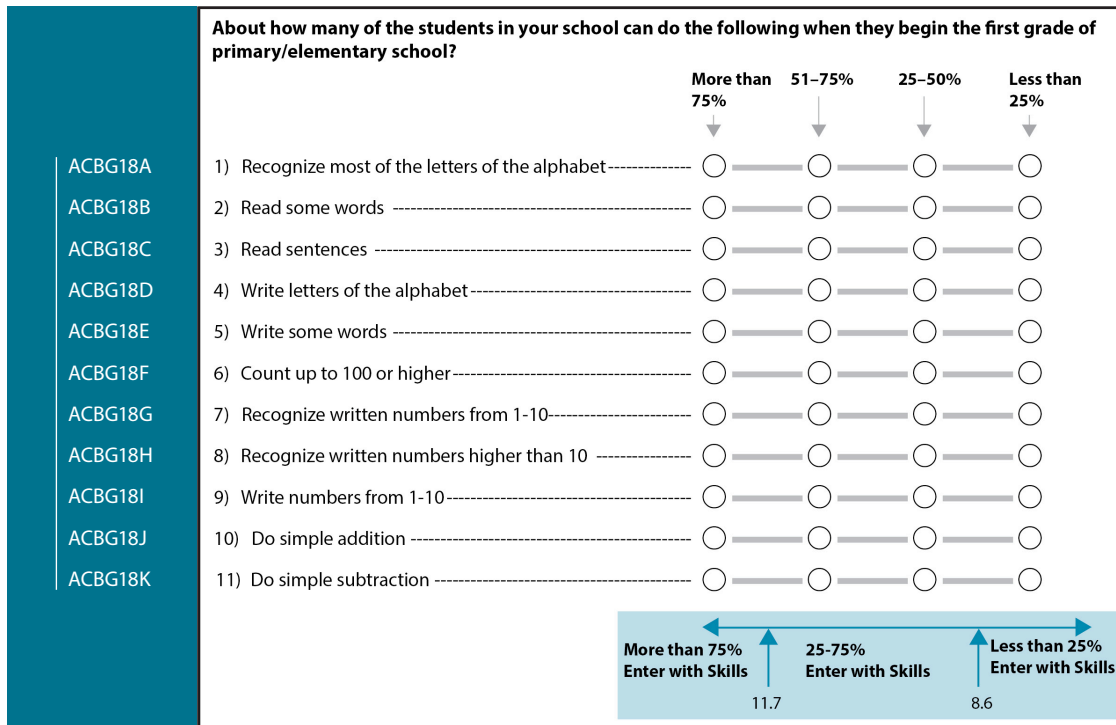
SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

A dash (-) indicates comparable data not available.

Schools Where Students Enter the Primary Grades with Literacy and Numeracy Skills Scale, Fourth Grade

The Schools Where Students Enter the Primary Grades with Literacy and Numeracy Skills (LNS) scale was created based on principals' responses about the percentage of children in the school who began first grade with the eleven key skills described below.

Items in the TIMSS 2015 Schools Where Students Enter the Primary Grades with Literacy and Numeracy Skills Scale, Fourth Grade



Item Parameters for the TIMSS 2015 Schools Where Students Enter the Primary Grades with Literacy and Numeracy Skills Scale, Fourth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|---------|----------|----------|----------|---------|-------|
| ACBG18A | -0.95602 | -1.74763 | 0.14297 | 1.60466 | 1.24 |
| ACBG18B | 0.12688 | -1.85096 | 0.04000 | 1.81096 | 0.98 |
| ACBG18C | 1.51017 | -1.41087 | -0.14993 | 1.56080 | 0.99 |
| ACBG18D | -0.71076 | -2.06675 | 0.21261 | 1.85414 | 1.22 |
| ACBG18E | 0.44307 | -1.83523 | 0.12227 | 1.71296 | 0.94 |
| ACBG18F | 0.94633 | -2.15667 | 0.04262 | 2.11405 | 1.39 |
| ACBG18G | -2.31455 | -2.27679 | 0.44943 | 1.82736 | 1.18 |
| ACBG18H | -0.10805 | -2.00446 | -0.00426 | 2.00872 | 1.13 |
| ACBG18I | -1.08180 | -1.80290 | 0.25691 | 1.54599 | 1.12 |
| ACBG18J | 0.76680 | -1.99761 | 0.02009 | 1.97752 | 1.07 |
| ACBG18K | 1.37793 | -1.79326 | -0.02855 | 1.82181 | 1.14 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Scale Transformation Constants for the TIMSS 2015 Schools Where Students Enter the Primary Grades with Literacy and Numeracy Skills Scale, Fourth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 10.111117 | Transformed Scale Score = 10.111117 + 0.64701 • Logit Scale Score |
| B = 0.64701 | |

Equivalence Table of Raw and Transformed Scale Scores for the TIMSS 2015 Schools Where Students Enter the Primary Grades with Literacy and Numeracy Skills Scale, Fourth Grade

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 6.26128 | |
| 1 | 7.18133 | |
| 2 | 7.67242 | |
| 3 | 8.01378 | |
| 4 | 8.28032 | |
| 5 | 8.50311 | 8.6 |
| 6 | 8.69803 | |
| 7 | 8.87309 | |
| 8 | 9.03362 | |
| 9 | 9.18319 | |
| 10 | 9.32436 | |
| 11 | 9.45882 | |
| 12 | 9.58860 | |
| 13 | 9.71450 | |
| 14 | 9.83751 | |
| 15 | 9.95849 | |
| 16 | 10.07824 | |
| 17 | 10.19745 | |
| 18 | 10.31684 | |
| 19 | 10.43711 | |
| 20 | 10.55900 | |
| 21 | 10.68334 | |
| 22 | 10.81104 | |
| 23 | 10.94315 | |
| 24 | 11.08052 | |
| 25 | 11.22538 | |
| 26 | 11.37954 | |
| 27 | 11.54578 | |
| 28 | 11.72807 | 11.7 |
| 29 | 11.93264 | |
| 30 | 12.16926 | |
| 31 | 12.46093 | |
| 32 | 12.86502 | |
| 33 | 13.64705 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Schools Where Students Enter the Primary Grades with Literacy and Numeracy Skills Scale, Fourth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| | | | ACBG18A | ACBG18B | ACBG18C | ACBG18D | ACBG18E | ACBG18F | ACBG18G | ACBG18H | ACBG18I | ACBG18J | ACBG18K |
| Australia | 0.97 | 78 | 0.85 | 0.91 | 0.87 | 0.91 | 0.91 | 0.88 | 0.86 | 0.89 | 0.91 | 0.88 | 0.85 |
| Bahrain | 0.97 | 76 | 0.84 | 0.92 | 0.86 | 0.89 | 0.90 | 0.86 | 0.80 | 0.88 | 0.85 | 0.89 | 0.86 |
| Belgium (Flemish) | 0.88 | 47 | 0.72 | 0.71 | 0.54 | 0.66 | 0.71 | 0.52 | 0.71 | 0.71 | 0.74 | 0.76 | 0.73 |
| Bulgaria | 0.95 | 66 | 0.82 | 0.86 | 0.77 | 0.84 | 0.85 | 0.64 | 0.77 | 0.83 | 0.81 | 0.85 | 0.84 |
| Canada | 0.96 | 69 | 0.79 | 0.88 | 0.83 | 0.83 | 0.88 | 0.83 | 0.79 | 0.84 | 0.82 | 0.84 | 0.81 |
| Chile | 0.95 | 66 | 0.73 | 0.86 | 0.82 | 0.85 | 0.88 | 0.84 | 0.76 | 0.83 | 0.78 | 0.77 | 0.77 |
| Chinese Taipei | 0.95 | 67 | 0.80 | 0.87 | 0.84 | 0.89 | 0.84 | 0.80 | 0.66 | 0.77 | 0.73 | 0.89 | 0.92 |
| Croatia | 0.92 | 55 | 0.71 | 0.82 | 0.71 | 0.78 | 0.81 | 0.67 | 0.72 | 0.71 | 0.76 | 0.77 | 0.72 |
| Cyprus | 0.92 | 57 | 0.77 | 0.84 | 0.60 | 0.79 | 0.77 | 0.64 | 0.74 | 0.79 | 0.75 | 0.81 | 0.78 |
| Czech Republic | 0.86 | 42 | 0.66 | 0.66 | 0.34 | 0.71 | 0.68 | 0.59 | 0.70 | 0.76 | 0.67 | 0.65 | 0.61 |
| Denmark | 0.92 | 55 | 0.72 | 0.78 | 0.75 | 0.52 | 0.75 | 0.74 | 0.78 | 0.82 | 0.75 | 0.76 | 0.78 |
| England | 0.97 | 78 | 0.90 | 0.93 | 0.88 | 0.91 | 0.93 | 0.73 | 0.88 | 0.87 | 0.90 | 0.87 | 0.86 |
| Finland | 0.92 | 55 | 0.68 | 0.74 | 0.61 | 0.72 | 0.74 | 0.68 | 0.73 | 0.81 | 0.78 | 0.85 | 0.82 |
| France | 0.88 | 46 | 0.59 | 0.70 | 0.57 | 0.67 | 0.71 | 0.62 | 0.66 | 0.72 | 0.67 | 0.77 | 0.74 |
| Georgia | 0.96 | 72 | 0.82 | 0.86 | 0.86 | 0.90 | 0.91 | 0.81 | 0.77 | 0.88 | 0.86 | 0.84 | 0.85 |
| Germany | 0.91 | 55 | 0.70 | 0.75 | 0.71 | 0.69 | 0.81 | 0.65 | 0.72 | 0.75 | 0.76 | 0.81 | 0.80 |
| Hong Kong SAR | 0.91 | 54 | 0.59 | 0.76 | 0.78 | 0.80 | 0.80 | 0.66 | 0.61 | 0.70 | 0.68 | 0.82 | 0.82 |
| Hungary | 0.84 | 40 | 0.55 | 0.47 | 0.32 | 0.60 | 0.62 | 0.66 | 0.72 | 0.76 | 0.70 | 0.71 | 0.67 |
| Indonesia | 0.96 | 71 | 0.79 | 0.88 | 0.87 | 0.86 | 0.91 | 0.76 | 0.78 | 0.84 | 0.84 | 0.87 | 0.87 |
| Iran, Islamic Rep. of | 0.95 | 69 | 0.75 | 0.85 | 0.84 | 0.89 | 0.85 | 0.79 | 0.77 | 0.88 | 0.82 | 0.86 | 0.84 |
| Ireland | 0.84 | 59 | 0.86 | 0.92 | 0.81 | 0.91 | 0.90 | 0.37 | 0.91 | 0.47 | 0.87 | 0.76 | 0.39 |
| Italy | 0.95 | 66 | 0.78 | 0.88 | 0.81 | 0.76 | 0.86 | 0.71 | 0.76 | 0.86 | 0.83 | 0.86 | 0.83 |
| Japan | 0.94 | 65 | 0.70 | 0.76 | 0.85 | 0.88 | 0.87 | 0.76 | 0.73 | 0.81 | 0.83 | 0.83 | 0.79 |
| Jordan | 0.97 | 77 | 0.86 | 0.91 | 0.85 | 0.88 | 0.90 | 0.84 | 0.84 | 0.88 | 0.87 | 0.90 | 0.90 |
| Kazakhstan | 0.94 | 64 | 0.74 | 0.83 | 0.79 | 0.84 | 0.83 | 0.73 | 0.72 | 0.76 | 0.81 | 0.87 | 0.88 |
| Korea, Rep. of | 0.95 | 69 | 0.86 | 0.69 | 0.87 | 0.90 | 0.83 | 0.80 | 0.82 | 0.86 | 0.88 | 0.81 | 0.82 |
| Kuwait | 0.97 | 79 | 0.90 | 0.94 | 0.90 | 0.91 | 0.92 | 0.86 | 0.81 | 0.90 | 0.84 | 0.90 | 0.89 |
| Lithuania | 0.94 | 62 | 0.75 | 0.81 | 0.77 | 0.76 | 0.80 | 0.71 | 0.71 | 0.78 | 0.78 | 0.87 | 0.86 |
| Morocco | 0.97 | 74 | 0.87 | 0.91 | 0.90 | 0.92 | 0.90 | 0.80 | 0.87 | 0.87 | 0.87 | 0.83 | 0.74 |
| Netherlands | 0.88 | 45 | 0.59 | 0.63 | 0.67 | 0.61 | 0.73 | 0.72 | 0.55 | 0.65 | 0.74 | 0.71 | 0.74 |
| New Zealand | 0.96 | 73 | 0.82 | 0.89 | 0.89 | 0.85 | 0.93 | 0.87 | 0.80 | 0.86 | 0.86 | 0.82 | 0.83 |
| Northern Ireland | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Norway (5) | 0.95 | 65 | 0.84 | 0.82 | 0.77 | 0.78 | 0.83 | 0.77 | 0.78 | 0.85 | 0.84 | 0.81 | 0.79 |
| Oman | 0.96 | 74 | 0.82 | 0.92 | 0.85 | 0.85 | 0.89 | 0.86 | 0.78 | 0.90 | 0.82 | 0.88 | 0.87 |
| Poland | 0.95 | 66 | 0.79 | 0.84 | 0.81 | 0.89 | 0.88 | 0.66 | 0.79 | 0.78 | 0.83 | 0.85 | 0.82 |
| Portugal | 0.95 | 65 | 0.82 | 0.83 | 0.76 | 0.78 | 0.86 | 0.71 | 0.76 | 0.84 | 0.80 | 0.87 | 0.85 |
| Qatar | 0.98 | 82 | 0.85 | 0.92 | 0.87 | 0.92 | 0.94 | 0.91 | 0.86 | 0.93 | 0.91 | 0.92 | 0.90 |
| Russian Federation | 0.94 | 63 | 0.79 | 0.87 | 0.81 | 0.79 | 0.78 | 0.71 | 0.78 | 0.82 | 0.75 | 0.83 | 0.81 |
| Saudi Arabia | 0.96 | 70 | 0.77 | 0.85 | 0.82 | 0.88 | 0.89 | 0.83 | 0.74 | 0.85 | 0.80 | 0.88 | 0.87 |
| Serbia | 0.93 | 58 | 0.69 | 0.81 | 0.76 | 0.82 | 0.81 | 0.67 | 0.77 | 0.82 | 0.84 | 0.73 | 0.63 |
| Singapore | 0.95 | 69 | 0.82 | 0.84 | 0.83 | 0.83 | 0.80 | 0.74 | 0.84 | 0.84 | 0.85 | 0.85 | 0.86 |
| Slovak Republic | 0.91 | 54 | 0.78 | 0.78 | 0.66 | 0.77 | 0.69 | 0.68 | 0.73 | 0.77 | 0.74 | 0.78 | 0.73 |
| Slovenia | 0.92 | 55 | 0.81 | 0.83 | 0.50 | 0.81 | 0.78 | 0.60 | 0.76 | 0.80 | 0.77 | 0.75 | 0.72 |
| South Africa (5) | 0.96 | 73 | 0.80 | 0.88 | 0.81 | 0.85 | 0.90 | 0.83 | 0.83 | 0.86 | 0.87 | 0.89 | 0.89 |
| Spain | 0.94 | 65 | 0.84 | 0.87 | 0.85 | 0.86 | 0.87 | 0.59 | 0.80 | 0.72 | 0.84 | 0.85 | 0.77 |
| Sweden | 0.94 | 64 | 0.82 | 0.85 | 0.76 | 0.76 | 0.83 | 0.73 | 0.82 | 0.83 | 0.81 | 0.83 | 0.76 |
| Turkey | 0.93 | 60 | 0.81 | 0.85 | 0.78 | 0.80 | 0.85 | 0.65 | 0.72 | 0.79 | 0.71 | 0.75 | 0.75 |
| United Arab Emirates | 0.97 | 79 | 0.87 | 0.91 | 0.86 | 0.92 | 0.92 | 0.87 | 0.86 | 0.89 | 0.89 | 0.90 | 0.87 |
| United States | 0.98 | 81 | 0.89 | 0.92 | 0.89 | 0.91 | 0.93 | 0.90 | 0.89 | 0.90 | 0.90 | 0.88 | 0.86 |
| Benchmarking Participants | | | | | | | | | | | | | |
| Buenos Aires, Argentina | 0.97 | 75 | 0.87 | 0.89 | 0.82 | 0.84 | 0.88 | 0.88 | 0.81 | 0.91 | 0.85 | 0.87 | 0.88 |
| Ontario, Canada | 0.96 | 73 | 0.87 | 0.90 | 0.87 | 0.90 | 0.86 | 0.83 | 0.82 | 0.84 | 0.83 | 0.84 | 0.84 |
| Quebec, Canada | 0.93 | 58 | 0.62 | 0.77 | 0.73 | 0.69 | 0.86 | 0.79 | 0.70 | 0.84 | 0.76 | 0.81 | 0.77 |
| Norway (4) | 0.94 | 63 | 0.79 | 0.80 | 0.75 | 0.76 | 0.81 | 0.75 | 0.79 | 0.83 | 0.84 | 0.80 | 0.78 |
| Abu Dhabi, UAE | 0.97 | 77 | 0.86 | 0.90 | 0.85 | 0.89 | 0.89 | 0.87 | 0.86 | 0.90 | 0.88 | 0.88 | 0.85 |
| Dubai, UAE | 0.98 | 85 | 0.92 | 0.94 | 0.87 | 0.96 | 0.95 | 0.87 | 0.93 | 0.92 | 0.94 | 0.93 | 0.89 |
| Florida, US | 0.97 | 77 | 0.89 | 0.93 | 0.92 | 0.90 | 0.87 | 0.84 | 0.87 | 0.89 | 0.84 | 0.86 | 0.82 |

A dash (-) indicates comparable data not available.

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Schools Where Students Enter the Primary Grades with Literacy and Numeracy Skills Scale, Fourth Grade, and TIMSS 2015 Achievement

| Country | Pearson's Correlation with Achievement | | | | Variance in Achievement Accounted for by Difference Between Regions of the Scale (η^2) | |
|----------------------------------|--|-------------|-------------|-------------|---|-------------|
| | (r) | | (r) | | Mathematics | Science |
| | Mathematics | Science | Mathematics | Science | | |
| Australia | 0.20 | 0.18 | 0.04 | 0.03 | 0.05 | 0.05 |
| Bahrain | 0.08 | 0.04 | 0.01 | 0.00 | 0.00 | 0.00 |
| Belgium (Flemish) | 0.05 | 0.07 | 0.00 | 0.01 | 0.00 | 0.00 |
| Bulgaria | 0.19 | 0.27 | 0.04 | 0.07 | 0.03 | 0.06 |
| Canada | 0.11 | 0.12 | 0.01 | 0.02 | 0.02 | 0.02 |
| Chile | 0.23 | 0.21 | 0.05 | 0.04 | 0.03 | 0.02 |
| Chinese Taipei | 0.08 | 0.05 | 0.01 | 0.00 | 0.02 | 0.01 |
| Croatia | 0.11 | 0.13 | 0.01 | 0.02 | 0.01 | 0.01 |
| Cyprus | 0.10 | 0.11 | 0.01 | 0.01 | 0.00 | 0.00 |
| Czech Republic | 0.08 | 0.07 | 0.01 | 0.00 | 0.00 | 0.00 |
| Denmark | 0.05 | 0.05 | 0.00 | 0.00 | 0.00 | 0.01 |
| England | 0.16 | 0.20 | 0.03 | 0.04 | 0.03 | 0.04 |
| Finland | 0.12 | 0.12 | 0.01 | 0.01 | 0.01 | 0.02 |
| France | 0.13 | 0.13 | 0.02 | 0.02 | 0.00 | 0.00 |
| Georgia | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Germany | 0.10 | 0.12 | 0.01 | 0.01 | 0.01 | 0.01 |
| Hong Kong SAR | 0.14 | 0.11 | 0.02 | 0.01 | 0.02 | 0.02 |
| Hungary | 0.22 | 0.23 | 0.05 | 0.05 | 0.03 | 0.03 |
| Indonesia | 0.25 | 0.27 | 0.06 | 0.08 | 0.05 | 0.05 |
| Iran, Islamic Rep. of | 0.09 | 0.06 | 0.01 | 0.00 | 0.01 | 0.01 |
| Ireland | 0.07 | 0.06 | 0.01 | 0.00 | 0.00 | 0.00 |
| Italy | 0.07 | 0.05 | 0.01 | 0.00 | 0.00 | 0.00 |
| Japan | 0.06 | 0.04 | 0.00 | 0.00 | 0.01 | 0.01 |
| Jordan | 0.17 | - | 0.03 | - | 0.02 | - |
| Kazakhstan | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Korea, Rep. of | 0.21 | 0.19 | 0.05 | 0.04 | 0.03 | 0.02 |
| Kuwait | 0.23 | 0.21 | 0.06 | 0.04 | 0.06 | 0.05 |
| Lithuania | 0.11 | 0.10 | 0.01 | 0.01 | 0.01 | 0.01 |
| Morocco | 0.19 | 0.19 | 0.03 | 0.04 | 0.03 | 0.03 |
| Netherlands | 0.05 | 0.08 | 0.00 | 0.01 | 0.00 | 0.01 |
| New Zealand | 0.23 | 0.24 | 0.05 | 0.06 | 0.04 | 0.04 |
| Northern Ireland | - | - | - | - | - | - |
| Norway (5) | 0.08 | 0.08 | 0.01 | 0.01 | 0.01 | 0.01 |
| Oman | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Poland | 0.04 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Portugal | 0.16 | 0.14 | 0.03 | 0.02 | 0.01 | 0.01 |
| Qatar | 0.13 | 0.12 | 0.02 | 0.01 | 0.02 | 0.02 |
| Russian Federation | 0.20 | 0.24 | 0.04 | 0.06 | 0.02 | 0.03 |
| Saudi Arabia | 0.15 | 0.19 | 0.02 | 0.04 | 0.03 | 0.05 |
| Serbia | 0.16 | 0.18 | 0.03 | 0.03 | 0.03 | 0.04 |
| Singapore | 0.14 | 0.15 | 0.02 | 0.02 | 0.02 | 0.03 |
| Slovak Republic | 0.21 | 0.23 | 0.05 | 0.05 | 0.03 | 0.04 |
| Slovenia | -0.01 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| South Africa (5) | 0.07 | - | 0.00 | - | 0.03 | - |
| Spain | 0.18 | 0.18 | 0.03 | 0.03 | 0.04 | 0.04 |
| Sweden | 0.15 | 0.15 | 0.02 | 0.02 | 0.01 | 0.01 |
| Turkey | 0.01 | 0.02 | 0.00 | 0.00 | 0.02 | 0.01 |
| United Arab Emirates | 0.19 | 0.22 | 0.04 | 0.05 | 0.04 | 0.05 |
| United States | 0.20 | 0.22 | 0.04 | 0.05 | 0.03 | 0.04 |
| International Median | 0.12 | 0.12 | 0.02 | 0.02 | 0.02 | 0.01 |
| Benchmarking Participants | | | | | | |
| Buenos Aires, Argentina | 0.25 | 0.25 | 0.06 | 0.06 | 0.07 | 0.08 |
| Ontario, Canada | 0.13 | 0.13 | 0.02 | 0.02 | 0.02 | 0.02 |
| Quebec, Canada | 0.10 | 0.08 | 0.01 | 0.01 | 0.01 | 0.01 |
| Norway (4) | -0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Abu Dhabi, UAE | 0.28 | 0.27 | 0.08 | 0.07 | 0.07 | 0.06 |
| Dubai, UAE | 0.12 | 0.18 | 0.01 | 0.03 | 0.02 | 0.04 |
| Florida, US | 0.20 | 0.18 | 0.04 | 0.03 | 0.03 | 0.02 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

A dash (-) indicates comparable data not available.

Student Bullying Scale, Fourth Grade

The Student Bullying (SB) scale was created based on students' responses to how often they experienced the eight bullying behaviors described below.

Items in the TIMSS 2015 Student Bullying Scale, Fourth Grade

| | | During this school year, how often have other students from your school done any of the following things to you (including through texting or the Internet)? | | | |
|---------|--|--|-----------------------|-----------------------|-----------------------|
| | | Never | A few times a year | Once or twice a month | At least once a week |
| ASBG12A | 1) Made fun of me or called me names----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ASBG12B | 2) Left me out of their games or activities----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ASBG12C | 3) Spread lies about me----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ASBG12D | 4) Stole something from me----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ASBG12E | 5) Hit or hurt me (e.g., <i>shoving, hitting, kicking</i>)----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ASBG12F | 6) Made me do things I didn't want to do----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ASBG12G | 7) Shared embarrassing information about me----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ASBG12H | 8) Threatened me----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

←-----→

Almost Never About Monthly About Weekly

9.6 8.0

Item Parameters for the TIMSS 2015 Student Bullying Scale, Fourth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|---------|----------|---------|----------|----------|-------|
| ASBG12A | 0.46618 | 0.24420 | -0.31625 | 0.07205 | 1.09 |
| ASBG12B | 0.28450 | 0.07329 | -0.01726 | -0.05603 | 1.19 |
| ASBG12C | 0.16218 | 0.09498 | -0.07059 | -0.02439 | 0.96 |
| ASBG12D | -0.27878 | 0.38164 | -0.13690 | -0.24474 | 1.12 |
| ASBG12E | 0.15176 | 0.07103 | -0.16425 | 0.09322 | 1.01 |
| ASBG12F | -0.31617 | 0.31731 | 0.10905 | -0.42636 | 0.97 |
| ASBG12G | -0.16420 | 0.27826 | -0.07753 | -0.20073 | 0.94 |
| ASBG12H | -0.30547 | 0.43020 | 0.06771 | -0.49791 | 0.94 |

Scale Transformation Constants for the TIMSS 2015 Student Bullying Scale, Fourth Grade

Scale Transformation Constants

A = 7.986312

B = 1.843301

Transformed Scale Score = 7.986312 + 1.843301 • Logit Scale Score

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Student Bullying Scale, Fourth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 3.45583 | |
| 1 | 4.98767 | |
| 2 | 5.62711 | |
| 3 | 6.04410 | |
| 4 | 6.36087 | |
| 5 | 6.61949 | |
| 6 | 6.85019 | |
| 7 | 7.05738 | |
| 8 | 7.24822 | |
| 9 | 7.42814 | |
| 10 | 7.60130 | |
| 11 | 7.77094 | |
| 12 | 7.93577 | 8.0 |
| 13 | 8.10996 | |
| 14 | 8.28412 | |
| 15 | 8.46483 | |
| 16 | 8.65532 | |
| 17 | 8.85956 | |
| 18 | 9.08276 | |
| 19 | 9.32730 | |
| 20 | 9.61409 | 9.6 |
| 21 | 9.96469 | |
| 22 | 10.42778 | |
| 23 | 11.14791 | |
| 24 | 12.87429 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Student Bullying Scale, Fourth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|---------|---------|
| | | | ASBG12A | ASBG12B | ASBG12C | ASBG12D | ASBG12E | ASBG12F | ASBG12G | ASBG12H |
| Australia | 0.87 | 52 | 0.74 | 0.68 | 0.78 | 0.63 | 0.73 | 0.71 | 0.76 | 0.73 |
| Bahrain | 0.85 | 48 | 0.63 | 0.61 | 0.71 | 0.66 | 0.74 | 0.72 | 0.72 | 0.74 |
| Belgium (Flemish) | 0.86 | 50 | 0.76 | 0.71 | 0.74 | 0.50 | 0.73 | 0.63 | 0.80 | 0.74 |
| Bulgaria | 0.83 | 47 | 0.70 | 0.50 | 0.73 | 0.59 | 0.75 | 0.70 | 0.76 | 0.72 |
| Canada | 0.87 | 52 | 0.73 | 0.68 | 0.77 | 0.65 | 0.73 | 0.71 | 0.74 | 0.74 |
| Chile | 0.86 | 52 | 0.70 | 0.67 | 0.77 | 0.64 | 0.76 | 0.71 | 0.76 | 0.75 |
| Chinese Taipei | 0.84 | 47 | 0.71 | 0.66 | 0.74 | 0.53 | 0.67 | 0.68 | 0.75 | 0.71 |
| Croatia | 0.84 | 49 | 0.64 | 0.68 | 0.75 | 0.56 | 0.71 | 0.70 | 0.78 | 0.72 |
| Cyprus | 0.85 | 48 | 0.71 | 0.63 | 0.74 | 0.62 | 0.73 | 0.71 | 0.68 | 0.71 |
| Czech Republic | 0.84 | 47 | 0.75 | 0.60 | 0.76 | 0.55 | 0.67 | 0.69 | 0.75 | 0.70 |
| Denmark | 0.84 | 48 | 0.73 | 0.65 | 0.76 | 0.50 | 0.72 | 0.69 | 0.73 | 0.74 |
| England | 0.86 | 50 | 0.72 | 0.67 | 0.77 | 0.60 | 0.74 | 0.70 | 0.74 | 0.70 |
| Finland | 0.87 | 52 | 0.74 | 0.69 | 0.79 | 0.61 | 0.70 | 0.68 | 0.78 | 0.76 |
| France | 0.81 | 43 | 0.65 | 0.63 | 0.73 | 0.52 | 0.68 | 0.61 | 0.71 | 0.68 |
| Georgia | 0.81 | 48 | 0.57 | 0.53 | 0.74 | 0.70 | 0.67 | 0.76 | 0.77 | 0.76 |
| Germany | 0.84 | 48 | 0.69 | 0.66 | 0.75 | 0.59 | 0.71 | 0.72 | 0.72 | 0.70 |
| Hong Kong SAR | 0.83 | 47 | 0.58 | 0.65 | 0.74 | 0.59 | 0.67 | 0.74 | 0.73 | 0.75 |
| Hungary | 0.81 | 44 | 0.67 | 0.61 | 0.73 | 0.51 | 0.72 | 0.66 | 0.66 | 0.69 |
| Indonesia | 0.83 | 47 | 0.61 | 0.49 | 0.72 | 0.69 | 0.71 | 0.72 | 0.77 | 0.75 |
| Iran, Islamic Rep. of | 0.79 | 42 | 0.60 | 0.50 | 0.70 | 0.57 | 0.68 | 0.70 | 0.69 | 0.71 |
| Ireland | 0.85 | 49 | 0.72 | 0.69 | 0.77 | 0.59 | 0.70 | 0.69 | 0.73 | 0.71 |
| Italy | 0.80 | 42 | 0.68 | 0.60 | 0.69 | 0.55 | 0.65 | 0.63 | 0.68 | 0.68 |
| Japan | 0.84 | 49 | 0.73 | 0.72 | 0.71 | 0.62 | 0.71 | 0.74 | 0.68 | 0.65 |
| Jordan | 0.86 | 52 | 0.66 | 0.63 | 0.71 | 0.69 | 0.74 | 0.76 | 0.78 | 0.77 |
| Kazakhstan | 0.82 | 47 | 0.66 | 0.59 | 0.73 | 0.66 | 0.71 | 0.72 | 0.72 | 0.68 |
| Korea, Rep. of | 0.81 | 44 | 0.68 | 0.65 | 0.71 | 0.51 | 0.71 | 0.70 | 0.69 | 0.66 |
| Kuwait | 0.82 | 44 | 0.61 | 0.58 | 0.68 | 0.61 | 0.71 | 0.70 | 0.70 | 0.72 |
| Lithuania | 0.83 | 46 | 0.69 | 0.62 | 0.74 | 0.60 | 0.71 | 0.68 | 0.70 | 0.66 |
| Morocco | 0.80 | 43 | 0.59 | 0.60 | 0.65 | 0.61 | 0.68 | 0.69 | 0.70 | 0.70 |
| Netherlands | 0.83 | 46 | 0.73 | 0.64 | 0.73 | 0.57 | 0.74 | 0.69 | 0.69 | 0.64 |
| New Zealand | 0.87 | 51 | 0.72 | 0.66 | 0.77 | 0.65 | 0.74 | 0.73 | 0.74 | 0.73 |
| Northern Ireland | 0.85 | 49 | 0.71 | 0.66 | 0.77 | 0.61 | 0.71 | 0.69 | 0.72 | 0.71 |
| Norway (5) | 0.86 | 50 | 0.71 | 0.66 | 0.77 | 0.58 | 0.71 | 0.72 | 0.79 | 0.71 |
| Oman | 0.81 | 44 | 0.63 | 0.55 | 0.70 | 0.66 | 0.67 | 0.68 | 0.70 | 0.67 |
| Poland | 0.86 | 51 | 0.70 | 0.66 | 0.77 | 0.62 | 0.74 | 0.70 | 0.81 | 0.72 |
| Portugal | 0.83 | 47 | 0.71 | 0.65 | 0.75 | 0.55 | 0.74 | 0.64 | 0.69 | 0.71 |
| Qatar | 0.87 | 52 | 0.64 | 0.66 | 0.75 | 0.69 | 0.74 | 0.74 | 0.77 | 0.75 |
| Russian Federation | 0.82 | 45 | 0.72 | 0.48 | 0.73 | 0.53 | 0.75 | 0.63 | 0.78 | 0.68 |
| Saudi Arabia | 0.87 | 53 | 0.68 | 0.61 | 0.75 | 0.69 | 0.76 | 0.76 | 0.78 | 0.77 |
| Serbia | 0.84 | 48 | 0.68 | 0.67 | 0.78 | 0.56 | 0.70 | 0.63 | 0.79 | 0.68 |
| Singapore | 0.85 | 48 | 0.64 | 0.66 | 0.77 | 0.61 | 0.69 | 0.71 | 0.75 | 0.73 |
| Slovak Republic | 0.85 | 49 | 0.70 | 0.63 | 0.74 | 0.60 | 0.73 | 0.69 | 0.76 | 0.72 |
| Slovenia | 0.85 | 49 | 0.71 | 0.67 | 0.76 | 0.59 | 0.69 | 0.70 | 0.78 | 0.72 |
| South Africa (5) | 0.80 | 42 | 0.59 | 0.62 | 0.68 | 0.58 | 0.66 | 0.69 | 0.71 | 0.66 |
| Spain | 0.83 | 46 | 0.65 | 0.64 | 0.71 | 0.58 | 0.71 | 0.70 | 0.67 | 0.74 |
| Sweden | 0.82 | 45 | 0.72 | 0.62 | 0.74 | 0.55 | 0.71 | 0.67 | 0.67 | 0.68 |
| Turkey | 0.80 | 43 | 0.59 | 0.65 | 0.69 | 0.57 | 0.66 | 0.64 | 0.71 | 0.70 |
| United Arab Emirates | 0.84 | 48 | 0.65 | 0.63 | 0.72 | 0.66 | 0.72 | 0.71 | 0.71 | 0.72 |
| United States | 0.86 | 50 | 0.74 | 0.69 | 0.77 | 0.64 | 0.70 | 0.66 | 0.73 | 0.72 |
| Benchmarking Participants | | | | | | | | | | |
| Buenos Aires, Argentina | 0.86 | 50 | 0.68 | 0.69 | 0.74 | 0.63 | 0.74 | 0.70 | 0.74 | 0.72 |
| Ontario, Canada | 0.86 | 51 | 0.72 | 0.70 | 0.78 | 0.63 | 0.73 | 0.70 | 0.73 | 0.73 |
| Quebec, Canada | 0.86 | 50 | 0.75 | 0.65 | 0.74 | 0.62 | 0.71 | 0.69 | 0.74 | 0.75 |
| Norway (4) | 0.85 | 50 | 0.71 | 0.65 | 0.76 | 0.61 | 0.70 | 0.75 | 0.76 | 0.70 |
| Abu Dhabi, UAE | 0.85 | 48 | 0.65 | 0.63 | 0.70 | 0.68 | 0.72 | 0.72 | 0.71 | 0.73 |
| Dubai, UAE | 0.85 | 48 | 0.68 | 0.65 | 0.73 | 0.65 | 0.72 | 0.70 | 0.71 | 0.70 |
| Florida, US | 0.86 | 51 | 0.72 | 0.68 | 0.77 | 0.66 | 0.71 | 0.67 | 0.76 | 0.72 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Student Bullying Scale, Fourth Grade, and TIMSS 2015 Achievement

| Country | Pearson's Correlation with Achievement | | | | Variance in Achievement Accounted for by Difference Between Regions of the Scale (η^2) | |
|----------------------------------|--|---------|-------------------|---------|---|---------|
| | (r) | | (r ²) | | Mathematics | Science |
| | Mathematics | Science | Mathematics | Science | | |
| Australia | 0.16 | 0.13 | 0.03 | 0.02 | 0.03 | 0.02 |
| Bahrain | 0.16 | 0.17 | 0.03 | 0.03 | 0.03 | 0.03 |
| Belgium (Flemish) | 0.04 | 0.05 | 0.00 | 0.00 | 0.01 | 0.01 |
| Bulgaria | 0.19 | 0.20 | 0.03 | 0.04 | 0.04 | 0.04 |
| Canada | 0.12 | 0.13 | 0.01 | 0.02 | 0.03 | 0.03 |
| Chile | 0.16 | 0.16 | 0.02 | 0.02 | 0.04 | 0.04 |
| Chinese Taipei | 0.07 | 0.06 | 0.00 | 0.00 | 0.01 | 0.01 |
| Croatia | 0.09 | 0.07 | 0.01 | 0.00 | 0.01 | 0.01 |
| Cyprus | 0.13 | 0.15 | 0.02 | 0.02 | 0.03 | 0.03 |
| Czech Republic | 0.11 | 0.09 | 0.01 | 0.01 | 0.02 | 0.01 |
| Denmark | 0.09 | 0.06 | 0.01 | 0.00 | 0.02 | 0.01 |
| England | 0.08 | 0.09 | 0.01 | 0.01 | 0.02 | 0.02 |
| Finland | 0.08 | 0.07 | 0.01 | 0.01 | 0.02 | 0.01 |
| France | 0.06 | 0.08 | 0.00 | 0.01 | 0.01 | 0.01 |
| Georgia | 0.19 | 0.16 | 0.04 | 0.03 | 0.05 | 0.03 |
| Germany | 0.09 | 0.13 | 0.01 | 0.02 | 0.02 | 0.03 |
| Hong Kong SAR | 0.08 | 0.06 | 0.01 | 0.00 | 0.01 | 0.00 |
| Hungary | 0.15 | 0.18 | 0.02 | 0.03 | 0.03 | 0.04 |
| Indonesia | 0.03 | 0.02 | 0.00 | 0.00 | 0.01 | 0.00 |
| Iran, Islamic Rep. of | 0.04 | 0.06 | 0.00 | 0.00 | 0.00 | 0.01 |
| Ireland | 0.15 | 0.12 | 0.02 | 0.01 | 0.04 | 0.03 |
| Italy | 0.07 | 0.05 | 0.00 | 0.00 | 0.01 | 0.01 |
| Japan | 0.09 | 0.06 | 0.01 | 0.00 | 0.02 | 0.01 |
| Jordan | 0.23 | - | 0.06 | - | 0.07 | - |
| Kazakhstan | 0.10 | 0.08 | 0.01 | 0.01 | 0.01 | 0.01 |
| Korea, Rep. of | -0.02 | -0.06 | 0.00 | 0.00 | 0.00 | 0.00 |
| Kuwait | 0.05 | 0.07 | 0.00 | 0.01 | 0.01 | 0.01 |
| Lithuania | 0.17 | 0.20 | 0.03 | 0.04 | 0.05 | 0.06 |
| Morocco | 0.16 | 0.14 | 0.03 | 0.02 | 0.03 | 0.03 |
| Netherlands | 0.05 | 0.10 | 0.00 | 0.01 | 0.01 | 0.02 |
| New Zealand | 0.13 | 0.12 | 0.02 | 0.01 | 0.03 | 0.02 |
| Northern Ireland | 0.12 | 0.06 | 0.01 | 0.00 | 0.03 | 0.01 |
| Norway (5) | 0.08 | 0.06 | 0.01 | 0.00 | 0.02 | 0.01 |
| Oman | 0.11 | 0.12 | 0.01 | 0.01 | 0.01 | 0.02 |
| Poland | 0.11 | 0.10 | 0.01 | 0.01 | 0.02 | 0.02 |
| Portugal | 0.07 | 0.05 | 0.00 | 0.00 | 0.01 | 0.01 |
| Qatar | 0.17 | 0.19 | 0.03 | 0.04 | 0.05 | 0.06 |
| Russian Federation | 0.12 | 0.09 | 0.01 | 0.01 | 0.02 | 0.01 |
| Saudi Arabia | 0.23 | 0.25 | 0.05 | 0.06 | 0.05 | 0.06 |
| Serbia | 0.05 | 0.06 | 0.00 | 0.00 | 0.01 | 0.02 |
| Singapore | 0.17 | 0.16 | 0.03 | 0.03 | 0.04 | 0.04 |
| Slovak Republic | 0.12 | 0.13 | 0.02 | 0.02 | 0.02 | 0.02 |
| Slovenia | 0.08 | 0.09 | 0.01 | 0.01 | 0.02 | 0.02 |
| South Africa (5) | 0.26 | - | 0.07 | - | 0.08 | - |
| Spain | 0.10 | 0.10 | 0.01 | 0.01 | 0.01 | 0.01 |
| Sweden | 0.11 | 0.12 | 0.01 | 0.01 | 0.03 | 0.03 |
| Turkey | 0.22 | 0.22 | 0.05 | 0.05 | 0.07 | 0.06 |
| United Arab Emirates | 0.16 | 0.19 | 0.02 | 0.04 | 0.04 | 0.05 |
| United States | 0.12 | 0.12 | 0.01 | 0.01 | 0.03 | 0.03 |
| International Median | 0.11 | 0.10 | 0.01 | 0.01 | 0.02 | 0.02 |
| Benchmarking Participants | | | | | | |
| Buenos Aires, Argentina | 0.10 | 0.06 | 0.01 | 0.00 | 0.03 | 0.01 |
| Ontario, Canada | 0.12 | 0.13 | 0.01 | 0.02 | 0.02 | 0.02 |
| Quebec, Canada | 0.07 | 0.10 | 0.01 | 0.01 | 0.02 | 0.03 |
| Norway (4) | 0.10 | 0.11 | 0.01 | 0.01 | 0.02 | 0.02 |
| Abu Dhabi, UAE | 0.15 | 0.19 | 0.02 | 0.04 | 0.04 | 0.06 |
| Dubai, UAE | 0.12 | 0.15 | 0.01 | 0.02 | 0.03 | 0.04 |
| Florida, US | 0.14 | 0.17 | 0.02 | 0.03 | 0.04 | 0.04 |

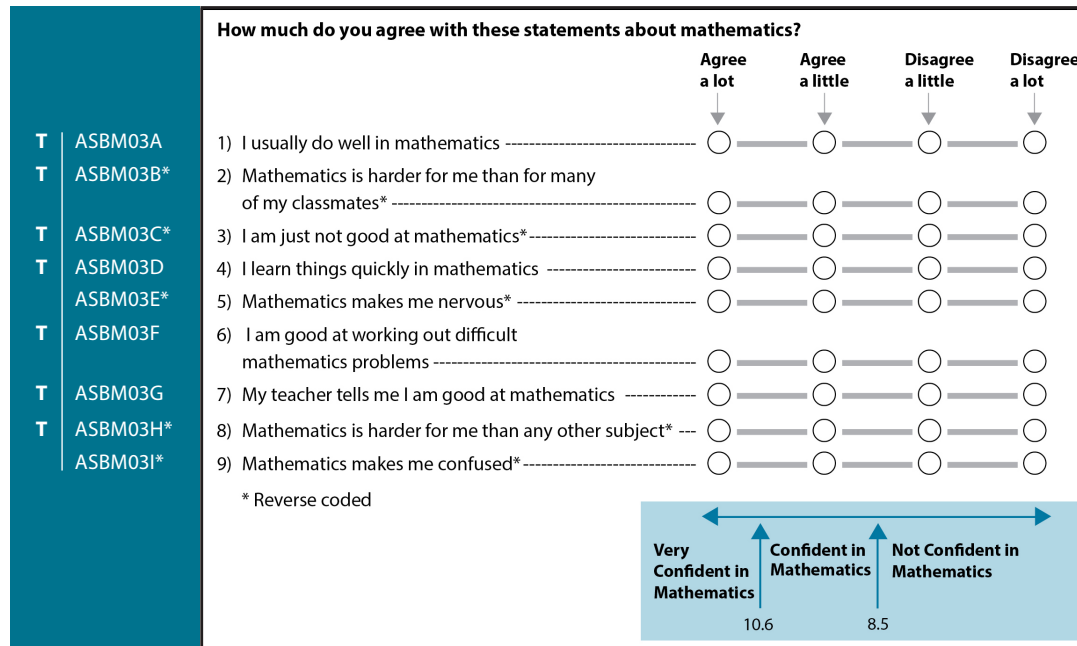
SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

A dash (-) indicates comparable data not available.

Students Confident in Mathematics Scale, Fourth Grade

The Students Confident in Mathematics (SCM) scale was created based on students' degree of agreement with the nine statements described below.

Items in the TIMSS 2015 Students Confident in Mathematics Scale, Fourth Grade



T Trend item—item was included in the same scale in TIMSS 2011 and was used for linking the TIMSS 2011 and TIMSS 2015 scales.

Item Parameters for the TIMSS 2015 Students Confident in Mathematics Scale, Fourth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|----------|----------|----------|----------|---------|-------|
| ASBM03A | -0.54541 | -0.55281 | -0.58064 | 1.13345 | 0.92 |
| ASBM03B* | 0.28031 | -0.54709 | 0.20931 | 0.33778 | 1.03 |
| ASBM03C* | 0.03294 | -0.35764 | 0.16685 | 0.19079 | 0.94 |
| ASBM03D | -0.29218 | -0.62562 | -0.32950 | 0.95512 | 0.98 |
| ASBM03E* | 0.11800 | -0.33518 | 0.20115 | 0.13403 | 1.14 |
| ASBM03F | 0.23717 | -0.75825 | -0.29418 | 1.05243 | 1.08 |
| ASBM03G | -0.08982 | -0.68948 | -0.31756 | 1.00704 | 1.18 |
| ASBM03H* | 0.17797 | -0.19045 | 0.15607 | 0.03438 | 0.92 |
| ASBM03I* | 0.08102 | -0.31116 | 0.17313 | 0.13803 | 0.96 |

*Reverse coded

Scale Transformation Constants for the TIMSS 2015 Students Confident in Mathematics Scale, Fourth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 8.5562 | Transformed Scale Score = 8.5562 + 1.599041 • Logit Scale Score |
| B = 1.599041 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Students Confident in Mathematics Scale, Fourth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 3.07742 | |
| 1 | 4.72829 | |
| 2 | 5.49394 | |
| 3 | 6.01123 | |
| 4 | 6.41043 | |
| 5 | 6.74273 | |
| 6 | 7.03006 | |
| 7 | 7.28571 | |
| 8 | 7.51692 | |
| 9 | 7.73253 | |
| 10 | 7.93452 | |
| 11 | 8.12606 | |
| 12 | 8.30992 | |
| 13 | 8.48862 | 8.5 |
| 14 | 8.66452 | |
| 15 | 8.83997 | |
| 16 | 9.01741 | |
| 17 | 9.19961 | |
| 18 | 9.38976 | |
| 19 | 9.59180 | |
| 20 | 9.81049 | |
| 21 | 10.04927 | |
| 22 | 10.32220 | |
| 23 | 10.64456 | 10.6 |
| 24 | 11.04413 | |
| 25 | 11.57999 | |
| 26 | 12.39959 | |
| 27 | 14.17323 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Students Confident in Mathematics Scale, Fourth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|----------|----------|---------|----------|---------|---------|----------|----------|
| | | | ASBM03A | ASBM03B* | ASBM03C* | ASBM03D | ASBM03E* | ASBM03F | ASBM03G | ASBM03H* | ASBM03I* |
| Australia | 0.87 | 50 | 0.74 | 0.71 | 0.78 | 0.71 | 0.65 | 0.74 | 0.42 | 0.78 | 0.74 |
| Bahrain | 0.76 | 35 | 0.18 | 0.72 | 0.74 | 0.38 | 0.73 | 0.34 | 0.33 | 0.79 | 0.74 |
| Belgium (Flemish) | 0.88 | 52 | 0.81 | 0.76 | 0.82 | 0.70 | 0.50 | 0.71 | 0.60 | 0.80 | 0.72 |
| Bulgaria | 0.87 | 49 | 0.73 | 0.70 | 0.73 | 0.71 | 0.62 | 0.70 | 0.66 | 0.74 | 0.73 |
| Canada | 0.86 | 48 | 0.73 | 0.75 | 0.77 | 0.70 | 0.63 | 0.69 | 0.38 | 0.78 | 0.74 |
| Chile | 0.82 | 41 | 0.65 | 0.60 | 0.70 | 0.64 | 0.64 | 0.61 | 0.44 | 0.72 | 0.75 |
| Chinese Taipei | 0.86 | 48 | 0.74 | 0.68 | 0.65 | 0.74 | 0.57 | 0.70 | 0.62 | 0.75 | 0.76 |
| Croatia | 0.89 | 53 | 0.75 | 0.73 | 0.71 | 0.76 | 0.69 | 0.70 | 0.67 | 0.77 | 0.78 |
| Cyprus | 0.86 | 47 | 0.71 | 0.68 | 0.71 | 0.68 | 0.61 | 0.70 | 0.59 | 0.73 | 0.74 |
| Czech Republic | 0.88 | 51 | 0.74 | 0.74 | 0.80 | 0.75 | 0.64 | 0.59 | 0.61 | 0.78 | 0.73 |
| Denmark | 0.87 | 50 | 0.78 | 0.75 | 0.80 | 0.74 | 0.58 | 0.63 | 0.54 | 0.75 | 0.74 |
| England | 0.87 | 49 | 0.73 | 0.70 | 0.78 | 0.71 | 0.64 | 0.72 | 0.36 | 0.79 | 0.76 |
| Finland | 0.86 | 49 | 0.78 | 0.73 | 0.81 | 0.74 | 0.64 | 0.70 | 0.52 | 0.77 | 0.53 |
| France | 0.87 | 50 | 0.75 | 0.72 | 0.77 | 0.74 | 0.64 | 0.61 | 0.54 | 0.76 | 0.77 |
| Georgia | 0.76 | 35 | 0.38 | 0.71 | 0.73 | 0.44 | 0.65 | 0.32 | 0.39 | 0.75 | 0.70 |
| Germany | 0.89 | 53 | 0.76 | 0.76 | 0.80 | 0.74 | 0.66 | 0.70 | 0.63 | 0.77 | 0.73 |
| Hong Kong SAR | 0.86 | 48 | 0.72 | 0.68 | 0.81 | 0.71 | 0.56 | 0.71 | 0.60 | 0.77 | 0.63 |
| Hungary | 0.88 | 52 | 0.78 | 0.72 | 0.78 | 0.76 | 0.56 | 0.74 | 0.72 | 0.74 | 0.68 |
| Indonesia | 0.75 | 34 | 0.37 | 0.70 | 0.73 | 0.41 | 0.70 | 0.16 | 0.32 | 0.75 | 0.76 |
| Iran, Islamic Rep. of | 0.76 | 34 | 0.50 | 0.56 | 0.50 | 0.52 | 0.68 | 0.52 | 0.49 | 0.72 | 0.72 |
| Ireland | 0.85 | 48 | 0.73 | 0.75 | 0.77 | 0.70 | 0.63 | 0.69 | 0.29 | 0.78 | 0.74 |
| Italy | 0.85 | 45 | 0.69 | 0.70 | 0.64 | 0.71 | 0.66 | 0.59 | 0.60 | 0.75 | 0.71 |
| Japan | 0.88 | 50 | 0.71 | 0.67 | 0.83 | 0.72 | 0.66 | 0.77 | 0.46 | 0.75 | 0.75 |
| Jordan | 0.75 | 35 | 0.09 | 0.73 | 0.76 | 0.26 | 0.78 | 0.17 | 0.25 | 0.80 | 0.77 |
| Kazakhstan | 0.85 | 45 | 0.68 | 0.69 | 0.72 | 0.66 | 0.62 | 0.66 | 0.65 | 0.72 | 0.64 |
| Korea, Rep. of | 0.88 | 53 | 0.82 | 0.78 | 0.78 | 0.73 | 0.43 | 0.79 | 0.56 | 0.80 | 0.76 |
| Kuwait | 0.75 | 33 | 0.22 | 0.68 | 0.70 | 0.40 | 0.71 | 0.36 | 0.39 | 0.75 | 0.70 |
| Lithuania | 0.84 | 45 | 0.75 | 0.70 | 0.75 | 0.66 | 0.48 | 0.69 | 0.62 | 0.72 | 0.59 |
| Morocco | 0.74 | 32 | 0.39 | 0.66 | 0.71 | 0.35 | 0.71 | 0.27 | 0.32 | 0.72 | 0.70 |
| Netherlands | 0.89 | 54 | 0.80 | 0.77 | 0.82 | 0.74 | 0.46 | 0.77 | 0.53 | 0.80 | 0.82 |
| New Zealand | 0.83 | 42 | 0.70 | 0.66 | 0.74 | 0.66 | 0.54 | 0.67 | 0.42 | 0.72 | 0.67 |
| Northern Ireland | 0.87 | 49 | 0.77 | 0.74 | 0.79 | 0.70 | 0.66 | 0.71 | 0.31 | 0.76 | 0.76 |
| Norway (5) | 0.87 | 49 | 0.76 | 0.72 | 0.75 | 0.75 | 0.57 | 0.75 | 0.50 | 0.76 | 0.70 |
| Oman | 0.69 | 30 | 0.07 | 0.73 | 0.62 | 0.21 | 0.74 | 0.08 | 0.15 | 0.78 | 0.76 |
| Poland | 0.88 | 52 | 0.75 | 0.74 | 0.73 | 0.76 | 0.60 | 0.74 | 0.65 | 0.79 | 0.74 |
| Portugal | 0.86 | 49 | 0.72 | 0.64 | 0.77 | 0.67 | 0.65 | 0.72 | 0.66 | 0.69 | 0.75 |
| Qatar | 0.80 | 38 | 0.34 | 0.75 | 0.76 | 0.43 | 0.72 | 0.40 | 0.39 | 0.79 | 0.73 |
| Russian Federation | 0.89 | 54 | 0.75 | 0.75 | 0.78 | 0.77 | 0.69 | 0.71 | 0.62 | 0.76 | 0.76 |
| Saudi Arabia | 0.75 | 35 | 0.04 | 0.74 | 0.74 | 0.24 | 0.79 | 0.18 | 0.24 | 0.81 | 0.77 |
| Serbia | 0.88 | 51 | 0.71 | 0.72 | 0.75 | 0.68 | 0.68 | 0.68 | 0.66 | 0.76 | 0.75 |
| Singapore | 0.87 | 49 | 0.77 | 0.73 | 0.76 | 0.69 | 0.61 | 0.69 | 0.52 | 0.78 | 0.75 |
| Slovak Republic | 0.87 | 48 | 0.72 | 0.68 | 0.75 | 0.70 | 0.67 | 0.67 | 0.58 | 0.74 | 0.74 |
| Slovenia | 0.88 | 52 | 0.76 | 0.70 | 0.72 | 0.69 | 0.66 | 0.74 | 0.66 | 0.78 | 0.75 |
| South Africa (5) | 0.69 | 29 | 0.12 | 0.72 | 0.73 | 0.11 | 0.68 | 0.05 | 0.06 | 0.76 | 0.71 |
| Spain | 0.85 | 45 | 0.68 | 0.71 | 0.74 | 0.61 | 0.65 | 0.61 | 0.58 | 0.73 | 0.73 |
| Sweden | 0.87 | 49 | 0.75 | 0.73 | 0.74 | 0.74 | 0.60 | 0.71 | 0.47 | 0.79 | 0.72 |
| Turkey | 0.82 | 42 | 0.63 | 0.70 | 0.74 | 0.55 | 0.61 | 0.58 | 0.59 | 0.70 | 0.70 |
| United Arab Emirates | 0.79 | 37 | 0.46 | 0.67 | 0.71 | 0.51 | 0.65 | 0.48 | 0.44 | 0.73 | 0.70 |
| United States | 0.86 | 48 | 0.70 | 0.75 | 0.77 | 0.68 | 0.64 | 0.68 | 0.39 | 0.79 | 0.75 |
| Benchmarking Participants | | | | | | | | | | | |
| Buenos Aires, Argentina | 0.81 | 40 | 0.64 | 0.62 | 0.69 | 0.55 | 0.66 | 0.55 | 0.41 | 0.74 | 0.75 |
| Ontario, Canada | 0.86 | 49 | 0.73 | 0.76 | 0.78 | 0.69 | 0.61 | 0.70 | 0.39 | 0.78 | 0.74 |
| Quebec, Canada | 0.87 | 50 | 0.77 | 0.75 | 0.76 | 0.77 | 0.66 | 0.69 | 0.39 | 0.75 | 0.72 |
| Norway (4) | 0.84 | 45 | 0.71 | 0.67 | 0.72 | 0.73 | 0.49 | 0.74 | 0.47 | 0.72 | 0.68 |
| Abu Dhabi, UAE | 0.77 | 35 | 0.37 | 0.67 | 0.71 | 0.45 | 0.69 | 0.40 | 0.37 | 0.72 | 0.73 |
| Dubai, UAE | 0.83 | 42 | 0.62 | 0.69 | 0.70 | 0.60 | 0.63 | 0.60 | 0.54 | 0.73 | 0.69 |
| Florida, US | 0.87 | 50 | 0.71 | 0.78 | 0.76 | 0.68 | 0.68 | 0.67 | 0.47 | 0.81 | 0.75 |

*Reverse coded

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Students Confident in Mathematics Scale, Fourth Grade, and TIMSS 2015 Mathematics Achievement

| Country | Pearson's Correlation with Mathematics Achievement | | Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|----------------------------------|--|-------------|---|
| | (r) | (r^2) | |
| Australia | 0.44 | 0.19 | 0.18 |
| Bahrain | 0.37 | 0.14 | 0.13 |
| Belgium (Flemish) | 0.39 | 0.15 | 0.14 |
| Bulgaria | 0.40 | 0.16 | 0.16 |
| Canada | 0.44 | 0.19 | 0.19 |
| Chile | 0.41 | 0.17 | 0.17 |
| Chinese Taipei | 0.44 | 0.19 | 0.20 |
| Croatia | 0.45 | 0.20 | 0.19 |
| Cyprus | 0.44 | 0.19 | 0.18 |
| Czech Republic | 0.42 | 0.18 | 0.18 |
| Denmark | 0.42 | 0.17 | 0.17 |
| England | 0.32 | 0.10 | 0.12 |
| Finland | 0.43 | 0.19 | 0.17 |
| France | 0.40 | 0.16 | 0.16 |
| Georgia | 0.36 | 0.13 | 0.15 |
| Germany | 0.42 | 0.18 | 0.18 |
| Hong Kong SAR | 0.41 | 0.17 | 0.18 |
| Hungary | 0.49 | 0.24 | 0.25 |
| Indonesia | 0.29 | 0.09 | 0.09 |
| Iran, Islamic Rep. of | 0.30 | 0.09 | 0.10 |
| Ireland | 0.43 | 0.18 | 0.18 |
| Italy | 0.32 | 0.10 | 0.10 |
| Japan | 0.44 | 0.19 | 0.19 |
| Jordan | 0.38 | 0.14 | 0.15 |
| Kazakhstan | 0.22 | 0.05 | 0.05 |
| Korea, Rep. of | 0.54 | 0.29 | 0.27 |
| Kuwait | 0.26 | 0.07 | 0.07 |
| Lithuania | 0.46 | 0.21 | 0.21 |
| Morocco | 0.32 | 0.10 | 0.10 |
| Netherlands | 0.52 | 0.27 | 0.28 |
| New Zealand | 0.37 | 0.14 | 0.13 |
| Northern Ireland | 0.40 | 0.16 | 0.17 |
| Norway (5) | 0.42 | 0.18 | 0.16 |
| Oman | 0.31 | 0.10 | 0.10 |
| Poland | 0.47 | 0.22 | 0.22 |
| Portugal | 0.49 | 0.24 | 0.25 |
| Qatar | 0.28 | 0.08 | 0.10 |
| Russian Federation | 0.39 | 0.15 | 0.16 |
| Saudi Arabia | 0.28 | 0.08 | 0.09 |
| Serbia | 0.44 | 0.19 | 0.19 |
| Singapore | 0.47 | 0.22 | 0.22 |
| Slovak Republic | 0.40 | 0.16 | 0.15 |
| Slovenia | 0.46 | 0.21 | 0.21 |
| South Africa (5) | 0.38 | 0.15 | 0.15 |
| Spain | 0.44 | 0.19 | 0.21 |
| Sweden | 0.38 | 0.14 | 0.13 |
| Turkey | 0.47 | 0.22 | 0.20 |
| United Arab Emirates | 0.32 | 0.11 | 0.11 |
| United States | 0.43 | 0.18 | 0.19 |
| International Median | 0.41 | 0.17 | 0.17 |
| Benchmarking Participants | | | |
| Buenos Aires, Argentina | 0.33 | 0.11 | 0.12 |
| Ontario, Canada | 0.45 | 0.20 | 0.20 |
| Quebec, Canada | 0.43 | 0.19 | 0.17 |
| Norway (4) | 0.39 | 0.15 | 0.14 |
| Abu Dhabi, UAE | 0.37 | 0.14 | 0.14 |
| Dubai, UAE | 0.30 | 0.09 | 0.10 |
| Florida, US | 0.43 | 0.18 | 0.20 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Students Confident in Science Scale, Fourth Grade

The Students Confident in Science (SCS) scale was created based on students’ degree of agreement with the seven statements described below.

Items in the TIMSS 2015 Students Confident in Science Scale, Fourth Grade

| | | How much do you agree with these statements about science? | | | | |
|---|----------|---|-----------------------|-----------------------|-----------------------|-----------------------|
| | | Agree a lot | Agree a little | Disagree a little | Disagree a lot | |
| T | ASBS06A | 1) I usually do well in science ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| T | ASBS06B* | 2) Science is harder for me than for many of my classmates* ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| T | ASBS06C* | 3) I am just not good at science* ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| T | ASBS06D | 4) I learn things quickly in science ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | ASBS06E | 5) My teacher tells me I am good at science ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| T | ASBS06F* | 6) Science is harder for me than any other subject* ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | ASBS06G* | 7) Science makes me confused* ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

* Reverse coded

T Trend item—item was included in the same scale in TIMSS 2011 and was used for linking the TIMSS 2011 and TIMSS 2015 scales.

Item Parameters for the TIMSS 2015 Students Confident in Science Scale, Fourth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|----------|----------|----------|----------|---------|-------|
| ASBS06A | -0.39055 | -0.49625 | -0.66696 | 1.16321 | 1.02 |
| ASBS06B* | 0.20690 | -0.51673 | 0.11786 | 0.39887 | 0.99 |
| ASBS06C* | 0.09646 | -0.33652 | 0.05023 | 0.28629 | 0.95 |
| ASBS06D | -0.24028 | -0.68647 | -0.30807 | 0.99454 | 1.03 |
| ASBS06E | 0.14669 | -0.81490 | -0.26498 | 1.07988 | 1.27 |
| ASBS06F* | 0.12712 | -0.23193 | 0.04516 | 0.18677 | 0.93 |
| ASBS06G* | 0.05366 | -0.19671 | 0.12470 | 0.07201 | 0.99 |

*Reverse coded

Scale Transformation Constants for the TIMSS 2015 Students Confident in Science Scale, Fourth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 8.285794 | Transformed Scale Score = 8.285794 + 1.489538 • Logit Scale Score |
| B = 1.489538 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Students Confident in Science Scale, Fourth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 3.59707 | |
| 1 | 5.10277 | |
| 2 | 5.80866 | |
| 3 | 6.29097 | |
| 4 | 6.67014 | |
| 5 | 6.98812 | |
| 6 | 7.26571 | |
| 7 | 7.51852 | |
| 8 | 7.75142 | |
| 9 | 7.97047 | |
| 10 | 8.18083 | 8.2 |
| 11 | 8.38716 | |
| 12 | 8.59408 | |
| 13 | 8.80664 | |
| 14 | 9.03080 | |
| 15 | 9.27412 | |
| 16 | 9.54624 | |
| 17 | 9.85727 | |
| 18 | 10.24189 | 10.2 |
| 19 | 10.75225 | |
| 20 | 11.53013 | |
| 21 | 13.20458 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Students Confident in Science Scale, Fourth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|----------|----------|---------|---------|----------|----------|
| | | | ASB506A | ASB506B* | ASB506C* | ASB506D | ASB506E | ASB506F* | ASB506G* |
| Australia | 0.84 | 51 | 0.72 | 0.77 | 0.79 | 0.71 | 0.50 | 0.75 | 0.73 |
| Bahrain | 0.72 | 39 | 0.08 | 0.81 | 0.79 | 0.35 | 0.26 | 0.85 | 0.76 |
| Belgium (Flemish) | 0.85 | 52 | 0.77 | 0.75 | 0.80 | 0.67 | 0.54 | 0.78 | 0.73 |
| Bulgaria | 0.82 | 48 | 0.60 | 0.76 | 0.77 | 0.64 | 0.53 | 0.77 | 0.75 |
| Canada | 0.83 | 51 | 0.70 | 0.78 | 0.77 | 0.71 | 0.45 | 0.79 | 0.74 |
| Chile | 0.76 | 42 | 0.51 | 0.74 | 0.72 | 0.53 | 0.31 | 0.79 | 0.77 |
| Chinese Taipei | 0.83 | 50 | 0.68 | 0.75 | 0.68 | 0.71 | 0.55 | 0.78 | 0.78 |
| Croatia | 0.87 | 57 | 0.75 | 0.79 | 0.75 | 0.74 | 0.66 | 0.81 | 0.77 |
| Cyprus | 0.85 | 52 | 0.73 | 0.72 | 0.75 | 0.72 | 0.65 | 0.72 | 0.75 |
| Czech Republic | 0.87 | 57 | 0.75 | 0.76 | 0.81 | 0.75 | 0.62 | 0.81 | 0.74 |
| Denmark | 0.86 | 55 | 0.78 | 0.73 | 0.79 | 0.79 | 0.61 | 0.75 | 0.73 |
| England | 0.85 | 54 | 0.75 | 0.77 | 0.82 | 0.73 | 0.46 | 0.79 | 0.76 |
| Finland | 0.82 | 49 | 0.76 | 0.76 | 0.81 | 0.75 | 0.53 | 0.76 | 0.47 |
| France | 0.85 | 54 | 0.75 | 0.72 | 0.76 | 0.74 | 0.58 | 0.78 | 0.78 |
| Georgia | 0.74 | 40 | 0.29 | 0.80 | 0.80 | 0.31 | 0.21 | 0.82 | 0.78 |
| Germany | 0.84 | 52 | 0.69 | 0.77 | 0.78 | 0.71 | 0.56 | 0.79 | 0.72 |
| Hong Kong SAR | 0.81 | 47 | 0.65 | 0.72 | 0.81 | 0.65 | 0.49 | 0.79 | 0.65 |
| Hungary | 0.86 | 55 | 0.77 | 0.77 | 0.80 | 0.72 | 0.68 | 0.78 | 0.66 |
| Indonesia | 0.73 | 39 | 0.29 | 0.77 | 0.78 | 0.38 | 0.21 | 0.79 | 0.78 |
| Iran, Islamic Rep. of | 0.76 | 41 | 0.32 | 0.69 | 0.80 | 0.44 | 0.36 | 0.83 | 0.80 |
| Ireland | 0.82 | 49 | 0.71 | 0.77 | 0.77 | 0.69 | 0.38 | 0.77 | 0.73 |
| Italy | 0.78 | 44 | 0.67 | 0.68 | 0.57 | 0.70 | 0.57 | 0.75 | 0.68 |
| Japan | 0.83 | 51 | 0.70 | 0.73 | 0.83 | 0.70 | 0.46 | 0.77 | 0.74 |
| Jordan | 0.72 | 40 | -0.02 | 0.82 | 0.82 | 0.21 | 0.22 | 0.85 | 0.80 |
| Kazakhstan | 0.82 | 48 | 0.60 | 0.76 | 0.76 | 0.63 | 0.58 | 0.77 | 0.71 |
| Korea, Rep. of | 0.86 | 55 | 0.80 | 0.77 | 0.80 | 0.69 | 0.57 | 0.78 | 0.76 |
| Kuwait | 0.72 | 39 | 0.17 | 0.78 | 0.76 | 0.40 | 0.34 | 0.81 | 0.75 |
| Lithuania | 0.81 | 48 | 0.69 | 0.75 | 0.79 | 0.60 | 0.51 | 0.78 | 0.66 |
| Morocco | 0.72 | 37 | 0.31 | 0.75 | 0.75 | 0.40 | 0.30 | 0.77 | 0.74 |
| Netherlands | 0.84 | 52 | 0.70 | 0.75 | 0.80 | 0.67 | 0.44 | 0.79 | 0.81 |
| New Zealand | 0.77 | 43 | 0.63 | 0.69 | 0.75 | 0.61 | 0.41 | 0.75 | 0.69 |
| Northern Ireland | 0.84 | 52 | 0.71 | 0.73 | 0.80 | 0.72 | 0.47 | 0.79 | 0.75 |
| Norway (5) | 0.82 | 48 | 0.72 | 0.75 | 0.75 | 0.71 | 0.49 | 0.74 | 0.67 |
| Oman | 0.70 | 37 | 0.11 | 0.78 | 0.72 | 0.33 | 0.25 | 0.82 | 0.77 |
| Poland | 0.83 | 50 | 0.72 | 0.77 | 0.66 | 0.73 | 0.58 | 0.76 | 0.72 |
| Portugal | 0.76 | 42 | 0.64 | 0.65 | 0.73 | 0.67 | 0.54 | 0.59 | 0.72 |
| Qatar | 0.77 | 43 | 0.30 | 0.82 | 0.77 | 0.42 | 0.37 | 0.84 | 0.78 |
| Russian Federation | 0.87 | 57 | 0.73 | 0.79 | 0.82 | 0.76 | 0.63 | 0.79 | 0.76 |
| Saudi Arabia | 0.72 | 40 | 0.00 | 0.81 | 0.81 | 0.24 | 0.20 | 0.85 | 0.80 |
| Serbia | 0.82 | 49 | 0.63 | 0.74 | 0.75 | 0.65 | 0.59 | 0.76 | 0.74 |
| Singapore | 0.86 | 55 | 0.74 | 0.80 | 0.79 | 0.70 | 0.55 | 0.80 | 0.75 |
| Slovak Republic | 0.85 | 53 | 0.73 | 0.73 | 0.79 | 0.71 | 0.57 | 0.79 | 0.74 |
| Slovenia | 0.86 | 54 | 0.74 | 0.75 | 0.73 | 0.73 | 0.64 | 0.79 | 0.74 |
| South Africa (5) | - | - | - | - | - | - | - | - | - |
| Spain | 0.82 | 49 | 0.67 | 0.75 | 0.75 | 0.64 | 0.58 | 0.76 | 0.72 |
| Sweden | 0.81 | 48 | 0.69 | 0.71 | 0.76 | 0.71 | 0.47 | 0.77 | 0.70 |
| Turkey | 0.77 | 43 | 0.50 | 0.75 | 0.79 | 0.49 | 0.41 | 0.79 | 0.73 |
| United Arab Emirates | 0.77 | 42 | 0.39 | 0.77 | 0.75 | 0.50 | 0.40 | 0.81 | 0.74 |
| United States | 0.82 | 49 | 0.67 | 0.78 | 0.77 | 0.64 | 0.43 | 0.80 | 0.74 |
| Benchmarking Participants | | | | | | | | | |
| Buenos Aires, Argentina | 0.74 | 40 | 0.54 | 0.70 | 0.74 | 0.50 | 0.38 | 0.72 | 0.73 |
| Ontario, Canada | 0.84 | 52 | 0.70 | 0.79 | 0.80 | 0.69 | 0.44 | 0.80 | 0.75 |
| Quebec, Canada | 0.83 | 50 | 0.74 | 0.75 | 0.70 | 0.75 | 0.47 | 0.78 | 0.73 |
| Norway (4) | 0.81 | 48 | 0.70 | 0.74 | 0.75 | 0.71 | 0.51 | 0.74 | 0.65 |
| Abu Dhabi, UAE | 0.74 | 40 | 0.27 | 0.78 | 0.76 | 0.41 | 0.33 | 0.82 | 0.75 |
| Dubai, UAE | 0.81 | 47 | 0.58 | 0.78 | 0.75 | 0.60 | 0.50 | 0.79 | 0.73 |
| Florida, US | 0.84 | 52 | 0.67 | 0.77 | 0.79 | 0.68 | 0.49 | 0.80 | 0.77 |

*Reverse coded

A dash (-) indicates comparable data not available.

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Students Confident in Science Scale, Fourth Grade, and TIMSS 2015 Science Achievement

| Country | Pearson's Correlation with Science Achievement | | Variance in Science Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|----------------------------------|--|-------------|---|
| | (r) | (r^2) | |
| Australia | 0.20 | 0.04 | 0.05 |
| Bahrain | 0.38 | 0.15 | 0.15 |
| Belgium (Flemish) | 0.25 | 0.06 | 0.08 |
| Bulgaria | 0.42 | 0.18 | 0.20 |
| Canada | 0.24 | 0.06 | 0.07 |
| Chile | 0.29 | 0.08 | 0.09 |
| Chinese Taipei | 0.31 | 0.10 | 0.10 |
| Croatia | 0.25 | 0.06 | 0.07 |
| Cyprus | 0.21 | 0.04 | 0.05 |
| Czech Republic | 0.20 | 0.04 | 0.06 |
| Denmark | 0.18 | 0.03 | 0.04 |
| England | 0.22 | 0.05 | 0.06 |
| Finland | 0.25 | 0.06 | 0.07 |
| France | 0.23 | 0.05 | 0.07 |
| Georgia | 0.29 | 0.09 | 0.10 |
| Germany | 0.24 | 0.06 | 0.06 |
| Hong Kong SAR | 0.30 | 0.09 | 0.11 |
| Hungary | 0.33 | 0.11 | 0.11 |
| Indonesia | 0.29 | 0.08 | 0.10 |
| Iran, Islamic Rep. of | 0.35 | 0.12 | 0.13 |
| Ireland | 0.23 | 0.05 | 0.07 |
| Italy | 0.20 | 0.04 | 0.05 |
| Japan | 0.22 | 0.05 | 0.05 |
| Jordan | - | - | - |
| Kazakhstan | 0.21 | 0.05 | 0.05 |
| Korea, Rep. of | 0.36 | 0.13 | 0.12 |
| Kuwait | 0.27 | 0.07 | 0.09 |
| Lithuania | 0.33 | 0.11 | 0.12 |
| Morocco | 0.35 | 0.12 | 0.13 |
| Netherlands | 0.28 | 0.08 | 0.09 |
| New Zealand | 0.26 | 0.07 | 0.08 |
| Northern Ireland | 0.18 | 0.03 | 0.05 |
| Norway (5) | 0.22 | 0.05 | 0.06 |
| Oman | 0.33 | 0.11 | 0.12 |
| Poland | 0.24 | 0.06 | 0.07 |
| Portugal | 0.26 | 0.07 | 0.08 |
| Qatar | 0.34 | 0.11 | 0.14 |
| Russian Federation | 0.20 | 0.04 | 0.04 |
| Saudi Arabia | 0.32 | 0.11 | 0.12 |
| Serbia | 0.27 | 0.07 | 0.08 |
| Singapore | 0.26 | 0.07 | 0.08 |
| Slovak Republic | 0.28 | 0.08 | 0.09 |
| Slovenia | 0.31 | 0.10 | 0.12 |
| South Africa (5) | - | - | - |
| Spain | 0.34 | 0.12 | 0.13 |
| Sweden | 0.22 | 0.05 | 0.06 |
| Turkey | 0.43 | 0.19 | 0.19 |
| United Arab Emirates | 0.37 | 0.14 | 0.15 |
| United States | 0.26 | 0.07 | 0.08 |
| International Median | 0.26 | 0.07 | 0.08 |
| Benchmarking Participants | | | |
| Buenos Aires, Argentina | 0.24 | 0.06 | 0.05 |
| Ontario, Canada | 0.23 | 0.05 | 0.06 |
| Quebec, Canada | 0.22 | 0.05 | 0.06 |
| Norway (4) | 0.24 | 0.06 | 0.07 |
| Abu Dhabi, UAE | 0.42 | 0.18 | 0.17 |
| Dubai, UAE | 0.28 | 0.08 | 0.10 |
| Florida, US | 0.27 | 0.07 | 0.08 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

A dash (-) indicates comparable data not available.

Students Like Learning Mathematics Scale, Fourth Grade

The Students Like Learning Mathematics (SLM) scale was created based on students' degree of agreement with the nine statements described below.

Items in the TIMSS 2015 Students Like Learning Mathematics Scale, Fourth Grade

| | | How much do you agree with these statements about learning mathematics? | | | |
|---|----------|---|----------------|-------------------|----------------|
| | | Agree a lot | Agree a little | Disagree a little | Disagree a lot |
| T | ASBM01A | 1) I enjoy learning mathematics -----○ | ○ | ○ | ○ |
| T | ASBM01B* | 2) I wish I did not have to study mathematics* -----○ | ○ | ○ | ○ |
| T | ASBM01C* | 3) Mathematics is boring* -----○ | ○ | ○ | ○ |
| T | ASBM01D | 4) I learn many interesting things in mathematics ---○ | ○ | ○ | ○ |
| T | ASBM01E | 5) I like mathematics -----○ | ○ | ○ | ○ |
| | ASBM01F | 6) I like any schoolwork that involves numbers -----○ | ○ | ○ | ○ |
| | ASBM01G | 7) I like to solve mathematics problems-----○ | ○ | ○ | ○ |
| | ASBM01H | 8) I look forward to mathematics lessons -----○ | ○ | ○ | ○ |
| | ASBM01I | 9) Mathematics is one of my favorite subjects -----○ | ○ | ○ | ○ |

* Reverse coded

T Trend item—item was included in the same scale in TIMSS 2011 and was used for linking the TIMSS 2011 and TIMSS 2015 scales.

Item Parameters for the TIMSS 2015 Students Like Learning Mathematics Scale, Fourth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|----------|----------|----------|----------|---------|-------|
| ASBM01A | -0.36154 | -0.78229 | -0.58169 | 1.36398 | 0.78 |
| ASBM01B* | 0.16159 | -0.46676 | -0.01626 | 0.48302 | 1.72 |
| ASBM01C* | 0.12982 | -0.82103 | 0.11530 | 0.70573 | 1.39 |
| ASBM01D | -0.81796 | -0.82855 | -0.37351 | 1.20206 | 1.18 |
| ASBM01E | -0.19078 | -0.58243 | -0.43159 | 1.01402 | 0.65 |
| ASBM01F | 0.03849 | -1.25798 | -0.21189 | 1.46987 | 1.05 |
| ASBM01G | 0.15055 | -0.96095 | -0.26596 | 1.22691 | 1.06 |
| ASBM01H | 0.41364 | -1.10049 | -0.23780 | 1.33829 | 0.84 |
| ASBM01I | 0.47619 | -0.62831 | -0.10305 | 0.73136 | 0.91 |

*Reverse coded

Scale Transformation Constants for the TIMSS 2015 Students Like Learning Mathematics Scale, Fourth Grade

Scale Transformation Constants

A = 8.402636

B = 1.047479

Transformed Scale Score = 8.402636 + 1.047479 • Logit Scale Score

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Students Like Learning Mathematics Scale, Fourth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 4.40782 | |
| 1 | 5.53183 | |
| 2 | 6.06393 | |
| 3 | 6.42611 | |
| 4 | 6.71073 | |
| 5 | 6.94947 | |
| 6 | 7.15899 | |
| 7 | 7.34756 | |
| 8 | 7.52392 | |
| 9 | 7.68976 | |
| 10 | 7.84785 | |
| 11 | 8.00037 | |
| 12 | 8.14916 | |
| 13 | 8.29582 | 8.3 |
| 14 | 8.44192 | |
| 15 | 8.58902 | |
| 16 | 8.73889 | |
| 17 | 8.89348 | |
| 18 | 9.05518 | |
| 19 | 9.22676 | |
| 20 | 9.41034 | |
| 21 | 9.61310 | |
| 22 | 9.84154 | |
| 23 | 10.10678 | 10.1 |
| 24 | 10.42683 | |
| 25 | 10.83982 | |
| 26 | 11.43903 | |
| 27 | 12.65794 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Students Like Learning Mathematics Scale, Fourth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|----------|----------|---------|---------|---------|---------|---------|---------|
| | | | ASBM01A | ASBM01B* | ASBM01C* | ASBM01D | ASBM01E | ASBM01F | ASBM01G | ASBM01H | ASBM01I |
| Australia | 0.93 | 66 | 0.88 | 0.67 | 0.77 | 0.70 | 0.91 | 0.76 | 0.82 | 0.89 | 0.86 |
| Bahrain | 0.89 | 55 | 0.79 | 0.47 | 0.52 | 0.76 | 0.87 | 0.69 | 0.80 | 0.82 | 0.83 |
| Belgium (Flemish) | 0.93 | 65 | 0.89 | 0.78 | 0.82 | 0.64 | 0.92 | 0.78 | 0.70 | 0.82 | 0.86 |
| Bulgaria | 0.92 | 63 | 0.86 | 0.52 | 0.68 | 0.74 | 0.89 | 0.83 | 0.88 | 0.84 | 0.85 |
| Canada | 0.93 | 64 | 0.87 | 0.63 | 0.74 | 0.70 | 0.91 | 0.77 | 0.81 | 0.87 | 0.85 |
| Chile | 0.91 | 59 | 0.84 | 0.58 | 0.68 | 0.69 | 0.88 | 0.71 | 0.83 | 0.84 | 0.83 |
| Chinese Taipei | 0.95 | 70 | 0.88 | 0.75 | 0.74 | 0.79 | 0.92 | 0.84 | 0.85 | 0.88 | 0.87 |
| Croatia | 0.93 | 66 | 0.89 | 0.71 | 0.82 | 0.68 | 0.92 | 0.82 | 0.61 | 0.92 | 0.86 |
| Cyprus | 0.93 | 64 | 0.86 | 0.70 | 0.70 | 0.73 | 0.89 | 0.77 | 0.79 | 0.87 | 0.85 |
| Czech Republic | 0.93 | 66 | 0.90 | 0.65 | 0.79 | 0.63 | 0.92 | 0.81 | 0.73 | 0.91 | 0.89 |
| Denmark | 0.94 | 67 | 0.86 | 0.70 | 0.81 | 0.77 | 0.90 | 0.76 | 0.85 | 0.87 | 0.82 |
| England | 0.93 | 66 | 0.87 | 0.72 | 0.80 | 0.68 | 0.91 | 0.77 | 0.77 | 0.90 | 0.85 |
| Finland | 0.93 | 65 | 0.86 | 0.68 | 0.82 | 0.78 | 0.91 | 0.81 | 0.67 | 0.86 | 0.85 |
| France | 0.91 | 59 | 0.87 | 0.65 | 0.76 | 0.68 | 0.89 | 0.70 | 0.67 | 0.83 | 0.84 |
| Georgia | 0.84 | 47 | 0.78 | 0.36 | 0.37 | 0.69 | 0.85 | 0.70 | 0.75 | 0.71 | 0.74 |
| Germany | 0.93 | 66 | 0.88 | 0.73 | 0.73 | 0.71 | 0.92 | 0.81 | 0.76 | 0.90 | 0.87 |
| Hong Kong SAR | 0.94 | 67 | 0.86 | 0.65 | 0.74 | 0.79 | 0.91 | 0.83 | 0.84 | 0.86 | 0.86 |
| Hungary | 0.93 | 63 | 0.87 | 0.65 | 0.72 | 0.69 | 0.90 | 0.81 | 0.74 | 0.88 | 0.84 |
| Indonesia | 0.75 | 40 | 0.72 | 0.31 | 0.39 | 0.66 | 0.81 | 0.69 | 0.43 | 0.70 | 0.74 |
| Iran, Islamic Rep. of | 0.83 | 46 | 0.77 | 0.47 | 0.44 | 0.63 | 0.83 | 0.53 | 0.79 | 0.72 | 0.80 |
| Ireland | 0.92 | 63 | 0.87 | 0.66 | 0.75 | 0.67 | 0.91 | 0.78 | 0.76 | 0.88 | 0.83 |
| Italy | 0.93 | 63 | 0.88 | 0.73 | 0.79 | 0.63 | 0.90 | 0.77 | 0.68 | 0.88 | 0.86 |
| Japan | 0.94 | 67 | 0.89 | 0.60 | 0.73 | 0.76 | 0.91 | 0.82 | 0.85 | 0.89 | 0.85 |
| Jordan | 0.83 | 50 | 0.71 | 0.30 | 0.36 | 0.75 | 0.86 | 0.74 | 0.80 | 0.82 | 0.77 |
| Kazakhstan | 0.83 | 47 | 0.62 | 0.36 | 0.56 | 0.63 | 0.80 | 0.71 | 0.77 | 0.80 | 0.78 |
| Korea, Rep. of | 0.94 | 67 | 0.86 | 0.63 | 0.80 | 0.77 | 0.91 | 0.85 | 0.86 | 0.83 | 0.85 |
| Kuwait | 0.87 | 54 | 0.80 | 0.30 | 0.46 | 0.76 | 0.87 | 0.74 | 0.82 | 0.84 | 0.80 |
| Lithuania | 0.92 | 61 | 0.85 | 0.66 | 0.67 | 0.59 | 0.89 | 0.81 | 0.86 | 0.85 | 0.80 |
| Morocco | 0.75 | 41 | 0.66 | 0.27 | 0.31 | 0.68 | 0.79 | 0.70 | 0.70 | 0.76 | 0.66 |
| Netherlands | 0.93 | 63 | 0.85 | 0.71 | 0.78 | 0.65 | 0.90 | 0.76 | 0.82 | 0.85 | 0.81 |
| New Zealand | 0.93 | 66 | 0.88 | 0.70 | 0.75 | 0.71 | 0.90 | 0.79 | 0.84 | 0.87 | 0.85 |
| Northern Ireland | 0.92 | 62 | 0.87 | 0.65 | 0.75 | 0.66 | 0.90 | 0.79 | 0.74 | 0.88 | 0.83 |
| Norway (5) | 0.94 | 68 | 0.86 | 0.66 | 0.82 | 0.75 | 0.91 | 0.81 | 0.86 | 0.87 | 0.85 |
| Oman | 0.77 | 41 | 0.69 | 0.33 | 0.39 | 0.62 | 0.79 | 0.64 | 0.76 | 0.65 | 0.75 |
| Poland | 0.93 | 65 | 0.88 | 0.71 | 0.78 | 0.73 | 0.91 | 0.78 | 0.87 | 0.72 | 0.85 |
| Portugal | 0.92 | 63 | 0.87 | 0.72 | 0.75 | 0.66 | 0.90 | 0.76 | 0.79 | 0.85 | 0.83 |
| Qatar | 0.89 | 55 | 0.80 | 0.44 | 0.52 | 0.77 | 0.87 | 0.74 | 0.79 | 0.80 | 0.82 |
| Russian Federation | 0.89 | 56 | 0.84 | 0.45 | 0.70 | 0.67 | 0.87 | 0.75 | 0.73 | 0.84 | 0.82 |
| Saudi Arabia | 0.87 | 54 | 0.78 | 0.34 | 0.40 | 0.79 | 0.87 | 0.75 | 0.83 | 0.85 | 0.80 |
| Serbia | 0.93 | 65 | 0.86 | 0.65 | 0.75 | 0.71 | 0.91 | 0.79 | 0.79 | 0.90 | 0.83 |
| Singapore | 0.93 | 64 | 0.86 | 0.75 | 0.75 | 0.72 | 0.89 | 0.73 | 0.81 | 0.84 | 0.85 |
| Slovak Republic | 0.92 | 62 | 0.87 | 0.65 | 0.73 | 0.58 | 0.89 | 0.75 | 0.82 | 0.90 | 0.85 |
| Slovenia | 0.93 | 66 | 0.86 | 0.65 | 0.78 | 0.76 | 0.91 | 0.77 | 0.81 | 0.91 | 0.84 |
| South Africa (5) | 0.77 | 39 | 0.70 | 0.26 | 0.33 | 0.60 | 0.79 | 0.67 | 0.67 | 0.67 | 0.72 |
| Spain | 0.91 | 59 | 0.83 | 0.59 | 0.74 | 0.64 | 0.88 | 0.70 | 0.77 | 0.85 | 0.84 |
| Sweden | 0.93 | 67 | 0.85 | 0.68 | 0.85 | 0.72 | 0.91 | 0.83 | 0.77 | 0.87 | 0.83 |
| Turkey | 0.84 | 48 | 0.78 | 0.54 | 0.65 | 0.40 | 0.83 | 0.62 | 0.74 | 0.77 | 0.79 |
| United Arab Emirates | 0.89 | 56 | 0.80 | 0.52 | 0.65 | 0.74 | 0.86 | 0.69 | 0.79 | 0.79 | 0.81 |
| United States | 0.93 | 65 | 0.88 | 0.66 | 0.75 | 0.71 | 0.91 | 0.76 | 0.86 | 0.87 | 0.85 |
| Benchmarking Participants | | | | | | | | | | | |
| Buenos Aires, Argentina | 0.91 | 60 | 0.84 | 0.54 | 0.64 | 0.68 | 0.89 | 0.78 | 0.81 | 0.85 | 0.85 |
| Ontario, Canada | 0.93 | 65 | 0.88 | 0.66 | 0.74 | 0.70 | 0.91 | 0.76 | 0.83 | 0.88 | 0.85 |
| Quebec, Canada | 0.91 | 60 | 0.84 | 0.56 | 0.76 | 0.69 | 0.89 | 0.74 | 0.73 | 0.87 | 0.82 |
| Norway (4) | 0.93 | 66 | 0.87 | 0.60 | 0.79 | 0.74 | 0.91 | 0.79 | 0.86 | 0.89 | 0.83 |
| Abu Dhabi, UAE | 0.89 | 55 | 0.79 | 0.48 | 0.60 | 0.75 | 0.85 | 0.71 | 0.80 | 0.80 | 0.80 |
| Dubai, UAE | 0.91 | 58 | 0.84 | 0.60 | 0.71 | 0.71 | 0.87 | 0.68 | 0.78 | 0.79 | 0.84 |
| Florida, US | 0.93 | 65 | 0.87 | 0.65 | 0.74 | 0.70 | 0.90 | 0.77 | 0.88 | 0.86 | 0.83 |

*Reverse coded

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Students Like Learning Mathematics Scale, Fourth Grade, and TIMSS 2015 Mathematics Achievement

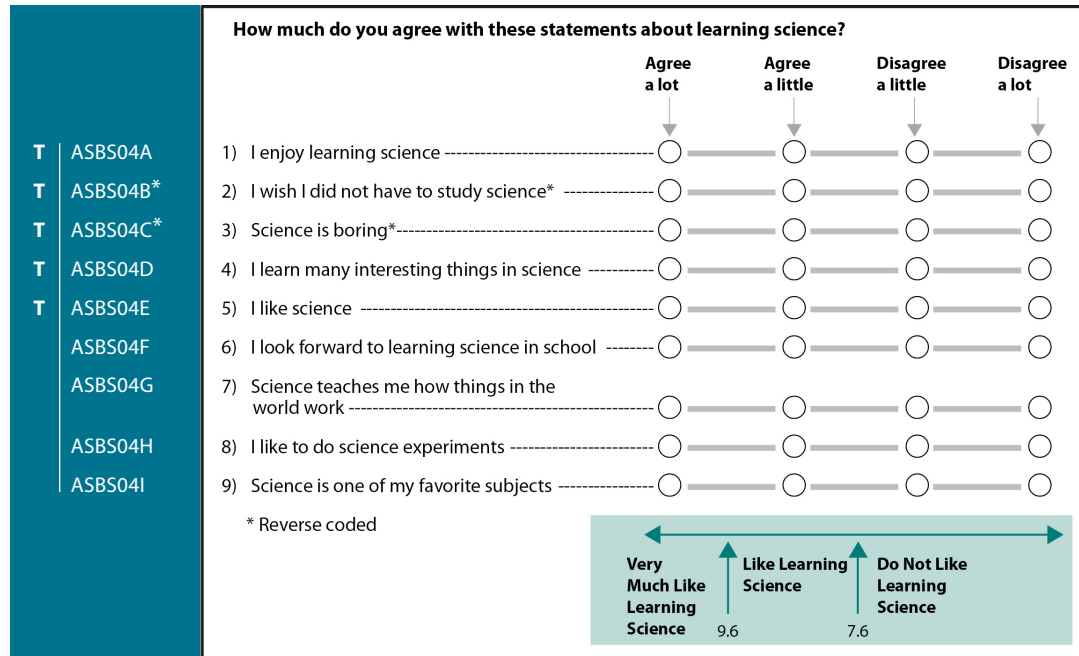
| Country | Pearson's Correlation with Mathematics Achievement | | Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|----------------------------------|--|-------------|---|
| | (r) | (r^2) | |
| Australia | 0.19 | 0.04 | 0.03 |
| Bahrain | 0.21 | 0.04 | 0.05 |
| Belgium (Flemish) | 0.10 | 0.01 | 0.01 |
| Bulgaria | 0.22 | 0.05 | 0.04 |
| Canada | 0.21 | 0.04 | 0.04 |
| Chile | 0.19 | 0.04 | 0.04 |
| Chinese Taipei | 0.21 | 0.05 | 0.04 |
| Croatia | 0.14 | 0.02 | 0.02 |
| Cyprus | 0.18 | 0.03 | 0.04 |
| Czech Republic | 0.17 | 0.03 | 0.02 |
| Denmark | 0.17 | 0.03 | 0.03 |
| England | 0.12 | 0.02 | 0.02 |
| Finland | 0.20 | 0.04 | 0.03 |
| France | 0.19 | 0.04 | 0.03 |
| Georgia | 0.22 | 0.05 | 0.04 |
| Germany | 0.16 | 0.03 | 0.03 |
| Hong Kong SAR | 0.22 | 0.05 | 0.04 |
| Hungary | 0.20 | 0.04 | 0.03 |
| Indonesia | 0.24 | 0.06 | 0.06 |
| Iran, Islamic Rep. of | 0.23 | 0.05 | 0.05 |
| Ireland | 0.17 | 0.03 | 0.03 |
| Italy | 0.13 | 0.02 | 0.01 |
| Japan | 0.30 | 0.09 | 0.09 |
| Jordan | 0.25 | 0.06 | 0.06 |
| Kazakhstan | 0.15 | 0.02 | 0.02 |
| Korea, Rep. of | 0.33 | 0.11 | 0.10 |
| Kuwait | 0.18 | 0.03 | 0.04 |
| Lithuania | 0.16 | 0.02 | 0.02 |
| Morocco | 0.29 | 0.09 | 0.08 |
| Netherlands | 0.18 | 0.03 | 0.03 |
| New Zealand | 0.05 | 0.00 | 0.00 |
| Northern Ireland | 0.18 | 0.03 | 0.03 |
| Norway (5) | 0.10 | 0.01 | 0.02 |
| Oman | 0.26 | 0.07 | 0.06 |
| Poland | 0.13 | 0.02 | 0.02 |
| Portugal | 0.28 | 0.08 | 0.07 |
| Qatar | 0.21 | 0.04 | 0.05 |
| Russian Federation | 0.22 | 0.05 | 0.04 |
| Saudi Arabia | 0.21 | 0.04 | 0.05 |
| Serbia | 0.10 | 0.01 | 0.01 |
| Singapore | 0.23 | 0.05 | 0.05 |
| Slovak Republic | 0.07 | 0.01 | 0.00 |
| Slovenia | 0.19 | 0.03 | 0.03 |
| South Africa (5) | 0.32 | 0.10 | 0.12 |
| Spain | 0.13 | 0.02 | 0.02 |
| Sweden | 0.07 | 0.00 | 0.00 |
| Turkey | 0.26 | 0.07 | 0.06 |
| United Arab Emirates | 0.19 | 0.03 | 0.04 |
| United States | 0.16 | 0.02 | 0.02 |
| International Median | 0.19 | 0.04 | 0.03 |
| Benchmarking Participants | | | |
| Buenos Aires, Argentina | 0.06 | 0.00 | 0.01 |
| Ontario, Canada | 0.21 | 0.04 | 0.04 |
| Quebec, Canada | 0.18 | 0.03 | 0.03 |
| Norway (4) | 0.17 | 0.03 | 0.03 |
| Abu Dhabi, UAE | 0.21 | 0.04 | 0.05 |
| Dubai, UAE | 0.16 | 0.02 | 0.02 |
| Florida, US | 0.19 | 0.04 | 0.04 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Students Like Learning Science Scale, Fourth Grade

The Students Like Learning Science (SLS) scale was created based on students' degree of agreement with the nine statements described below.

Items in the TIMSS 2015 Students Like Learning Science Scale, Fourth Grade



T Trend item—item was included in the same scale in TIMSS 2011 and was used for linking the TIMSS 2011 and TIMSS 2015 scales.

Item Parameters for the TIMSS 2015 Students Like Learning Science Scale, Fourth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|----------|----------|----------|----------|---------|-------|
| ASBS04A | -0.03177 | -0.48837 | -0.55624 | 1.04461 | 0.81 |
| ASBS04B* | 0.54508 | -0.31578 | -0.16722 | 0.48300 | 1.53 |
| ASBS04C* | 0.36011 | -0.48672 | -0.06029 | 0.54701 | 1.28 |
| ASBS04D | -0.49710 | -0.28238 | -0.48794 | 0.77032 | 0.95 |
| ASBS04E | -0.00762 | -0.45509 | -0.40061 | 0.85570 | 0.65 |
| ASBS04F | 0.32089 | -0.78932 | -0.22311 | 1.01243 | 0.85 |
| ASBS04G | -0.63912 | -0.42807 | -0.58269 | 1.01076 | 1.21 |
| ASBS04H | -0.63548 | -0.16495 | -0.39717 | 0.56212 | 1.38 |
| ASBS04I | 0.58501 | -0.73823 | -0.18404 | 0.92227 | 0.93 |

*Reverse coded

Scale Transformation Constants for the TIMSS 2015 Students Like Learning Science Scale, Fourth Grade

| Scale Transformation Constants | |
|--------------------------------|--|
| A = 7.692952 | Transformed Scale Score = 7.692952 + 1.31277 • Logit Scale Score |
| B = 1.31277 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Students Like Learning Science Scale, Fourth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 3.23946 | |
| 1 | 4.51118 | |
| 2 | 5.09266 | |
| 3 | 5.48363 | |
| 4 | 5.78856 | |
| 5 | 6.04394 | |
| 6 | 6.26730 | |
| 7 | 6.47373 | |
| 8 | 6.66589 | |
| 9 | 6.84816 | |
| 10 | 7.02381 | |
| 11 | 7.19528 | |
| 12 | 7.36446 | |
| 13 | 7.53286 | 7.6 |
| 14 | 7.70219 | |
| 15 | 7.87285 | |
| 16 | 8.04737 | |
| 17 | 8.22734 | |
| 18 | 8.41513 | |
| 19 | 8.61378 | |
| 20 | 8.82516 | |
| 21 | 9.05834 | |
| 22 | 9.32098 | |
| 23 | 9.62700 | 9.6 |
| 24 | 9.99920 | |
| 25 | 10.48630 | |
| 26 | 11.20666 | |
| 27 | 12.70534 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Students Like Learning Science Scale, Fourth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|----------|----------|---------|---------|---------|---------|---------|---------|--|
| | | | ASBS04A | ASBS04B* | ASBS04C* | ASBS04D | ASBS04E | ASBS04F | ASBS04G | ASBS04H | ASBS04I | |
| Australia | 0.92 | 62 | 0.86 | 0.69 | 0.74 | 0.79 | 0.90 | 0.90 | 0.66 | 0.62 | 0.84 | |
| Bahrain | 0.86 | 52 | 0.76 | 0.43 | 0.47 | 0.79 | 0.87 | 0.81 | 0.74 | 0.70 | 0.81 | |
| Belgium (Flemish) | 0.91 | 59 | 0.88 | 0.78 | 0.83 | 0.70 | 0.91 | 0.83 | 0.58 | 0.46 | 0.84 | |
| Bulgaria | 0.86 | 52 | 0.81 | 0.43 | 0.56 | 0.78 | 0.88 | 0.77 | 0.73 | 0.59 | 0.80 | |
| Canada | 0.91 | 59 | 0.87 | 0.64 | 0.74 | 0.77 | 0.91 | 0.88 | 0.60 | 0.57 | 0.84 | |
| Chile | 0.86 | 51 | 0.81 | 0.40 | 0.56 | 0.76 | 0.89 | 0.83 | 0.63 | 0.58 | 0.82 | |
| Chinese Taipei | 0.92 | 62 | 0.87 | 0.66 | 0.60 | 0.81 | 0.91 | 0.87 | 0.75 | 0.72 | 0.85 | |
| Croatia | 0.90 | 58 | 0.86 | 0.67 | 0.78 | 0.78 | 0.90 | 0.89 | 0.56 | 0.42 | 0.84 | |
| Cyprus | 0.91 | 59 | 0.86 | 0.70 | 0.71 | 0.78 | 0.91 | 0.87 | 0.64 | 0.48 | 0.86 | |
| Czech Republic | 0.92 | 61 | 0.88 | 0.63 | 0.77 | 0.71 | 0.92 | 0.90 | 0.63 | 0.58 | 0.88 | |
| Denmark | 0.93 | 65 | 0.87 | 0.74 | 0.81 | 0.84 | 0.91 | 0.90 | 0.67 | 0.59 | 0.84 | |
| England | 0.93 | 64 | 0.88 | 0.74 | 0.79 | 0.75 | 0.92 | 0.90 | 0.65 | 0.64 | 0.85 | |
| Finland | 0.93 | 63 | 0.86 | 0.73 | 0.82 | 0.80 | 0.91 | 0.85 | 0.67 | 0.66 | 0.82 | |
| France | 0.92 | 61 | 0.88 | 0.70 | 0.78 | 0.78 | 0.91 | 0.86 | 0.62 | 0.60 | 0.82 | |
| Georgia | 0.82 | 45 | 0.77 | 0.36 | 0.37 | 0.75 | 0.85 | 0.65 | 0.71 | 0.72 | 0.66 | |
| Germany | 0.91 | 60 | 0.82 | 0.77 | 0.76 | 0.77 | 0.90 | 0.90 | 0.65 | 0.46 | 0.84 | |
| Hong Kong SAR | 0.92 | 61 | 0.84 | 0.58 | 0.65 | 0.79 | 0.91 | 0.88 | 0.75 | 0.71 | 0.85 | |
| Hungary | 0.89 | 54 | 0.87 | 0.59 | 0.71 | 0.72 | 0.90 | 0.88 | 0.53 | 0.42 | 0.83 | |
| Indonesia | 0.74 | 37 | 0.66 | 0.29 | 0.36 | 0.68 | 0.78 | 0.65 | 0.58 | 0.61 | 0.71 | |
| Iran, Islamic Rep. of | 0.79 | 43 | 0.74 | 0.39 | 0.41 | 0.68 | 0.82 | 0.66 | 0.62 | 0.67 | 0.78 | |
| Ireland | 0.91 | 59 | 0.86 | 0.65 | 0.74 | 0.73 | 0.90 | 0.89 | 0.64 | 0.63 | 0.82 | |
| Italy | 0.85 | 47 | 0.84 | 0.67 | 0.70 | 0.74 | 0.86 | 0.56 | 0.41 | 0.46 | 0.81 | |
| Japan | 0.92 | 63 | 0.87 | 0.65 | 0.69 | 0.79 | 0.91 | 0.90 | 0.70 | 0.72 | 0.84 | |
| Jordan | 0.82 | 48 | 0.70 | 0.34 | 0.37 | 0.78 | 0.85 | 0.79 | 0.75 | 0.74 | 0.75 | |
| Kazakhstan | 0.83 | 46 | 0.68 | 0.34 | 0.62 | 0.68 | 0.80 | 0.77 | 0.69 | 0.64 | 0.76 | |
| Korea, Rep. of | 0.93 | 63 | 0.86 | 0.71 | 0.79 | 0.81 | 0.90 | 0.86 | 0.69 | 0.65 | 0.83 | |
| Kuwait | 0.82 | 46 | 0.69 | 0.38 | 0.46 | 0.72 | 0.84 | 0.77 | 0.67 | 0.69 | 0.72 | |
| Lithuania | 0.89 | 55 | 0.82 | 0.65 | 0.65 | 0.76 | 0.87 | 0.83 | 0.65 | 0.62 | 0.77 | |
| Morocco | 0.77 | 41 | 0.61 | 0.38 | 0.42 | 0.69 | 0.78 | 0.73 | 0.66 | 0.69 | 0.65 | |
| Netherlands | 0.90 | 57 | 0.84 | 0.65 | 0.78 | 0.74 | 0.90 | 0.86 | 0.58 | 0.54 | 0.81 | |
| New Zealand | 0.91 | 59 | 0.84 | 0.63 | 0.66 | 0.77 | 0.90 | 0.87 | 0.69 | 0.70 | 0.82 | |
| Northern Ireland | 0.90 | 57 | 0.85 | 0.65 | 0.72 | 0.72 | 0.89 | 0.87 | 0.62 | 0.59 | 0.80 | |
| Norway (5) | 0.91 | 59 | 0.87 | 0.67 | 0.79 | 0.77 | 0.91 | 0.88 | 0.61 | 0.48 | 0.82 | |
| Oman | 0.75 | 41 | 0.67 | 0.35 | 0.41 | 0.62 | 0.78 | 0.65 | 0.69 | 0.70 | 0.73 | |
| Poland | 0.90 | 57 | 0.85 | 0.63 | 0.66 | 0.81 | 0.89 | 0.71 | 0.72 | 0.65 | 0.82 | |
| Portugal | 0.87 | 52 | 0.82 | 0.62 | 0.64 | 0.72 | 0.88 | 0.81 | 0.59 | 0.59 | 0.77 | |
| Qatar | 0.86 | 52 | 0.74 | 0.44 | 0.48 | 0.80 | 0.87 | 0.81 | 0.75 | 0.70 | 0.79 | |
| Russian Federation | 0.88 | 53 | 0.83 | 0.57 | 0.72 | 0.71 | 0.86 | 0.83 | 0.62 | 0.49 | 0.80 | |
| Saudi Arabia | 0.85 | 51 | 0.73 | 0.33 | 0.39 | 0.79 | 0.87 | 0.84 | 0.73 | 0.74 | 0.80 | |
| Serbia | 0.88 | 54 | 0.85 | 0.47 | 0.64 | 0.75 | 0.89 | 0.88 | 0.58 | 0.57 | 0.83 | |
| Singapore | 0.92 | 60 | 0.86 | 0.72 | 0.73 | 0.78 | 0.90 | 0.87 | 0.66 | 0.58 | 0.85 | |
| Slovak Republic | 0.90 | 57 | 0.86 | 0.65 | 0.73 | 0.64 | 0.90 | 0.88 | 0.62 | 0.58 | 0.84 | |
| Slovenia | 0.91 | 59 | 0.85 | 0.66 | 0.76 | 0.80 | 0.91 | 0.90 | 0.57 | 0.48 | 0.82 | |
| South Africa (5) | - | - | - | - | - | - | - | - | - | - | - | |
| Spain | 0.88 | 53 | 0.83 | 0.58 | 0.72 | 0.73 | 0.89 | 0.86 | 0.52 | 0.37 | 0.84 | |
| Sweden | 0.92 | 62 | 0.86 | 0.70 | 0.81 | 0.80 | 0.91 | 0.88 | 0.66 | 0.61 | 0.82 | |
| Turkey | 0.76 | 38 | 0.70 | 0.53 | 0.58 | 0.45 | 0.78 | 0.68 | 0.49 | 0.53 | 0.73 | |
| United Arab Emirates | 0.88 | 53 | 0.77 | 0.51 | 0.63 | 0.78 | 0.86 | 0.80 | 0.70 | 0.65 | 0.80 | |
| United States | 0.91 | 60 | 0.87 | 0.63 | 0.71 | 0.78 | 0.91 | 0.88 | 0.67 | 0.61 | 0.84 | |
| Benchmarking Participants | | | | | | | | | | | | |
| Buenos Aires, Argentina | 0.87 | 52 | 0.84 | 0.48 | 0.56 | 0.75 | 0.90 | 0.86 | 0.60 | 0.51 | 0.84 | |
| Ontario, Canada | 0.91 | 59 | 0.87 | 0.66 | 0.75 | 0.76 | 0.91 | 0.88 | 0.63 | 0.53 | 0.85 | |
| Quebec, Canada | 0.90 | 58 | 0.88 | 0.60 | 0.76 | 0.78 | 0.92 | 0.90 | 0.50 | 0.57 | 0.83 | |
| Norway (4) | 0.91 | 59 | 0.87 | 0.64 | 0.77 | 0.77 | 0.91 | 0.90 | 0.57 | 0.57 | 0.82 | |
| Abu Dhabi, UAE | 0.88 | 52 | 0.74 | 0.50 | 0.60 | 0.79 | 0.86 | 0.81 | 0.71 | 0.64 | 0.78 | |
| Dubai, UAE | 0.88 | 54 | 0.82 | 0.58 | 0.70 | 0.74 | 0.86 | 0.79 | 0.66 | 0.57 | 0.82 | |
| Florida, US | 0.92 | 60 | 0.88 | 0.65 | 0.72 | 0.79 | 0.92 | 0.88 | 0.66 | 0.59 | 0.84 | |

*Reverse coded

A dash (-) indicates comparable data not available.

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Students Like Learning Science Scale, Fourth Grade, and TIMSS 2015 Science Achievement

| Country | Pearson's Correlation with Science Achievement | | Variance in Science Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|----------------------------------|--|-------------|---|
| | (r) | (r^2) | |
| Australia | 0.10 | 0.01 | 0.01 |
| Bahrain | 0.38 | 0.14 | 0.13 |
| Belgium (Flemish) | 0.12 | 0.02 | 0.02 |
| Bulgaria | 0.28 | 0.08 | 0.08 |
| Canada | 0.11 | 0.01 | 0.01 |
| Chile | 0.14 | 0.02 | 0.02 |
| Chinese Taipei | 0.16 | 0.03 | 0.02 |
| Croatia | 0.10 | 0.01 | 0.01 |
| Cyprus | 0.10 | 0.01 | 0.01 |
| Czech Republic | 0.06 | 0.00 | 0.00 |
| Denmark | 0.07 | 0.00 | 0.01 |
| England | 0.10 | 0.01 | 0.01 |
| Finland | 0.08 | 0.01 | 0.01 |
| France | 0.11 | 0.01 | 0.01 |
| Georgia | 0.20 | 0.04 | 0.04 |
| Germany | 0.09 | 0.01 | 0.01 |
| Hong Kong SAR | 0.22 | 0.05 | 0.04 |
| Hungary | 0.15 | 0.02 | 0.02 |
| Indonesia | 0.29 | 0.09 | 0.10 |
| Iran, Islamic Rep. of | 0.28 | 0.08 | 0.07 |
| Ireland | 0.19 | 0.04 | 0.03 |
| Italy | 0.10 | 0.01 | 0.01 |
| Japan | 0.17 | 0.03 | 0.02 |
| Jordan | - | - | - |
| Kazakhstan | 0.16 | 0.03 | 0.02 |
| Korea, Rep. of | 0.26 | 0.07 | 0.05 |
| Kuwait | 0.27 | 0.03 | 0.06 |
| Lithuania | 0.18 | 0.11 | 0.03 |
| Morocco | 0.34 | 0.02 | 0.10 |
| Netherlands | 0.15 | 0.01 | 0.02 |
| New Zealand | 0.12 | 0.02 | 0.02 |
| Northern Ireland | 0.14 | 0.01 | 0.01 |
| Norway (5) | 0.10 | 0.12 | 0.01 |
| Oman | 0.34 | 0.00 | 0.10 |
| Poland | 0.07 | 0.02 | 0.01 |
| Portugal | 0.14 | 0.12 | 0.02 |
| Qatar | 0.34 | 0.00 | 0.11 |
| Russian Federation | 0.06 | 0.08 | 0.00 |
| Saudi Arabia | 0.28 | 0.00 | 0.09 |
| Serbia | 0.02 | 0.02 | 0.00 |
| Singapore | 0.14 | 0.00 | 0.02 |
| Slovak Republic | 0.06 | 0.02 | 0.00 |
| Slovenia | 0.13 | 0.02 | 0.01 |
| South Africa (5) | - | - | - |
| Spain | 0.13 | 0.02 | 0.02 |
| Sweden | -0.02 | 0.00 | 0.00 |
| Turkey | 0.34 | 0.12 | 0.11 |
| United Arab Emirates | 0.35 | 0.12 | 0.11 |
| United States | 0.13 | 0.02 | 0.02 |
| International Median | 0.14 | 0.02 | 0.02 |
| Benchmarking Participants | | | |
| Buenos Aires, Argentina | 0.08 | 0.01 | 0.01 |
| Ontario, Canada | 0.11 | 0.01 | 0.01 |
| Quebec, Canada | 0.12 | 0.01 | 0.01 |
| Norway (4) | 0.11 | 0.01 | 0.01 |
| Abu Dhabi, UAE | 0.35 | 0.13 | 0.13 |
| Dubai, UAE | 0.27 | 0.07 | 0.06 |
| Florida, US | 0.16 | 0.02 | 0.02 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

A dash (-) indicates comparable data not available.

Students' Sense of School Belonging Scale, Fourth Grade

The Students' Sense of School Belonging (SSB) scale was created based on students' degree of agreement with the seven statements described below.

Items in the TIMSS 2015 Students' Sense of School Belonging, Fourth Grade

What do you think about your school? Tell how much you agree with these statements.

| | Agree a lot | Agree a little | Disagree a little | Disagree a lot |
|--|-----------------------|-----------------------|-----------------------|-----------------------|
| ASBG11A 1) I like being in school ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ASBG11B 2) I feel safe when I am at school ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ASBG11C 3) I feel like I belong at this school ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ASBG11D 4) I like to see my classmates at school ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ASBG11E 5) Teachers at my school are fair to me ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ASBG11F 6) I am proud to go to this school ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ASBG11G 7) I learn a lot in school ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

High Sense of School Belonging 9.1 Sense of School Belonging 6.8 Little Sense of School Belonging

Item Parameters for the TIMSS 2015 Students' Sense of School Belonging Scale, Fourth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|---------|----------|----------|----------|---------|-------|
| ASBG11A | 0.56254 | -0.33789 | -0.81923 | 1.15712 | 1.06 |
| ASBG11B | 0.18287 | -0.43736 | -0.56824 | 1.00560 | 1.01 |
| ASBG11C | 0.30843 | -0.24942 | -0.47527 | 0.72469 | 1.02 |
| ASBG11D | -0.64754 | 0.09352 | -0.52319 | 0.42967 | 1.13 |
| ASBG11E | 0.05958 | -0.20049 | -0.59003 | 0.79052 | 1.10 |
| ASBG11F | 0.13972 | -0.12324 | -0.60389 | 0.72713 | 0.94 |
| ASBG11G | -0.60560 | -0.08268 | -0.71676 | 0.79944 | 1.00 |

Scale Transformation Constants for the TIMSS 2015 Students' Sense of School Belonging Scale, Fourth Grade

Scale Transformation Constants

A = 7.050578

B = 1.530558

Transformed Scale Score = 7.050578 + 1.530558 • Logit Scale Score

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Students' Sense of School Belonging Scale, Fourth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 2.69267 | |
| 1 | 3.96448 | |
| 2 | 4.56327 | |
| 3 | 4.97987 | |
| 4 | 5.31312 | |
| 5 | 5.59808 | |
| 6 | 5.85633 | |
| 7 | 6.09696 | |
| 8 | 6.32653 | |
| 9 | 6.55299 | |
| 10 | 6.77277 | 6.8 |
| 11 | 6.99462 | |
| 12 | 7.22296 | |
| 13 | 7.46316 | |
| 14 | 7.72193 | |
| 15 | 8.00589 | |
| 16 | 8.33009 | |
| 17 | 8.71486 | |
| 18 | 9.19396 | 9.1 |
| 19 | 9.83052 | |
| 20 | 10.76714 | |
| 21 | 12.63595 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Students' Sense of School Belonging Scale, Fourth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|---------|
| | | | ASBG11A | ASBG11B | ASBG11C | ASBG11D | ASBG11E | ASBG11F | ASBG11G |
| Australia | 0.82 | 49 | 0.70 | 0.73 | 0.74 | 0.51 | 0.69 | 0.82 | 0.66 |
| Bahrain | 0.80 | 46 | 0.69 | 0.70 | 0.73 | 0.59 | 0.59 | 0.76 | 0.65 |
| Belgium (Flemish) | 0.77 | 43 | 0.71 | 0.67 | 0.74 | 0.53 | 0.64 | 0.75 | 0.51 |
| Bulgaria | 0.79 | 45 | 0.65 | 0.69 | 0.72 | 0.54 | 0.63 | 0.78 | 0.68 |
| Canada | 0.82 | 48 | 0.70 | 0.71 | 0.73 | 0.60 | 0.68 | 0.80 | 0.63 |
| Chile | 0.81 | 48 | 0.69 | 0.71 | 0.73 | 0.61 | 0.65 | 0.80 | 0.64 |
| Chinese Taipei | 0.78 | 44 | 0.72 | 0.69 | 0.69 | 0.57 | 0.65 | 0.65 | 0.68 |
| Croatia | 0.78 | 45 | 0.67 | 0.72 | 0.67 | 0.48 | 0.65 | 0.77 | 0.68 |
| Cyprus | 0.81 | 48 | 0.71 | 0.67 | 0.73 | 0.48 | 0.70 | 0.81 | 0.69 |
| Czech Republic | 0.77 | 43 | 0.64 | 0.66 | 0.61 | 0.53 | 0.69 | 0.78 | 0.66 |
| Denmark | 0.83 | 49 | 0.73 | 0.76 | 0.77 | 0.60 | 0.63 | 0.78 | 0.63 |
| England | 0.82 | 48 | 0.72 | 0.71 | 0.75 | 0.45 | 0.69 | 0.81 | 0.69 |
| Finland | 0.82 | 49 | 0.76 | 0.74 | 0.69 | 0.57 | 0.65 | 0.77 | 0.69 |
| France | 0.68 | 36 | 0.63 | 0.61 | 0.66 | 0.48 | 0.44 | 0.78 | 0.57 |
| Georgia | 0.77 | 45 | 0.57 | 0.58 | 0.46 | 0.79 | 0.65 | 0.80 | 0.79 |
| Germany | 0.80 | 46 | 0.70 | 0.72 | 0.73 | 0.59 | 0.63 | 0.78 | 0.60 |
| Hong Kong SAR | 0.85 | 52 | 0.76 | 0.79 | 0.81 | 0.59 | 0.67 | 0.75 | 0.69 |
| Hungary | 0.76 | 42 | 0.64 | 0.67 | 0.73 | 0.50 | 0.66 | 0.77 | 0.53 |
| Indonesia | 0.79 | 45 | 0.62 | 0.60 | 0.70 | 0.72 | 0.66 | 0.69 | 0.70 |
| Iran, Islamic Rep. of | 0.66 | 38 | 0.66 | 0.67 | 0.68 | 0.64 | 0.66 | 0.35 | 0.61 |
| Ireland | 0.79 | 46 | 0.66 | 0.74 | 0.74 | 0.50 | 0.67 | 0.79 | 0.62 |
| Italy | 0.77 | 43 | 0.68 | 0.66 | 0.69 | 0.49 | 0.67 | 0.78 | 0.59 |
| Japan | 0.83 | 50 | 0.76 | 0.74 | 0.69 | 0.64 | 0.67 | 0.79 | 0.67 |
| Jordan | 0.80 | 46 | 0.68 | 0.65 | 0.72 | 0.64 | 0.61 | 0.74 | 0.68 |
| Kazakhstan | 0.75 | 42 | 0.62 | 0.56 | 0.67 | 0.59 | 0.65 | 0.73 | 0.67 |
| Korea, Rep. of | 0.83 | 50 | 0.75 | 0.72 | 0.64 | 0.66 | 0.65 | 0.79 | 0.70 |
| Kuwait | 0.77 | 42 | 0.67 | 0.66 | 0.69 | 0.56 | 0.57 | 0.74 | 0.63 |
| Lithuania | 0.77 | 43 | 0.68 | 0.65 | 0.68 | 0.57 | 0.66 | 0.76 | 0.55 |
| Morocco | 0.75 | 42 | 0.62 | 0.62 | 0.63 | 0.61 | 0.63 | 0.72 | 0.69 |
| Netherlands | 0.80 | 47 | 0.74 | 0.69 | 0.73 | 0.61 | 0.66 | 0.77 | 0.58 |
| New Zealand | 0.82 | 48 | 0.71 | 0.71 | 0.76 | 0.52 | 0.65 | 0.81 | 0.67 |
| Northern Ireland | 0.79 | 47 | 0.66 | 0.73 | 0.73 | 0.50 | 0.71 | 0.77 | 0.64 |
| Norway (5) | 0.81 | 48 | 0.65 | 0.73 | 0.78 | 0.57 | 0.63 | 0.79 | 0.64 |
| Oman | 0.80 | 46 | 0.64 | 0.64 | 0.68 | 0.65 | 0.65 | 0.75 | 0.71 |
| Poland | 0.79 | 45 | 0.74 | 0.68 | 0.71 | 0.42 | 0.64 | 0.80 | 0.63 |
| Portugal | 0.75 | 42 | 0.72 | 0.65 | 0.70 | 0.47 | 0.50 | 0.81 | 0.62 |
| Qatar | 0.84 | 50 | 0.75 | 0.72 | 0.76 | 0.58 | 0.67 | 0.80 | 0.65 |
| Russian Federation | 0.75 | 41 | 0.72 | 0.61 | 0.69 | 0.47 | 0.62 | 0.75 | 0.59 |
| Saudi Arabia | 0.80 | 46 | 0.67 | 0.68 | 0.71 | 0.60 | 0.68 | 0.75 | 0.65 |
| Serbia | 0.76 | 42 | 0.70 | 0.66 | 0.72 | 0.51 | 0.62 | 0.79 | 0.48 |
| Singapore | 0.81 | 47 | 0.75 | 0.70 | 0.76 | 0.51 | 0.65 | 0.80 | 0.61 |
| Slovak Republic | 0.79 | 44 | 0.67 | 0.68 | 0.74 | 0.41 | 0.68 | 0.78 | 0.60 |
| Slovenia | 0.81 | 48 | 0.70 | 0.69 | 0.74 | 0.45 | 0.69 | 0.81 | 0.69 |
| South Africa (5) | 0.75 | 41 | 0.63 | 0.66 | 0.67 | 0.65 | 0.48 | 0.70 | 0.69 |
| Spain | 0.77 | 43 | 0.66 | 0.67 | 0.66 | 0.52 | 0.65 | 0.76 | 0.66 |
| Sweden | 0.81 | 47 | 0.68 | 0.69 | 0.76 | 0.60 | 0.58 | 0.80 | 0.66 |
| Turkey | 0.60 | 34 | 0.59 | 0.64 | 0.64 | 0.60 | 0.34 | 0.62 | 0.58 |
| United Arab Emirates | 0.81 | 47 | 0.67 | 0.69 | 0.72 | 0.59 | 0.66 | 0.77 | 0.67 |
| United States | 0.82 | 49 | 0.69 | 0.72 | 0.76 | 0.57 | 0.69 | 0.82 | 0.63 |
| Benchmarking Participants | | | | | | | | | |
| Buenos Aires, Argentina | 0.76 | 43 | 0.69 | 0.67 | 0.64 | 0.49 | 0.66 | 0.77 | 0.62 |
| Ontario, Canada | 0.81 | 48 | 0.70 | 0.70 | 0.74 | 0.57 | 0.68 | 0.81 | 0.63 |
| Quebec, Canada | 0.80 | 46 | 0.70 | 0.70 | 0.72 | 0.58 | 0.66 | 0.78 | 0.58 |
| Norway (4) | 0.78 | 45 | 0.66 | 0.67 | 0.76 | 0.52 | 0.60 | 0.80 | 0.65 |
| Abu Dhabi, UAE | 0.80 | 46 | 0.64 | 0.69 | 0.72 | 0.62 | 0.65 | 0.75 | 0.67 |
| Dubai, UAE | 0.81 | 47 | 0.70 | 0.69 | 0.71 | 0.55 | 0.67 | 0.80 | 0.64 |
| Florida, US | 0.82 | 49 | 0.70 | 0.72 | 0.76 | 0.59 | 0.66 | 0.83 | 0.59 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Students' Sense of School Belonging Scale, Fourth Grade, and TIMSS 2015 Achievement

| Country | Pearson's Correlation with Achievement | | | | Variance in Achievement Accounted for by Difference Between Regions of the Scale (η^2) | |
|----------------------------------|--|-------------|-------------------|-------------|---|-------------|
| | (r) | | (r ²) | | Mathematics | Science |
| | Mathematics | Science | Mathematics | Science | | |
| Australia | 0.11 | 0.10 | 0.01 | 0.01 | 0.01 | 0.01 |
| Bahrain | 0.10 | 0.12 | 0.01 | 0.01 | 0.01 | 0.02 |
| Belgium (Flemish) | 0.08 | 0.10 | 0.01 | 0.01 | 0.01 | 0.02 |
| Bulgaria | 0.02 | -0.01 | 0.00 | 0.00 | -0.01 | 0.01 |
| Canada | 0.07 | 0.08 | 0.01 | 0.01 | 0.01 | 0.01 |
| Chile | 0.16 | 0.12 | 0.02 | 0.02 | 0.02 | 0.01 |
| Chinese Taipei | 0.11 | 0.08 | 0.01 | 0.01 | 0.01 | 0.01 |
| Croatia | 0.05 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cyprus | 0.02 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Czech Republic | -0.03 | -0.05 | 0.00 | 0.00 | 0.01 | 0.00 |
| Denmark | 0.14 | 0.12 | 0.02 | 0.01 | 0.02 | 0.01 |
| England | 0.12 | 0.12 | 0.01 | 0.01 | 0.01 | 0.01 |
| Finland | 0.08 | 0.07 | 0.01 | 0.01 | 0.01 | 0.01 |
| France | 0.04 | 0.07 | 0.00 | 0.01 | 0.01 | 0.01 |
| Georgia | 0.09 | 0.04 | 0.01 | 0.00 | 0.02 | 0.01 |
| Germany | 0.07 | 0.06 | 0.00 | 0.00 | 0.01 | 0.00 |
| Hong Kong SAR | 0.16 | 0.13 | 0.03 | 0.02 | 0.02 | 0.01 |
| Hungary | 0.09 | 0.05 | 0.01 | 0.00 | 0.01 | 0.00 |
| Indonesia | 0.09 | 0.08 | 0.01 | 0.01 | 0.02 | 0.02 |
| Iran, Islamic Rep. of | -0.12 | -0.12 | 0.01 | 0.02 | 0.01 | 0.02 |
| Ireland | 0.10 | 0.06 | 0.01 | 0.00 | 0.01 | 0.01 |
| Italy | 0.06 | 0.03 | 0.00 | 0.00 | 0.01 | 0.01 |
| Japan | 0.16 | 0.13 | 0.03 | 0.02 | 0.03 | 0.02 |
| Jordan | 0.06 | - | 0.00 | - | 0.01 | - |
| Kazakhstan | 0.11 | 0.16 | 0.01 | 0.02 | 0.01 | 0.02 |
| Korea, Rep. of | 0.13 | 0.06 | 0.02 | 0.00 | 0.01 | 0.00 |
| Kuwait | -0.01 | 0.07 | 0.00 | 0.00 | 0.00 | 0.01 |
| Lithuania | 0.07 | 0.06 | 0.00 | 0.00 | 0.01 | 0.01 |
| Morocco | 0.14 | 0.19 | 0.02 | 0.04 | 0.02 | 0.05 |
| Netherlands | 0.09 | 0.13 | 0.01 | 0.02 | 0.01 | 0.02 |
| New Zealand | 0.03 | 0.02 | 0.00 | 0.00 | 0.01 | 0.00 |
| Northern Ireland | 0.10 | 0.06 | 0.01 | 0.00 | 0.02 | 0.01 |
| Norway (5) | 0.09 | 0.05 | 0.01 | 0.00 | 0.01 | 0.01 |
| Oman | 0.11 | 0.13 | 0.01 | 0.02 | 0.02 | 0.02 |
| Poland | -0.05 | -0.06 | 0.00 | 0.00 | 0.00 | 0.00 |
| Portugal | 0.11 | 0.05 | 0.01 | 0.00 | 0.01 | 0.00 |
| Qatar | 0.13 | 0.16 | 0.02 | 0.02 | 0.02 | 0.03 |
| Russian Federation | 0.08 | 0.01 | 0.01 | 0.00 | 0.01 | 0.00 |
| Saudi Arabia | 0.16 | 0.17 | 0.03 | 0.03 | 0.03 | 0.03 |
| Serbia | -0.04 | -0.08 | 0.00 | 0.01 | 0.00 | 0.00 |
| Singapore | 0.08 | 0.05 | 0.01 | 0.00 | 0.01 | 0.00 |
| Slovak Republic | -0.08 | -0.08 | 0.01 | 0.01 | 0.01 | 0.01 |
| Slovenia | -0.03 | -0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| South Africa (5) | 0.16 | - | 0.03 | - | 0.04 | - |
| Spain | 0.03 | 0.04 | 0.00 | 0.00 | 0.00 | 0.01 |
| Sweden | 0.07 | 0.08 | 0.00 | 0.01 | 0.01 | 0.01 |
| Turkey | 0.22 | 0.20 | 0.05 | 0.04 | 0.04 | 0.04 |
| United Arab Emirates | 0.13 | 0.16 | 0.02 | 0.03 | 0.02 | 0.03 |
| United States | 0.14 | 0.13 | 0.02 | 0.02 | 0.02 | 0.02 |
| International Median | 0.09 | 0.07 | 0.01 | 0.01 | 0.01 | 0.01 |
| Benchmarking Participants | | | | | | |
| Buenos Aires, Argentina | -0.01 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Ontario, Canada | 0.10 | 0.09 | 0.01 | 0.01 | 0.01 | 0.01 |
| Quebec, Canada | 0.04 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| Norway (4) | 0.12 | 0.13 | 0.02 | 0.02 | 0.01 | 0.01 |
| Abu Dhabi, UAE | 0.11 | 0.13 | 0.01 | 0.02 | 0.02 | 0.02 |
| Dubai, UAE | 0.15 | 0.18 | 0.02 | 0.03 | 0.03 | 0.04 |
| Florida, US | 0.18 | 0.17 | 0.03 | 0.03 | 0.03 | 0.03 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

A dash (-) indicates comparable data not available.

Students' Views on Engaging Teaching in Mathematics Lessons Scale, Fourth Grade

The Students' Views on Engaging Teaching in Mathematics Lessons (EML) scale was created based on students' degree of agreement with the ten statements described below.

Items in the TIMSS 2015 Students' Views on Engaging Teaching in Mathematics Lessons Scale, Fourth Grade

How much do you agree with these statements about your mathematics lessons?

| | Agree a lot | Agree a little | Disagree a little | Disagree a lot |
|---|-----------------------|-----------------------|-----------------------|-----------------------|
| ASBM02A 1) I know what my teacher expects me to do ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ASBM02B 2) My teacher is easy to understand ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ASBM02C 3) I am interested in what my teacher says ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ASBM02D 4) My teacher gives me interesting things to do ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ASBM02E 5) My teacher has clear answers to my questions ---- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ASBM02F 6) My teacher is good at explaining mathematics ---- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ASBM02G 7) My teacher lets me show what I have learned----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ASBM02H 8) My teacher does a variety of things to help us learn ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ASBM02I 9) My teacher tells me how to do better when I make a mistake ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ASBM02J 10) My teacher listens to what I have to say ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Very Engaging Teaching 9.0 Engaging Teaching 7.0 Less than Engaging Teaching

Item Parameters for the TIMSS 2015 Students' Views on Engaging Teaching in Mathematics Lessons Scale, Fourth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|---------|----------|----------|----------|---------|-------|
| ASBM02A | 0.38419 | -0.45928 | -0.74716 | 1.20644 | 1.45 |
| ASBM02B | 0.03877 | -0.72151 | -0.67326 | 1.39477 | 1.09 |
| ASBM02C | 0.12130 | -0.75604 | -0.46634 | 1.22238 | 0.99 |
| ASBM02D | 0.40625 | -0.83775 | -0.35861 | 1.19636 | 0.99 |
| ASBM02E | -0.14411 | -0.72485 | -0.45891 | 1.18376 | 0.90 |
| ASBM02F | -0.48092 | -0.43600 | -0.50640 | 0.94240 | 0.86 |
| ASBM02G | 0.35273 | -0.79575 | -0.43071 | 1.22646 | 1.10 |
| ASBM02H | -0.39195 | -0.38697 | -0.55457 | 0.94154 | 0.95 |
| ASBM02I | -0.20522 | -0.43958 | -0.49368 | 0.93326 | 1.01 |
| ASBM02J | -0.08104 | -0.40846 | -0.52440 | 0.93286 | 1.01 |

Scale Transformation Constants for the TIMSS 2015 Students' Views on Engaging Teaching in Mathematics Lessons Scale, Fourth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 7.092835 | Transformed Scale Score = 7.092835 + 1.336512 • Logit Scale Score |
| B = 1.336512 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Students' Views on Engaging Teaching in Mathematics Lessons
Scale, Fourth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 2.28692 | |
| 1 | 3.63188 | |
| 2 | 4.24280 | |
| 3 | 4.64797 | |
| 4 | 4.95849 | |
| 5 | 5.21283 | |
| 6 | 5.43698 | |
| 7 | 5.63375 | |
| 8 | 5.81602 | |
| 9 | 5.98702 | |
| 10 | 6.15013 | |
| 11 | 6.30793 | |
| 12 | 6.46248 | |
| 13 | 6.61730 | |
| 14 | 6.76989 | |
| 15 | 6.92442 | 7.0 |
| 16 | 7.08212 | |
| 17 | 7.24591 | |
| 18 | 7.41643 | |
| 19 | 7.59618 | |
| 20 | 7.78743 | |
| 21 | 7.99236 | |
| 22 | 8.21605 | |
| 23 | 8.46252 | |
| 24 | 8.73772 | |
| 25 | 9.04989 | 9.0 |
| 26 | 9.41158 | |
| 27 | 9.84507 | |
| 28 | 10.39553 | |
| 29 | 11.17927 | |
| 30 | 12.74909 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Students' Views on Engaging Teaching in Mathematics Lessons Scale, Fourth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| | | | ASBM02A | ASBM02B | ASBM02C | ASBM02D | ASBM02E | ASBM02F | ASBM02G | ASBM02H | ASBM02I | ASBM02J |
| Australia | 0.88 | 49 | 0.52 | 0.73 | 0.75 | 0.75 | 0.74 | 0.76 | 0.65 | 0.71 | 0.68 | 0.68 |
| Bahrain | 0.88 | 49 | 0.45 | 0.63 | 0.71 | 0.76 | 0.76 | 0.74 | 0.73 | 0.75 | 0.70 | 0.68 |
| Belgium (Flemish) | 0.83 | 41 | 0.52 | 0.65 | 0.66 | 0.63 | 0.70 | 0.72 | 0.57 | 0.65 | 0.61 | 0.65 |
| Bulgaria | 0.86 | 47 | 0.50 | 0.65 | 0.70 | 0.69 | 0.76 | 0.71 | 0.73 | 0.66 | 0.70 | 0.71 |
| Canada | 0.88 | 48 | 0.54 | 0.70 | 0.73 | 0.73 | 0.75 | 0.75 | 0.64 | 0.69 | 0.67 | 0.68 |
| Chile | 0.87 | 48 | 0.49 | 0.63 | 0.71 | 0.69 | 0.74 | 0.76 | 0.65 | 0.72 | 0.72 | 0.75 |
| Chinese Taipei | 0.90 | 54 | 0.70 | 0.71 | 0.77 | 0.71 | 0.76 | 0.75 | 0.75 | 0.77 | 0.74 | 0.66 |
| Croatia | 0.87 | 48 | 0.54 | 0.68 | 0.61 | 0.67 | 0.79 | 0.77 | 0.70 | 0.71 | 0.73 | 0.72 |
| Cyprus | 0.89 | 51 | 0.54 | 0.62 | 0.76 | 0.75 | 0.76 | 0.77 | 0.72 | 0.77 | 0.68 | 0.73 |
| Czech Republic | 0.88 | 50 | 0.54 | 0.76 | 0.69 | 0.66 | 0.77 | 0.77 | 0.57 | 0.77 | 0.72 | 0.74 |
| Denmark | 0.88 | 50 | 0.49 | 0.75 | 0.73 | 0.73 | 0.73 | 0.79 | 0.67 | 0.72 | 0.67 | 0.73 |
| England | 0.87 | 48 | 0.51 | 0.72 | 0.73 | 0.73 | 0.74 | 0.76 | 0.60 | 0.70 | 0.67 | 0.71 |
| Finland | 0.86 | 46 | 0.41 | 0.72 | 0.68 | 0.68 | 0.66 | 0.78 | 0.67 | 0.74 | 0.70 | 0.72 |
| France | 0.84 | 42 | 0.45 | 0.66 | 0.71 | 0.69 | 0.68 | 0.72 | 0.64 | 0.63 | 0.64 | 0.65 |
| Georgia | 0.87 | 53 | 0.38 | 0.74 | 0.48 | 0.79 | 0.80 | 0.87 | 0.76 | 0.83 | 0.66 | 0.79 |
| Germany | 0.85 | 44 | 0.46 | 0.74 | 0.69 | 0.71 | 0.74 | 0.73 | 0.65 | 0.63 | 0.63 | 0.63 |
| Hong Kong SAR | 0.91 | 56 | 0.67 | 0.76 | 0.78 | 0.78 | 0.79 | 0.75 | 0.74 | 0.75 | 0.72 | 0.73 |
| Hungary | 0.87 | 47 | 0.51 | 0.63 | 0.73 | 0.71 | 0.73 | 0.75 | 0.62 | 0.70 | 0.70 | 0.72 |
| Indonesia | 0.79 | 36 | 0.43 | 0.55 | 0.63 | 0.64 | 0.57 | 0.62 | 0.64 | 0.67 | 0.64 | 0.56 |
| Iran, Islamic Rep. of | 0.85 | 45 | 0.36 | 0.62 | 0.71 | 0.66 | 0.75 | 0.76 | 0.70 | 0.68 | 0.64 | 0.73 |
| Ireland | 0.87 | 47 | 0.48 | 0.71 | 0.73 | 0.73 | 0.75 | 0.75 | 0.62 | 0.69 | 0.68 | 0.71 |
| Italy | 0.82 | 41 | 0.36 | 0.54 | 0.70 | 0.69 | 0.72 | 0.71 | 0.67 | 0.60 | 0.60 | 0.69 |
| Japan | 0.90 | 53 | 0.57 | 0.79 | 0.77 | 0.73 | 0.77 | 0.79 | 0.55 | 0.76 | 0.76 | 0.75 |
| Jordan | 0.84 | 46 | 0.35 | 0.60 | 0.75 | 0.73 | 0.76 | 0.76 | 0.65 | 0.71 | 0.71 | 0.66 |
| Kazakhstan | 0.83 | 43 | 0.41 | 0.52 | 0.72 | 0.75 | 0.72 | 0.73 | 0.75 | 0.60 | 0.66 | 0.63 |
| Korea, Rep. of | 0.90 | 54 | 0.53 | 0.70 | 0.78 | 0.76 | 0.78 | 0.78 | 0.59 | 0.81 | 0.78 | 0.78 |
| Kuwait | 0.85 | 45 | 0.44 | 0.66 | 0.67 | 0.72 | 0.75 | 0.75 | 0.65 | 0.69 | 0.66 | 0.65 |
| Lithuania | 0.83 | 42 | 0.47 | 0.60 | 0.60 | 0.70 | 0.70 | 0.71 | 0.63 | 0.64 | 0.66 | 0.70 |
| Morocco | 0.78 | 37 | 0.37 | 0.53 | 0.67 | 0.64 | 0.66 | 0.69 | 0.55 | 0.69 | 0.65 | 0.62 |
| Netherlands | 0.82 | 40 | 0.54 | 0.66 | 0.64 | 0.63 | 0.72 | 0.70 | 0.56 | 0.60 | 0.60 | 0.67 |
| New Zealand | 0.87 | 48 | 0.53 | 0.69 | 0.73 | 0.72 | 0.75 | 0.75 | 0.63 | 0.70 | 0.65 | 0.69 |
| Northern Ireland | 0.86 | 45 | 0.49 | 0.70 | 0.73 | 0.70 | 0.75 | 0.72 | 0.57 | 0.66 | 0.63 | 0.71 |
| Norway (5) | 0.87 | 48 | 0.51 | 0.72 | 0.69 | 0.70 | 0.74 | 0.74 | 0.67 | 0.70 | 0.70 | 0.71 |
| Oman | 0.81 | 41 | 0.35 | 0.59 | 0.69 | 0.64 | 0.69 | 0.71 | 0.68 | 0.68 | 0.68 | 0.65 |
| Poland | 0.91 | 55 | 0.61 | 0.70 | 0.73 | 0.77 | 0.81 | 0.81 | 0.72 | 0.78 | 0.72 | 0.76 |
| Portugal | 0.79 | 38 | 0.37 | 0.51 | 0.64 | 0.71 | 0.67 | 0.67 | 0.63 | 0.57 | 0.63 | 0.67 |
| Qatar | 0.90 | 53 | 0.53 | 0.73 | 0.76 | 0.78 | 0.78 | 0.78 | 0.69 | 0.78 | 0.71 | 0.70 |
| Russian Federation | 0.82 | 42 | 0.43 | 0.64 | 0.68 | 0.69 | 0.69 | 0.69 | 0.62 | 0.67 | 0.64 | 0.68 |
| Saudi Arabia | 0.87 | 48 | 0.40 | 0.68 | 0.74 | 0.72 | 0.77 | 0.77 | 0.63 | 0.77 | 0.69 | 0.69 |
| Serbia | 0.85 | 44 | 0.46 | 0.67 | 0.70 | 0.68 | 0.73 | 0.72 | 0.72 | 0.61 | 0.64 | 0.65 |
| Singapore | 0.88 | 49 | 0.56 | 0.72 | 0.75 | 0.74 | 0.74 | 0.73 | 0.64 | 0.72 | 0.71 | 0.68 |
| Slovak Republic | 0.88 | 49 | 0.56 | 0.70 | 0.69 | 0.69 | 0.73 | 0.76 | 0.69 | 0.73 | 0.74 | 0.72 |
| Slovenia | 0.88 | 49 | 0.55 | 0.59 | 0.68 | 0.76 | 0.74 | 0.79 | 0.71 | 0.74 | 0.71 | 0.68 |
| South Africa (5) | 0.85 | 42 | 0.52 | 0.63 | 0.67 | 0.69 | 0.63 | 0.68 | 0.64 | 0.66 | 0.67 | 0.64 |
| Spain | 0.84 | 44 | 0.39 | 0.58 | 0.69 | 0.72 | 0.72 | 0.67 | 0.65 | 0.70 | 0.71 | 0.72 |
| Sweden | 0.86 | 46 | 0.44 | 0.70 | 0.68 | 0.68 | 0.73 | 0.73 | 0.68 | 0.73 | 0.67 | 0.70 |
| Turkey | 0.73 | 34 | 0.39 | 0.53 | 0.61 | 0.40 | 0.65 | 0.63 | 0.60 | 0.58 | 0.64 | 0.68 |
| United Arab Emirates | 0.88 | 48 | 0.48 | 0.70 | 0.72 | 0.74 | 0.76 | 0.75 | 0.67 | 0.71 | 0.69 | 0.68 |
| United States | 0.88 | 49 | 0.54 | 0.73 | 0.74 | 0.72 | 0.75 | 0.75 | 0.63 | 0.71 | 0.71 | 0.72 |
| Benchmarking Participants | | | | | | | | | | | | |
| Buenos Aires, Argentina | 0.84 | 43 | 0.41 | 0.56 | 0.72 | 0.70 | 0.72 | 0.72 | 0.61 | 0.67 | 0.67 | 0.71 |
| Ontario, Canada | 0.88 | 48 | 0.53 | 0.71 | 0.73 | 0.74 | 0.74 | 0.75 | 0.62 | 0.70 | 0.67 | 0.68 |
| Quebec, Canada | 0.87 | 46 | 0.49 | 0.68 | 0.73 | 0.72 | 0.74 | 0.74 | 0.67 | 0.67 | 0.67 | 0.65 |
| Norway (4) | 0.85 | 44 | 0.52 | 0.64 | 0.69 | 0.70 | 0.70 | 0.73 | 0.63 | 0.69 | 0.66 | 0.67 |
| Abu Dhabi, UAE | 0.87 | 46 | 0.47 | 0.69 | 0.72 | 0.74 | 0.74 | 0.74 | 0.65 | 0.70 | 0.67 | 0.65 |
| Dubai, UAE | 0.88 | 49 | 0.53 | 0.70 | 0.71 | 0.74 | 0.75 | 0.75 | 0.67 | 0.71 | 0.70 | 0.69 |
| Florida, US | 0.87 | 47 | 0.57 | 0.72 | 0.74 | 0.72 | 0.72 | 0.73 | 0.65 | 0.65 | 0.66 | 0.71 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Students' Views on Engaging Teaching in Mathematics Lessons Scale, Fourth Grade, and TIMSS 2015 Mathematics Achievement

| Country | Pearson's Correlation with Mathematics Achievement | | Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|----------------------------------|--|-------------|---|
| | (r) | (r^2) | |
| Australia | 0.03 | 0.00 | 0.01 |
| Bahrain | 0.13 | 0.02 | 0.02 |
| Belgium (Flemish) | -0.06 | 0.00 | 0.00 |
| Bulgaria | 0.09 | 0.01 | 0.02 |
| Canada | 0.02 | 0.00 | 0.00 |
| Chile | 0.12 | 0.01 | 0.02 |
| Chinese Taipei | 0.10 | 0.01 | 0.01 |
| Croatia | 0.08 | 0.01 | 0.00 |
| Cyprus | 0.05 | 0.00 | 0.00 |
| Czech Republic | -0.05 | 0.00 | 0.00 |
| Denmark | 0.11 | 0.01 | 0.01 |
| England | 0.01 | 0.00 | 0.00 |
| Finland | 0.08 | 0.01 | 0.01 |
| France | 0.01 | 0.00 | 0.00 |
| Georgia | 0.13 | 0.02 | 0.03 |
| Germany | -0.01 | 0.00 | 0.00 |
| Hong Kong SAR | 0.12 | 0.02 | 0.02 |
| Hungary | 0.05 | 0.00 | 0.00 |
| Indonesia | 0.07 | 0.00 | 0.02 |
| Iran, Islamic Rep. of | 0.04 | 0.00 | 0.01 |
| Ireland | -0.01 | 0.00 | 0.00 |
| Italy | 0.07 | 0.00 | 0.01 |
| Japan | 0.05 | 0.00 | 0.01 |
| Jordan | 0.14 | 0.02 | 0.03 |
| Kazakhstan | 0.10 | 0.01 | 0.02 |
| Korea, Rep. of | 0.11 | 0.01 | 0.01 |
| Kuwait | 0.06 | 0.00 | 0.01 |
| Lithuania | 0.03 | 0.00 | 0.00 |
| Morocco | 0.13 | 0.02 | 0.03 |
| Netherlands | 0.04 | 0.00 | 0.01 |
| New Zealand | -0.06 | 0.00 | 0.00 |
| Northern Ireland | -0.03 | 0.00 | 0.00 |
| Norway (5) | 0.05 | 0.00 | 0.00 |
| Oman | 0.15 | 0.02 | 0.04 |
| Poland | 0.02 | 0.00 | 0.00 |
| Portugal | 0.08 | 0.01 | 0.00 |
| Qatar | 0.13 | 0.02 | 0.04 |
| Russian Federation | 0.04 | 0.00 | 0.00 |
| Saudi Arabia | 0.11 | 0.01 | 0.03 |
| Serbia | -0.01 | 0.00 | 0.00 |
| Singapore | 0.10 | 0.01 | 0.01 |
| Slovak Republic | -0.08 | 0.01 | 0.00 |
| Slovenia | 0.05 | 0.00 | 0.00 |
| South Africa (5) | 0.23 | 0.05 | 0.07 |
| Spain | -0.01 | 0.00 | 0.00 |
| Sweden | -0.02 | 0.00 | 0.00 |
| Turkey | 0.24 | 0.06 | 0.06 |
| United Arab Emirates | 0.17 | 0.03 | 0.03 |
| United States | 0.07 | 0.01 | 0.01 |
| International Median | 0.06 | 0.00 | 0.01 |
| Benchmarking Participants | | | |
| Buenos Aires, Argentina | -0.01 | 0.00 | 0.00 |
| Ontario, Canada | 0.03 | 0.00 | 0.01 |
| Quebec, Canada | -0.01 | 0.00 | 0.00 |
| Norway (4) | 0.05 | 0.00 | 0.00 |
| Abu Dhabi, UAE | 0.17 | 0.03 | 0.04 |
| Dubai, UAE | 0.12 | 0.01 | 0.02 |
| Florida, US | 0.10 | 0.01 | 0.02 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Students' Views on Engaging Teaching in Science Lessons Scale, Fourth Grade

The Students' Views on Engaging Teaching in Science Lessons (ESL) scale was created based on students' degree of agreement with the ten statements described below.

Items in the TIMSS 2015 Students' Views on Engaging Teaching in Science Lessons Scale, Fourth Grade

How much do you agree with these statements about your science lessons?

| | Agree a lot | Agree a little | Disagree a little | Disagree a lot |
|---------|---|----------------|-------------------|----------------|
| ASBS05A | 1) I know what my teacher expects me to do ----- ○ | ○ | ○ | ○ |
| ASBS05B | 2) My teacher is easy to understand ----- ○ | ○ | ○ | ○ |
| ASBS05C | 3) I am interested in what my teacher says ----- ○ | ○ | ○ | ○ |
| ASBS05D | 4) My teacher gives me interesting things to do ----- ○ | ○ | ○ | ○ |
| ASBS05E | 5) My teacher has clear answers to my questions ----- ○ | ○ | ○ | ○ |
| ASBS05F | 6) My teacher is good at explaining science ----- ○ | ○ | ○ | ○ |
| ASBS05G | 7) My teacher lets me show what I have learned ----- ○ | ○ | ○ | ○ |
| ASBS05H | 8) My teacher does a variety of things to help us learn ----- ○ | ○ | ○ | ○ |
| ASBS05I | 9) My teacher tells me how to do better when I make a mistake ----- ○ | ○ | ○ | ○ |
| ASBS05J | 10) My teacher listens to what I have to say ----- ○ | ○ | ○ | ○ |

Very Engaging Teaching 9.0 Engaging Teaching Less than Engaging Teaching 7.0

Item Parameters for the TIMSS 2015 Students' Views on Engaging Teaching in Science Lessons Scale, Fourth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|---------|----------|----------|----------|---------|-------|
| ASBS05A | 0.50888 | -0.81715 | -0.58879 | 1.40594 | 1.50 |
| ASBS05B | -0.03751 | -0.82603 | -0.63735 | 1.46338 | 1.09 |
| ASBS05C | -0.04871 | -0.88128 | -0.35960 | 1.24088 | 1.02 |
| ASBS05D | 0.22876 | -0.99483 | -0.27841 | 1.27324 | 1.02 |
| ASBS05E | -0.21612 | -0.95060 | -0.40396 | 1.35456 | 0.90 |
| ASBS05F | -0.47098 | -0.74576 | -0.49669 | 1.24245 | 0.91 |
| ASBS05G | 0.45511 | -1.06157 | -0.35018 | 1.41175 | 1.15 |
| ASBS05H | -0.31307 | -0.72648 | -0.49092 | 1.21740 | 1.02 |
| ASBS05I | -0.05738 | -0.77774 | -0.42703 | 1.20477 | 1.04 |
| ASBS05J | -0.04898 | -0.67414 | -0.50076 | 1.17490 | 1.05 |

Scale Transformation Constants for the TIMSS 2015 Students' Views on Engaging Teaching in Science Lessons Scale, Fourth Grade

Scale Transformation Constants

A = 7.078772

B = 1.209047

Transformed Scale Score = 7.078772 + 1.209047 • Logit Scale Score

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Students' Views on Engaging Teaching in Science Lessons Scale,
Fourth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 2.40628 | |
| 1 | 3.68357 | |
| 2 | 4.27493 | |
| 3 | 4.67030 | |
| 4 | 4.97489 | |
| 5 | 5.22528 | |
| 6 | 5.44624 | |
| 7 | 5.64160 | |
| 8 | 5.82255 | |
| 9 | 5.99269 | |
| 10 | 6.15531 | |
| 11 | 6.31297 | |
| 12 | 6.46770 | |
| 13 | 6.62249 | |
| 14 | 6.77592 | |
| 15 | 6.93146 | 7.0 |
| 16 | 7.09103 | |
| 17 | 7.25510 | |
| 18 | 7.42646 | |
| 19 | 7.60651 | |
| 20 | 7.79674 | |
| 21 | 8.00038 | |
| 22 | 8.22000 | |
| 23 | 8.45923 | |
| 24 | 8.72285 | |
| 25 | 9.01785 | 9.0 |
| 26 | 9.35467 | |
| 27 | 9.75424 | |
| 28 | 10.25748 | |
| 29 | 10.97053 | |
| 30 | 12.39384 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Students' Views on Engaging Teaching in Science Lessons Scale, Fourth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| | | | ASBS05A | ASBS05B | ASBS05C | ASBS05D | ASBS05E | ASBS05F | ASBS05G | ASBS05H | ASBS05I | ASBS05J |
| Australia | 0.91 | 56 | 0.63 | 0.78 | 0.79 | 0.78 | 0.80 | 0.76 | 0.69 | 0.77 | 0.72 | 0.72 |
| Bahrain | 0.90 | 54 | 0.49 | 0.71 | 0.77 | 0.79 | 0.81 | 0.76 | 0.75 | 0.78 | 0.74 | 0.71 |
| Belgium (Flemish) | 0.87 | 48 | 0.62 | 0.74 | 0.71 | 0.69 | 0.75 | 0.72 | 0.58 | 0.70 | 0.69 | 0.69 |
| Bulgaria | 0.88 | 50 | 0.54 | 0.66 | 0.71 | 0.71 | 0.78 | 0.74 | 0.75 | 0.71 | 0.74 | 0.74 |
| Canada | 0.90 | 53 | 0.60 | 0.76 | 0.76 | 0.76 | 0.78 | 0.76 | 0.68 | 0.74 | 0.71 | 0.71 |
| Chile | 0.90 | 53 | 0.56 | 0.68 | 0.75 | 0.75 | 0.78 | 0.78 | 0.68 | 0.76 | 0.75 | 0.75 |
| Chinese Taipei | 0.92 | 59 | 0.76 | 0.79 | 0.81 | 0.77 | 0.79 | 0.77 | 0.75 | 0.80 | 0.74 | 0.69 |
| Croatia | 0.90 | 55 | 0.59 | 0.77 | 0.66 | 0.72 | 0.82 | 0.82 | 0.76 | 0.73 | 0.76 | 0.78 |
| Cyprus | 0.93 | 60 | 0.63 | 0.70 | 0.81 | 0.80 | 0.83 | 0.82 | 0.78 | 0.82 | 0.77 | 0.79 |
| Czech Republic | 0.90 | 55 | 0.65 | 0.80 | 0.74 | 0.68 | 0.79 | 0.80 | 0.62 | 0.79 | 0.75 | 0.75 |
| Denmark | 0.92 | 60 | 0.62 | 0.80 | 0.80 | 0.78 | 0.79 | 0.81 | 0.74 | 0.80 | 0.77 | 0.77 |
| England | 0.91 | 55 | 0.62 | 0.78 | 0.77 | 0.77 | 0.80 | 0.79 | 0.65 | 0.74 | 0.73 | 0.73 |
| Finland | 0.89 | 52 | 0.52 | 0.79 | 0.73 | 0.72 | 0.72 | 0.80 | 0.72 | 0.74 | 0.72 | 0.73 |
| France | 0.89 | 52 | 0.55 | 0.74 | 0.74 | 0.75 | 0.76 | 0.77 | 0.73 | 0.73 | 0.69 | 0.72 |
| Georgia | 0.89 | 57 | 0.39 | 0.78 | 0.54 | 0.82 | 0.84 | 0.86 | 0.82 | 0.83 | 0.70 | 0.82 |
| Germany | 0.89 | 51 | 0.52 | 0.78 | 0.74 | 0.76 | 0.79 | 0.78 | 0.67 | 0.66 | 0.71 | 0.71 |
| Hong Kong SAR | 0.94 | 65 | 0.77 | 0.81 | 0.83 | 0.84 | 0.85 | 0.81 | 0.78 | 0.82 | 0.78 | 0.78 |
| Hungary | 0.90 | 54 | 0.63 | 0.71 | 0.76 | 0.74 | 0.78 | 0.79 | 0.68 | 0.74 | 0.74 | 0.76 |
| Indonesia | 0.81 | 38 | 0.47 | 0.56 | 0.61 | 0.69 | 0.59 | 0.62 | 0.68 | 0.65 | 0.66 | 0.60 |
| Iran, Islamic Rep. of | 0.85 | 46 | 0.37 | 0.66 | 0.75 | 0.65 | 0.74 | 0.77 | 0.72 | 0.71 | 0.65 | 0.70 |
| Ireland | 0.90 | 53 | 0.56 | 0.76 | 0.76 | 0.75 | 0.79 | 0.76 | 0.67 | 0.74 | 0.72 | 0.74 |
| Italy | 0.85 | 45 | 0.45 | 0.57 | 0.72 | 0.73 | 0.75 | 0.71 | 0.69 | 0.63 | 0.67 | 0.71 |
| Japan | 0.92 | 58 | 0.62 | 0.80 | 0.82 | 0.76 | 0.81 | 0.79 | 0.59 | 0.79 | 0.80 | 0.78 |
| Jordan | 0.87 | 49 | 0.37 | 0.66 | 0.77 | 0.76 | 0.77 | 0.78 | 0.64 | 0.79 | 0.73 | 0.66 |
| Kazakhstan | 0.84 | 45 | 0.44 | 0.60 | 0.71 | 0.76 | 0.70 | 0.74 | 0.73 | 0.64 | 0.68 | 0.66 |
| Korea, Rep. of | 0.92 | 59 | 0.63 | 0.77 | 0.81 | 0.81 | 0.81 | 0.80 | 0.63 | 0.82 | 0.80 | 0.79 |
| Kuwait | 0.84 | 44 | 0.39 | 0.65 | 0.71 | 0.73 | 0.75 | 0.74 | 0.63 | 0.71 | 0.64 | 0.64 |
| Lithuania | 0.87 | 48 | 0.54 | 0.65 | 0.65 | 0.73 | 0.77 | 0.75 | 0.64 | 0.68 | 0.70 | 0.77 |
| Morocco | 0.79 | 38 | 0.34 | 0.47 | 0.67 | 0.69 | 0.69 | 0.71 | 0.52 | 0.71 | 0.63 | 0.66 |
| Netherlands | 0.86 | 45 | 0.60 | 0.71 | 0.67 | 0.64 | 0.75 | 0.70 | 0.62 | 0.65 | 0.64 | 0.73 |
| New Zealand | 0.92 | 57 | 0.65 | 0.76 | 0.78 | 0.80 | 0.81 | 0.78 | 0.72 | 0.78 | 0.75 | 0.75 |
| Northern Ireland | 0.90 | 53 | 0.59 | 0.75 | 0.74 | 0.77 | 0.77 | 0.71 | 0.67 | 0.74 | 0.73 | 0.74 |
| Norway (5) | 0.90 | 53 | 0.60 | 0.75 | 0.71 | 0.74 | 0.76 | 0.77 | 0.70 | 0.73 | 0.75 | 0.72 |
| Oman | 0.82 | 42 | 0.34 | 0.65 | 0.73 | 0.69 | 0.69 | 0.70 | 0.67 | 0.67 | 0.64 | 0.65 |
| Poland | 0.93 | 62 | 0.71 | 0.77 | 0.79 | 0.80 | 0.84 | 0.83 | 0.79 | 0.79 | 0.76 | 0.79 |
| Portugal | 0.84 | 44 | 0.53 | 0.55 | 0.67 | 0.74 | 0.69 | 0.69 | 0.66 | 0.67 | 0.68 | 0.72 |
| Qatar | 0.91 | 56 | 0.55 | 0.76 | 0.79 | 0.80 | 0.80 | 0.80 | 0.71 | 0.79 | 0.74 | 0.72 |
| Russian Federation | 0.86 | 48 | 0.51 | 0.67 | 0.73 | 0.74 | 0.75 | 0.73 | 0.69 | 0.69 | 0.67 | 0.70 |
| Saudi Arabia | 0.89 | 51 | 0.47 | 0.72 | 0.77 | 0.74 | 0.78 | 0.78 | 0.68 | 0.75 | 0.69 | 0.73 |
| Serbia | 0.87 | 48 | 0.52 | 0.74 | 0.72 | 0.68 | 0.78 | 0.73 | 0.74 | 0.58 | 0.70 | 0.68 |
| Singapore | 0.91 | 56 | 0.66 | 0.78 | 0.79 | 0.79 | 0.79 | 0.78 | 0.68 | 0.76 | 0.76 | 0.69 |
| Slovak Republic | 0.90 | 55 | 0.65 | 0.75 | 0.73 | 0.71 | 0.78 | 0.77 | 0.70 | 0.77 | 0.76 | 0.75 |
| Slovenia | 0.91 | 56 | 0.64 | 0.70 | 0.71 | 0.78 | 0.79 | 0.83 | 0.74 | 0.78 | 0.77 | 0.74 |
| South Africa (5) | - | - | - | - | - | - | - | - | - | - | - | - |
| Spain | 0.88 | 51 | 0.47 | 0.68 | 0.74 | 0.74 | 0.78 | 0.69 | 0.71 | 0.76 | 0.77 | 0.77 |
| Sweden | 0.89 | 52 | 0.53 | 0.75 | 0.71 | 0.73 | 0.78 | 0.78 | 0.69 | 0.74 | 0.70 | 0.73 |
| Turkey | 0.77 | 37 | 0.39 | 0.55 | 0.61 | 0.45 | 0.70 | 0.66 | 0.66 | 0.57 | 0.68 | 0.70 |
| United Arab Emirates | 0.90 | 54 | 0.54 | 0.75 | 0.77 | 0.77 | 0.79 | 0.79 | 0.71 | 0.74 | 0.73 | 0.71 |
| United States | 0.91 | 56 | 0.64 | 0.78 | 0.78 | 0.76 | 0.79 | 0.78 | 0.69 | 0.76 | 0.73 | 0.76 |
| Benchmarking Participants | | | | | | | | | | | | |
| Buenos Aires, Argentina | 0.87 | 49 | 0.49 | 0.63 | 0.75 | 0.73 | 0.78 | 0.75 | 0.65 | 0.74 | 0.73 | 0.71 |
| Ontario, Canada | 0.90 | 53 | 0.62 | 0.76 | 0.77 | 0.76 | 0.77 | 0.76 | 0.67 | 0.74 | 0.72 | 0.71 |
| Quebec, Canada | 0.89 | 52 | 0.52 | 0.76 | 0.75 | 0.76 | 0.78 | 0.73 | 0.72 | 0.74 | 0.69 | 0.70 |
| Norway (4) | 0.89 | 52 | 0.61 | 0.71 | 0.72 | 0.75 | 0.77 | 0.76 | 0.72 | 0.74 | 0.74 | 0.70 |
| Abu Dhabi, UAE | 0.89 | 52 | 0.51 | 0.74 | 0.75 | 0.77 | 0.79 | 0.77 | 0.70 | 0.73 | 0.71 | 0.70 |
| Dubai, UAE | 0.90 | 53 | 0.59 | 0.74 | 0.75 | 0.76 | 0.78 | 0.77 | 0.70 | 0.74 | 0.72 | 0.71 |
| Florida, US | 0.91 | 57 | 0.66 | 0.77 | 0.77 | 0.76 | 0.79 | 0.78 | 0.73 | 0.73 | 0.75 | 0.77 |

A dash (-) indicates comparable data not available.

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Students' Views on Engaging Teaching in Science Lessons Scale, Fourth Grade, and TIMSS 2015 Science Achievement

| Country | Pearson's Correlation with Science Achievement | | Variance in Science Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|----------------------------------|--|-------------|---|
| | (r) | (r^2) | |
| Australia | -0.02 | 0.00 | 0.00 |
| Bahrain | 0.22 | 0.05 | 0.04 |
| Belgium (Flemish) | -0.08 | 0.01 | 0.01 |
| Bulgaria | 0.11 | 0.01 | 0.02 |
| Canada | 0.02 | 0.00 | 0.00 |
| Chile | 0.09 | 0.01 | 0.01 |
| Chinese Taipei | 0.07 | 0.01 | 0.01 |
| Croatia | 0.06 | 0.00 | 0.01 |
| Cyprus | 0.03 | 0.00 | 0.00 |
| Czech Republic | -0.06 | 0.00 | 0.00 |
| Denmark | 0.02 | 0.00 | 0.00 |
| England | -0.05 | 0.00 | 0.00 |
| Finland | 0.07 | 0.00 | 0.01 |
| France | -0.02 | 0.00 | 0.00 |
| Georgia | 0.10 | 0.01 | 0.02 |
| Germany | -0.02 | 0.00 | 0.00 |
| Hong Kong SAR | 0.07 | 0.00 | 0.01 |
| Hungary | 0.04 | 0.00 | 0.00 |
| Indonesia | 0.16 | 0.02 | 0.04 |
| Iran, Islamic Rep. of | 0.08 | 0.01 | 0.02 |
| Ireland | -0.05 | 0.00 | 0.00 |
| Italy | 0.04 | 0.00 | 0.01 |
| Japan | 0.04 | 0.00 | 0.00 |
| Jordan | - | - | - |
| Kazakhstan | 0.12 | 0.01 | 0.02 |
| Korea, Rep. of | 0.09 | 0.01 | 0.01 |
| Kuwait | 0.13 | 0.02 | 0.03 |
| Lithuania | 0.07 | 0.00 | 0.01 |
| Morocco | 0.17 | 0.03 | 0.03 |
| Netherlands | -0.01 | 0.00 | 0.00 |
| New Zealand | -0.05 | 0.00 | 0.00 |
| Northern Ireland | -0.06 | 0.00 | 0.00 |
| Norway (5) | -0.01 | 0.00 | 0.00 |
| Oman | 0.17 | 0.03 | 0.04 |
| Poland | -0.02 | 0.00 | 0.00 |
| Portugal | 0.07 | 0.01 | 0.00 |
| Qatar | 0.19 | 0.04 | 0.04 |
| Russian Federation | -0.01 | 0.00 | 0.00 |
| Saudi Arabia | 0.12 | 0.01 | 0.02 |
| Serbia | -0.02 | 0.00 | 0.00 |
| Singapore | 0.07 | 0.00 | 0.00 |
| Slovak Republic | -0.07 | 0.00 | 0.00 |
| Slovenia | 0.06 | 0.00 | 0.01 |
| South Africa (5) | - | - | - |
| Spain | 0.03 | 0.00 | 0.00 |
| Sweden | -0.06 | 0.00 | 0.01 |
| Turkey | 0.28 | 0.08 | 0.07 |
| United Arab Emirates | 0.20 | 0.04 | 0.04 |
| United States | 0.06 | 0.00 | 0.01 |
| International Median | 0.06 | 0.00 | 0.01 |
| Benchmarking Participants | | | |
| Buenos Aires, Argentina | 0.01 | 0.00 | 0.00 |
| Ontario, Canada | 0.02 | 0.00 | 0.00 |
| Quebec, Canada | -0.01 | 0.00 | 0.00 |
| Norway (4) | 0.03 | 0.00 | 0.00 |
| Abu Dhabi, UAE | 0.18 | 0.03 | 0.03 |
| Dubai, UAE | 0.16 | 0.03 | 0.03 |
| Florida, US | 0.15 | 0.02 | 0.03 |

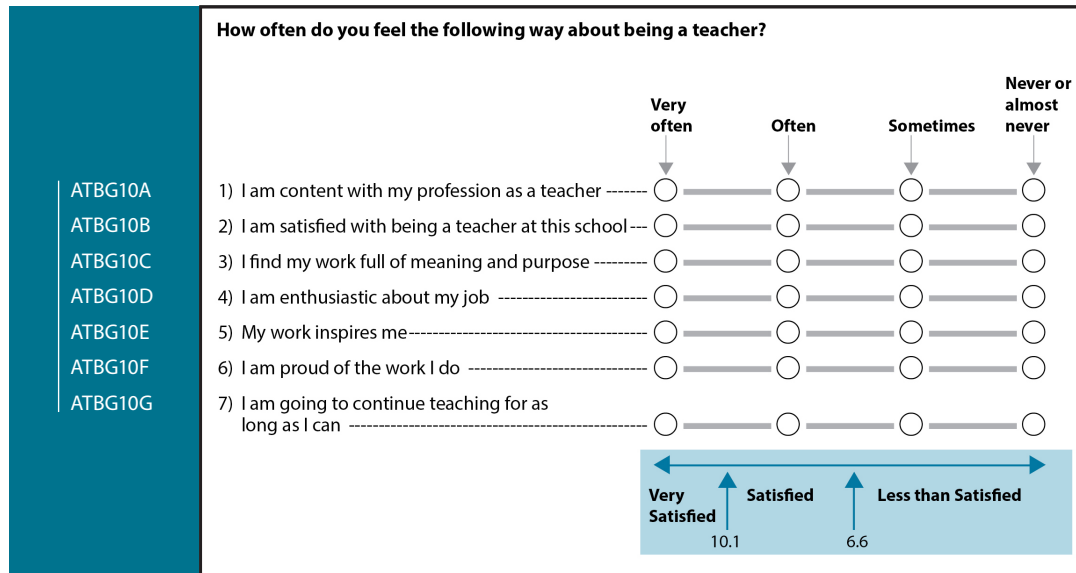
SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

A dash (-) indicates comparable data not available.

Teacher Job Satisfaction Scale, Fourth Grade

The Teacher Job Satisfaction (TJS) scale was created based on how often teachers responded positively to the seven statements described below.

Items in the TIMSS 2015 Teacher Job Satisfaction Scale, Fourth Grade¹



¹ For the purpose of scaling, categories in which there were very few respondents were combined. The categories “Sometimes” and “Never or almost never” were combined for all variables. The scale statistics that are reported herein reflect analysis of the items following collapsing.

Item Parameters for the TIMSS 2015 Teacher Job Satisfaction Scale, Fourth Grade

| Item | delta | tau_1 | tau_2 | Infit |
|---------|----------|----------|---------|-------|
| ATBG10A | 0.18167 | -1.87034 | 1.87034 | 0.92 |
| ATBG10B | 0.10394 | -1.66322 | 1.66322 | 1.28 |
| ATBG10C | -0.65803 | -1.81035 | 1.81035 | 0.97 |
| ATBG10D | -0.08795 | -1.84973 | 1.84973 | 0.79 |
| ATBG10E | 0.26732 | -1.76637 | 1.76637 | 0.84 |
| ATBG10F | -0.20476 | -1.60751 | 1.60751 | 1.00 |
| ATBG10G | 0.39781 | -1.29161 | 1.29161 | 1.19 |

Scale Transformation Constants for the TIMSS 2015 Teacher Job Satisfaction Scale, Fourth Grade

Scale Transformation Constants

A = 8.377535

B = 0.905788

Transformed Scale Score = 8.377535 + 0.905788 • Logit Scale Score

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Teacher Job Satisfaction Scale, Fourth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 4.30095 | |
| 1 | 5.44546 | |
| 2 | 6.07197 | |
| 3 | 6.56411 | 6.6 |
| 4 | 7.00941 | |
| 5 | 7.44953 | |
| 6 | 7.91110 | |
| 7 | 8.39763 | |
| 8 | 8.88012 | |
| 9 | 9.32868 | |
| 10 | 9.75567 | |
| 11 | 10.18696 | 10.1 |
| 12 | 10.66453 | |
| 13 | 11.27347 | |
| 14 | 12.40375 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Teacher Job Satisfaction Scale, Fourth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|---------|
| | | | ATBG10A | ATBG10B | ATBG10C | ATBG10D | ATBG10E | ATBG10F | ATBG10G |
| Australia | 0.91 | 65 | 0.84 | 0.70 | 0.85 | 0.87 | 0.88 | 0.74 | 0.74 |
| Bahrain | 0.90 | 63 | 0.84 | 0.73 | 0.71 | 0.87 | 0.86 | 0.77 | 0.76 |
| Belgium (Flemish) | 0.90 | 63 | 0.80 | 0.65 | 0.75 | 0.89 | 0.85 | 0.84 | 0.74 |
| Bulgaria | 0.89 | 61 | 0.73 | 0.74 | 0.76 | 0.86 | 0.81 | 0.84 | 0.69 |
| Canada | 0.90 | 63 | 0.83 | 0.70 | 0.78 | 0.88 | 0.85 | 0.79 | 0.73 |
| Chile | 0.87 | 58 | 0.70 | 0.65 | 0.66 | 0.81 | 0.87 | 0.85 | 0.76 |
| Chinese Taipei | 0.94 | 75 | 0.89 | 0.79 | 0.89 | 0.91 | 0.88 | 0.92 | 0.80 |
| Croatia | 0.91 | 65 | 0.82 | 0.72 | 0.74 | 0.87 | 0.87 | 0.86 | 0.76 |
| Cyprus | 0.91 | 66 | 0.82 | 0.60 | 0.86 | 0.87 | 0.89 | 0.81 | 0.80 |
| Czech Republic | 0.91 | 66 | 0.80 | 0.65 | 0.86 | 0.89 | 0.89 | 0.80 | 0.77 |
| Denmark | 0.92 | 67 | 0.87 | 0.78 | 0.76 | 0.88 | 0.86 | 0.76 | 0.80 |
| England | 0.93 | 73 | 0.85 | 0.76 | 0.85 | 0.91 | 0.92 | 0.86 | 0.80 |
| Finland | 0.93 | 69 | 0.86 | 0.73 | 0.79 | 0.89 | 0.87 | 0.85 | 0.83 |
| France | 0.88 | 58 | 0.78 | 0.59 | 0.66 | 0.88 | 0.87 | 0.78 | 0.75 |
| Georgia | 0.85 | 54 | 0.69 | 0.67 | 0.58 | 0.79 | 0.77 | 0.82 | 0.79 |
| Germany | 0.87 | 58 | 0.77 | 0.61 | 0.77 | 0.86 | 0.83 | 0.74 | 0.71 |
| Hong Kong SAR | 0.93 | 70 | 0.86 | 0.81 | 0.86 | 0.86 | 0.85 | 0.83 | 0.77 |
| Hungary | 0.89 | 63 | 0.78 | 0.67 | 0.79 | 0.88 | 0.86 | 0.77 | 0.80 |
| Indonesia | 0.87 | 58 | 0.74 | 0.81 | 0.84 | 0.82 | 0.78 | 0.67 | 0.66 |
| Iran, Islamic Rep. of | 0.82 | 51 | 0.73 | 0.59 | 0.74 | 0.80 | 0.76 | 0.59 | 0.76 |
| Ireland | 0.91 | 67 | 0.83 | 0.63 | 0.87 | 0.86 | 0.87 | 0.80 | 0.84 |
| Italy | 0.90 | 62 | 0.80 | 0.73 | 0.74 | 0.87 | 0.83 | 0.83 | 0.69 |
| Japan | 0.92 | 67 | 0.84 | 0.76 | 0.84 | 0.83 | 0.89 | 0.84 | 0.73 |
| Jordan | 0.91 | 66 | 0.83 | 0.70 | 0.73 | 0.87 | 0.83 | 0.88 | 0.83 |
| Kazakhstan | 0.89 | 61 | 0.69 | 0.76 | 0.77 | 0.78 | 0.82 | 0.83 | 0.79 |
| Korea, Rep. of | 0.93 | 72 | 0.81 | 0.71 | 0.89 | 0.92 | 0.93 | 0.88 | 0.78 |
| Kuwait | 0.92 | 68 | 0.83 | 0.77 | 0.79 | 0.89 | 0.86 | 0.83 | 0.81 |
| Lithuania | 0.90 | 63 | 0.78 | 0.74 | 0.75 | 0.85 | 0.85 | 0.79 | 0.77 |
| Morocco | 0.89 | 62 | 0.81 | 0.71 | 0.76 | 0.85 | 0.87 | 0.79 | 0.69 |
| Netherlands | 0.87 | 57 | 0.75 | 0.65 | 0.71 | 0.83 | 0.87 | 0.72 | 0.73 |
| New Zealand | 0.92 | 67 | 0.83 | 0.76 | 0.84 | 0.88 | 0.86 | 0.75 | 0.81 |
| Northern Ireland | 0.92 | 68 | 0.88 | 0.72 | 0.88 | 0.87 | 0.87 | 0.75 | 0.78 |
| Norway (5) | 0.92 | 67 | 0.82 | 0.73 | 0.81 | 0.87 | 0.86 | 0.82 | 0.82 |
| Oman | 0.85 | 55 | 0.79 | 0.67 | 0.62 | 0.85 | 0.81 | 0.76 | 0.65 |
| Poland | 0.91 | 66 | 0.85 | 0.73 | 0.82 | 0.86 | 0.84 | 0.83 | 0.73 |
| Portugal | 0.86 | 54 | 0.77 | 0.63 | 0.71 | 0.85 | 0.78 | 0.69 | 0.70 |
| Qatar | 0.90 | 64 | 0.80 | 0.77 | 0.78 | 0.84 | 0.85 | 0.80 | 0.75 |
| Russian Federation | 0.89 | 61 | 0.86 | 0.78 | 0.63 | 0.84 | 0.85 | 0.79 | 0.68 |
| Saudi Arabia | 0.88 | 60 | 0.79 | 0.72 | 0.71 | 0.84 | 0.80 | 0.81 | 0.76 |
| Serbia | 0.88 | 59 | 0.81 | 0.66 | 0.70 | 0.83 | 0.82 | 0.78 | 0.76 |
| Singapore | 0.95 | 79 | 0.88 | 0.81 | 0.89 | 0.93 | 0.93 | 0.91 | 0.86 |
| Slovak Republic | 0.92 | 68 | 0.83 | 0.69 | 0.84 | 0.89 | 0.86 | 0.85 | 0.80 |
| Slovenia | 0.87 | 57 | 0.76 | 0.67 | 0.80 | 0.82 | 0.74 | 0.76 | 0.72 |
| South Africa (5) | 0.90 | 63 | 0.76 | 0.75 | 0.83 | 0.83 | 0.83 | 0.79 | 0.76 |
| Spain | 0.88 | 60 | 0.79 | 0.73 | 0.80 | 0.80 | 0.84 | 0.76 | 0.66 |
| Sweden | 0.85 | 55 | 0.80 | 0.56 | 0.69 | 0.85 | 0.85 | 0.69 | 0.69 |
| Turkey | 0.84 | 53 | 0.73 | 0.59 | 0.65 | 0.83 | 0.83 | 0.75 | 0.65 |
| United Arab Emirates | 0.90 | 63 | 0.79 | 0.74 | 0.74 | 0.86 | 0.84 | 0.81 | 0.75 |
| United States | 0.92 | 69 | 0.83 | 0.75 | 0.85 | 0.91 | 0.87 | 0.78 | 0.82 |
| Benchmarking Participants | | | | | | | | | |
| Buenos Aires, Argentina | 0.87 | 57 | 0.68 | 0.60 | 0.77 | 0.84 | 0.76 | 0.82 | 0.81 |
| Ontario, Canada | 0.91 | 65 | 0.84 | 0.70 | 0.85 | 0.87 | 0.86 | 0.79 | 0.73 |
| Quebec, Canada | 0.90 | 62 | 0.81 | 0.65 | 0.64 | 0.90 | 0.84 | 0.82 | 0.80 |
| Norway (4) | 0.92 | 68 | 0.86 | 0.66 | 0.78 | 0.90 | 0.88 | 0.88 | 0.78 |
| Abu Dhabi, UAE | 0.91 | 65 | 0.84 | 0.77 | 0.81 | 0.85 | 0.85 | 0.83 | 0.65 |
| Dubai, UAE | 0.89 | 62 | 0.75 | 0.78 | 0.75 | 0.87 | 0.82 | 0.77 | 0.77 |
| Florida, US | 0.91 | 67 | 0.78 | 0.77 | 0.88 | 0.85 | 0.86 | 0.72 | 0.84 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Teacher Job Satisfaction Scale, Fourth Grade, and TIMSS 2015 Achievement

| Country | Pearson's Correlation with Achievement | | | | Variance in Achievement Accounted for by Difference Between Regions of the Scale (η^2) | |
|----------------------------------|--|---------|-------------|---------|---|---------|
| | (r) | | (r) | | Mathematics | Science |
| | Mathematics | Science | Mathematics | Science | | |
| Australia | 0.04 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Bahrain | 0.10 | 0.02 | 0.01 | 0.00 | 0.01 | 0.00 |
| Belgium (Flemish) | 0.01 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Bulgaria | 0.05 | 0.05 | 0.00 | 0.00 | 0.00 | 0.01 |
| Canada | -0.02 | -0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Chile | 0.13 | 0.09 | 0.02 | 0.01 | 0.02 | 0.01 |
| Chinese Taipei | -0.02 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Croatia | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cyprus | 0.03 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Czech Republic | 0.04 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| Denmark | -0.04 | -0.01 | 0.00 | 0.00 | 0.01 | 0.00 |
| England | 0.07 | 0.04 | 0.01 | 0.00 | 0.00 | 0.00 |
| Finland | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| France | 0.06 | 0.06 | 0.00 | 0.00 | 0.01 | 0.01 |
| Georgia | 0.01 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Germany | 0.03 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Hong Kong SAR | 0.06 | 0.15 | 0.00 | 0.02 | 0.01 | 0.02 |
| Hungary | 0.06 | 0.03 | 0.00 | 0.00 | 0.02 | 0.00 |
| Indonesia | 0.01 | 0.04 | 0.00 | 0.00 | 0.00 | 0.01 |
| Iran, Islamic Rep. of | -0.01 | -0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Ireland | 0.02 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| Italy | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Japan | 0.02 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Jordan | 0.10 | - | 0.01 | - | 0.01 | - |
| Kazakhstan | 0.06 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| Korea, Rep. of | 0.05 | 0.04 | 0.00 | 0.00 | 0.01 | 0.00 |
| Kuwait | 0.04 | 0.06 | 0.00 | 0.00 | 0.00 | 0.01 |
| Lithuania | 0.03 | 0.04 | 0.00 | 0.00 | 0.01 | 0.00 |
| Morocco | 0.12 | 0.07 | 0.02 | 0.00 | 0.01 | 0.01 |
| Netherlands | -0.04 | -0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| New Zealand | 0.07 | 0.07 | 0.00 | 0.00 | 0.00 | 0.00 |
| Northern Ireland | 0.04 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Norway (5) | 0.05 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Oman | 0.05 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Poland | 0.02 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Portugal | 0.12 | 0.10 | 0.01 | 0.01 | 0.01 | 0.01 |
| Qatar | -0.07 | -0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Russian Federation | -0.04 | -0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| Saudi Arabia | 0.10 | 0.15 | 0.01 | 0.02 | 0.02 | 0.02 |
| Serbia | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Singapore | 0.05 | 0.03 | 0.00 | 0.00 | 0.01 | 0.01 |
| Slovak Republic | 0.06 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 |
| Slovenia | 0.01 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| South Africa (5) | 0.02 | - | 0.00 | - | 0.00 | - |
| Spain | 0.09 | 0.09 | 0.01 | 0.01 | 0.01 | 0.01 |
| Sweden | 0.08 | 0.10 | 0.01 | 0.01 | 0.01 | 0.01 |
| Turkey | 0.12 | 0.11 | 0.01 | 0.01 | 0.01 | 0.01 |
| United Arab Emirates | 0.14 | 0.14 | 0.02 | 0.02 | 0.02 | 0.01 |
| United States | 0.06 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| International Median | 0.04 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Benchmarking Participants | | | | | | |
| Buenos Aires, Argentina | 0.17 | 0.19 | 0.03 | 0.04 | 0.03 | 0.04 |
| Ontario, Canada | -0.01 | -0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Quebec, Canada | 0.03 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Norway (4) | 0.04 | 0.07 | 0.00 | 0.01 | 0.00 | 0.01 |
| Abu Dhabi, UAE | 0.20 | 0.12 | 0.04 | 0.02 | 0.04 | 0.01 |
| Dubai, UAE | 0.07 | 0.07 | 0.00 | 0.01 | 0.01 | 0.01 |
| Florida, US | 0.17 | 0.15 | 0.03 | 0.02 | 0.03 | 0.03 |

A dash (-) indicates comparable data not available.

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Teachers Emphasize Science Investigation Scale, Fourth Grade

The Teachers Emphasize Science Investigation (ESI) scale was created based on teachers' responses to how often they used the eight instructional activities described below.

Items in the TIMSS 2015 Teachers Emphasize Science Investigation Scale, Fourth Grade¹

| | | In teaching science to the students in this class, how often do you ask them to do the following? | | | |
|---------|--|---|------------------------|-----------------------|-----------------------|
| | | Every or almost every lesson | About half the lessons | Some lessons | Never |
| ATBS03B | 1) Observe natural phenomena such as the weather or a plant growing and describe what they see ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ATBS03C | 2) Watch me demonstrate an experiment or investigation --- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ATBS03D | 3) Design or plan experiments or investigations ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ATBS03E | 4) Conduct experiments or investigations ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ATBS03F | 5) Present data from experiments or investigations ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ATBS03G | 6) Interpret data from experiments or investigations----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ATBS03H | 7) Use evidence from experiments or investigations to support conclusions ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ATBS03K | 8) Do field work outside the class ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

←-----→
 About Half the Lessons or More 11.3 Less than Half the Lessons

¹ For the purpose of scaling, categories in which there were very few respondents were combined. The categories "Some Lessons" and "Never" were combined for all variables. The scale statistics that are reported herein reflect analysis of the items following collapsing.

Item Parameters for the TIMSS 2015 Teachers Emphasize Science Investigation Scale, Fourth Grade

| Item | delta | tau_1 | tau_2 | Infit |
|---------|----------|----------|---------|-------|
| ATBS03B | -0.97859 | -1.00917 | 1.00917 | 1.54 |
| ATBS03C | -0.43524 | -0.63501 | 0.63501 | 1.34 |
| ATBS03D | 0.08764 | -0.94529 | 0.94529 | 0.86 |
| ATBS03E | -0.19774 | -0.99274 | 0.99274 | 0.81 |
| ATBS03F | 0.14498 | -0.92496 | 0.92496 | 0.72 |
| ATBS03G | 0.00719 | -0.96463 | 0.96463 | 0.73 |
| ATBS03H | -0.34379 | -0.92870 | 0.92870 | 0.92 |
| ATBS03K | 1.71555 | -0.79925 | 0.79925 | 1.40 |

Scale Transformation Constants for the TIMSS 2015 Teachers Emphasize Science Investigation Scale, Fourth Grade

Scale Transformation Constants

$$A = 11.370579$$

$$B = 1.031391$$

$$\text{Transformed Scale Score} = 11.370579 + 1.031391 \cdot \text{Logit Scale Score}$$

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Teachers Emphasize Science Investigation Scale, Fourth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 7.29951 | |
| 1 | 8.55692 | |
| 2 | 9.20866 | |
| 3 | 9.68367 | |
| 4 | 10.07397 | |
| 5 | 10.42134 | |
| 6 | 10.74105 | |
| 7 | 11.04610 | |
| 8 | 11.34471 | 11.3 |
| 9 | 11.64792 | |
| 10 | 11.95987 | |
| 11 | 12.29081 | |
| 12 | 12.65106 | |
| 13 | 13.06204 | |
| 14 | 13.56297 | |
| 15 | 14.24746 | |
| 16 | 15.54731 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Teachers Emphasize Science Investigation Scale, Fourth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|---------|---------|
| | | | ATBS02B | ATBS02C | ATBS02D | ATBS02E | ATBS02F | ATBS02G | ATBS02H | ATBS02K |
| Australia | 0.89 | 58 | 0.63 | 0.58 | 0.83 | 0.86 | 0.88 | 0.88 | 0.75 | 0.64 |
| Bahrain | 0.83 | 47 | 0.46 | 0.42 | 0.75 | 0.80 | 0.83 | 0.83 | 0.80 | 0.43 |
| Belgium (Flemish) | 0.90 | 64 | 0.58 | 0.70 | 0.90 | 0.93 | 0.93 | 0.91 | 0.88 | 0.41 |
| Bulgaria | 0.85 | 53 | 0.64 | 0.63 | 0.80 | 0.87 | 0.85 | 0.81 | 0.55 | 0.62 |
| Canada | 0.85 | 49 | 0.56 | 0.44 | 0.72 | 0.80 | 0.84 | 0.86 | 0.82 | 0.40 |
| Chile | 0.90 | 62 | 0.56 | 0.76 | 0.83 | 0.89 | 0.87 | 0.83 | 0.75 | 0.74 |
| Chinese Taipei | 0.89 | 57 | 0.59 | 0.60 | 0.78 | 0.84 | 0.89 | 0.90 | 0.88 | 0.40 |
| Croatia | 0.90 | 62 | 0.67 | 0.66 | 0.84 | 0.91 | 0.92 | 0.91 | 0.64 | 0.64 |
| Cyprus | 0.81 | 48 | 0.32 | 0.25 | 0.83 | 0.85 | 0.86 | 0.88 | 0.85 | 0.22 |
| Czech Republic | 0.87 | 57 | 0.54 | 0.65 | 0.84 | 0.88 | 0.90 | 0.87 | 0.79 | 0.40 |
| Denmark | 0.84 | 50 | 0.39 | 0.53 | 0.73 | 0.72 | 0.82 | 0.85 | 0.80 | 0.71 |
| England | 0.86 | 53 | 0.43 | 0.55 | 0.81 | 0.85 | 0.88 | 0.86 | 0.88 | 0.31 |
| Finland | 0.82 | 52 | 0.48 | 0.55 | 0.78 | 0.87 | 0.88 | 0.87 | 0.73 | 0.45 |
| France | 0.85 | 50 | 0.53 | 0.26 | 0.78 | 0.89 | 0.88 | 0.89 | 0.84 | 0.14 |
| Georgia | 0.86 | 56 | 0.50 | 0.68 | 0.87 | 0.89 | 0.90 | 0.86 | 0.61 | 0.53 |
| Germany | 0.88 | 55 | 0.65 | 0.51 | 0.78 | 0.88 | 0.87 | 0.88 | 0.84 | 0.37 |
| Hong Kong SAR | 0.89 | 58 | 0.66 | 0.77 | 0.87 | 0.79 | 0.87 | 0.85 | 0.81 | 0.30 |
| Hungary | 0.76 | 46 | 0.53 | 0.41 | 0.81 | 0.81 | 0.84 | 0.73 | 0.70 | 0.40 |
| Indonesia | 0.92 | 63 | 0.68 | 0.78 | 0.80 | 0.86 | 0.87 | 0.86 | 0.80 | 0.64 |
| Iran, Islamic Rep. of | 0.87 | 53 | 0.52 | 0.62 | 0.79 | 0.84 | 0.84 | 0.84 | 0.76 | 0.56 |
| Ireland | 0.81 | 45 | 0.37 | 0.41 | 0.69 | 0.75 | 0.81 | 0.84 | 0.85 | 0.41 |
| Italy | 0.91 | 63 | 0.67 | 0.67 | 0.84 | 0.87 | 0.90 | 0.86 | 0.86 | 0.59 |
| Japan | 0.84 | 49 | 0.64 | 0.59 | 0.65 | 0.76 | 0.80 | 0.83 | 0.82 | 0.45 |
| Jordan | - | - | - | - | - | - | - | - | - | - |
| Kazakhstan | 0.90 | 59 | 0.55 | 0.77 | 0.84 | 0.86 | 0.85 | 0.78 | 0.71 | 0.71 |
| Korea, Rep. of | 0.84 | 50 | 0.54 | 0.45 | 0.73 | 0.85 | 0.86 | 0.89 | 0.80 | 0.35 |
| Kuwait | 0.87 | 53 | 0.59 | 0.65 | 0.71 | 0.79 | 0.85 | 0.85 | 0.81 | 0.51 |
| Lithuania | 0.90 | 64 | 0.67 | 0.77 | 0.92 | 0.92 | 0.91 | 0.82 | 0.75 | 0.61 |
| Morocco | 0.85 | 49 | 0.49 | 0.48 | 0.74 | 0.83 | 0.85 | 0.85 | 0.76 | 0.38 |
| Netherlands | 0.82 | 51 | 0.66 | 0.56 | 0.86 | 0.87 | 0.67 | 0.85 | 0.82 | -0.08 |
| New Zealand | 0.85 | 50 | 0.48 | 0.49 | 0.78 | 0.81 | 0.84 | 0.84 | 0.83 | 0.43 |
| Northern Ireland | 0.87 | 54 | 0.46 | 0.64 | 0.87 | 0.87 | 0.89 | 0.86 | 0.80 | 0.17 |
| Norway (5) | 0.85 | 50 | 0.70 | 0.48 | 0.74 | 0.81 | 0.83 | 0.83 | 0.70 | 0.48 |
| Oman | 0.84 | 48 | 0.44 | 0.59 | 0.77 | 0.80 | 0.80 | 0.81 | 0.79 | 0.37 |
| Poland | 0.92 | 67 | 0.61 | 0.75 | 0.89 | 0.88 | 0.88 | 0.91 | 0.91 | 0.66 |
| Portugal | 0.89 | 59 | 0.63 | 0.68 | 0.82 | 0.88 | 0.87 | 0.86 | 0.85 | 0.43 |
| Qatar | 0.89 | 58 | 0.49 | 0.58 | 0.82 | 0.86 | 0.89 | 0.87 | 0.87 | 0.61 |
| Russian Federation | 0.91 | 63 | 0.60 | 0.68 | 0.86 | 0.92 | 0.90 | 0.90 | 0.85 | 0.54 |
| Saudi Arabia | 0.84 | 47 | 0.45 | 0.40 | 0.71 | 0.76 | 0.88 | 0.85 | 0.76 | 0.54 |
| Serbia | 0.90 | 62 | 0.66 | 0.71 | 0.84 | 0.86 | 0.86 | 0.87 | 0.81 | 0.63 |
| Singapore | 0.86 | 51 | 0.63 | 0.60 | 0.75 | 0.78 | 0.83 | 0.84 | 0.64 | 0.61 |
| Slovak Republic | 0.90 | 61 | 0.57 | 0.70 | 0.86 | 0.90 | 0.91 | 0.90 | 0.77 | 0.52 |
| Slovenia | 0.89 | 59 | 0.57 | 0.61 | 0.80 | 0.91 | 0.93 | 0.90 | 0.79 | 0.49 |
| South Africa (5) | - | - | - | - | - | - | - | - | - | - |
| Spain | 0.87 | 55 | 0.54 | 0.65 | 0.85 | 0.84 | 0.84 | 0.82 | 0.77 | 0.55 |
| Sweden | 0.83 | 50 | 0.25 | 0.44 | 0.84 | 0.86 | 0.81 | 0.88 | 0.85 | 0.37 |
| Turkey | 0.88 | 57 | 0.64 | 0.59 | 0.82 | 0.82 | 0.90 | 0.88 | 0.83 | 0.41 |
| United Arab Emirates | 0.88 | 56 | 0.56 | 0.59 | 0.82 | 0.85 | 0.88 | 0.86 | 0.84 | 0.46 |
| United States | 0.90 | 60 | 0.73 | 0.66 | 0.79 | 0.88 | 0.90 | 0.89 | 0.78 | 0.52 |
| Benchmarking Participants | | | | | | | | | | |
| Buenos Aires, Argentina | 0.91 | 61 | 0.70 | 0.72 | 0.85 | 0.87 | 0.87 | 0.87 | 0.83 | 0.42 |
| Ontario, Canada | 0.86 | 51 | 0.52 | 0.51 | 0.80 | 0.76 | 0.84 | 0.85 | 0.82 | 0.50 |
| Quebec, Canada | 0.81 | 45 | 0.47 | 0.51 | 0.61 | 0.81 | 0.84 | 0.87 | 0.78 | 0.16 |
| Norway (4) | 0.77 | 44 | 0.58 | 0.71 | 0.79 | 0.77 | 0.78 | 0.76 | 0.43 | 0.33 |
| Abu Dhabi, UAE | 0.90 | 60 | 0.65 | 0.65 | 0.85 | 0.86 | 0.89 | 0.83 | 0.84 | 0.57 |
| Dubai, UAE | 0.87 | 56 | 0.59 | 0.49 | 0.81 | 0.87 | 0.89 | 0.88 | 0.84 | 0.44 |
| Florida, US | 0.91 | 65 | 0.78 | 0.64 | 0.87 | 0.91 | 0.93 | 0.92 | 0.77 | 0.53 |

A dash (-) indicates comparable data not available.

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Teachers Emphasize Science Investigation Scale, Fourth Grade, and TIMSS 2015 Science Achievement

| Country | Pearson's Correlation with Science Achievement | | Variance in Science Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|----------------------------------|--|-------------|---|
| | (r) | (r^2) | |
| Australia | 0.05 | 0.00 | 0.00 |
| Bahrain | 0.05 | 0.00 | 0.01 |
| Belgium (Flemish) | -0.07 | 0.00 | 0.01 |
| Bulgaria | -0.05 | 0.00 | 0.00 |
| Canada | -0.04 | 0.00 | 0.00 |
| Chile | -0.08 | 0.01 | 0.01 |
| Chinese Taipei | 0.01 | 0.00 | 0.00 |
| Croatia | -0.01 | 0.00 | 0.00 |
| Cyprus | -0.01 | 0.00 | 0.00 |
| Czech Republic | 0.02 | 0.00 | 0.00 |
| Denmark | -0.04 | 0.00 | 0.01 |
| England | 0.05 | 0.00 | 0.00 |
| Finland | -0.04 | 0.00 | 0.00 |
| France | 0.05 | 0.00 | 0.00 |
| Georgia | 0.02 | 0.00 | 0.00 |
| Germany | 0.05 | 0.00 | 0.00 |
| Hong Kong SAR | 0.05 | 0.00 | 0.01 |
| Hungary | -0.03 | 0.00 | 0.00 |
| Indonesia | 0.07 | 0.00 | 0.00 |
| Iran, Islamic Rep. of | 0.05 | 0.00 | 0.00 |
| Ireland | 0.08 | 0.01 | 0.01 |
| Italy | -0.01 | 0.00 | 0.00 |
| Japan | 0.02 | 0.00 | 0.00 |
| Jordan | - | - | - |
| Kazakhstan | 0.04 | 0.00 | 0.01 |
| Korea, Rep. of | -0.01 | 0.00 | 0.00 |
| Kuwait | -0.06 | 0.00 | 0.00 |
| Lithuania | -0.04 | 0.00 | 0.00 |
| Morocco | 0.05 | 0.00 | 0.01 |
| Netherlands | 0.02 | 0.00 | 0.00 |
| New Zealand | 0.06 | 0.00 | 0.00 |
| Northern Ireland | -0.02 | 0.00 | 0.00 |
| Norway (5) | -0.02 | 0.00 | 0.00 |
| Oman | 0.01 | 0.00 | 0.00 |
| Poland | -0.02 | 0.00 | 0.00 |
| Portugal | -0.03 | 0.00 | 0.00 |
| Qatar | -0.13 | 0.02 | 0.02 |
| Russian Federation | -0.03 | 0.00 | 0.00 |
| Saudi Arabia | 0.12 | 0.02 | 0.01 |
| Serbia | 0.04 | 0.00 | 0.00 |
| Singapore | 0.04 | 0.00 | 0.00 |
| Slovak Republic | 0.07 | 0.00 | 0.01 |
| Slovenia | 0.01 | 0.00 | 0.00 |
| South Africa (5) | - | - | - |
| Spain | 0.03 | 0.00 | 0.00 |
| Sweden | 0.02 | 0.00 | 0.00 |
| Turkey | 0.09 | 0.01 | 0.01 |
| United Arab Emirates | 0.10 | 0.01 | 0.01 |
| United States | 0.01 | 0.00 | 0.00 |
| International Median | 0.02 | 0.00 | 0.00 |
| Benchmarking Participants | | | |
| Buenos Aires, Argentina | -0.07 | 0.01 | 0.01 |
| Ontario, Canada | -0.03 | 0.00 | 0.00 |
| Quebec, Canada | 0.02 | 0.00 | 0.00 |
| Norway (4) | 0.03 | 0.00 | 0.00 |
| Abu Dhabi, UAE | 0.09 | 0.01 | 0.01 |
| Dubai, UAE | -0.03 | 0.00 | 0.00 |
| Florida, US | 0.02 | 0.00 | 0.00 |

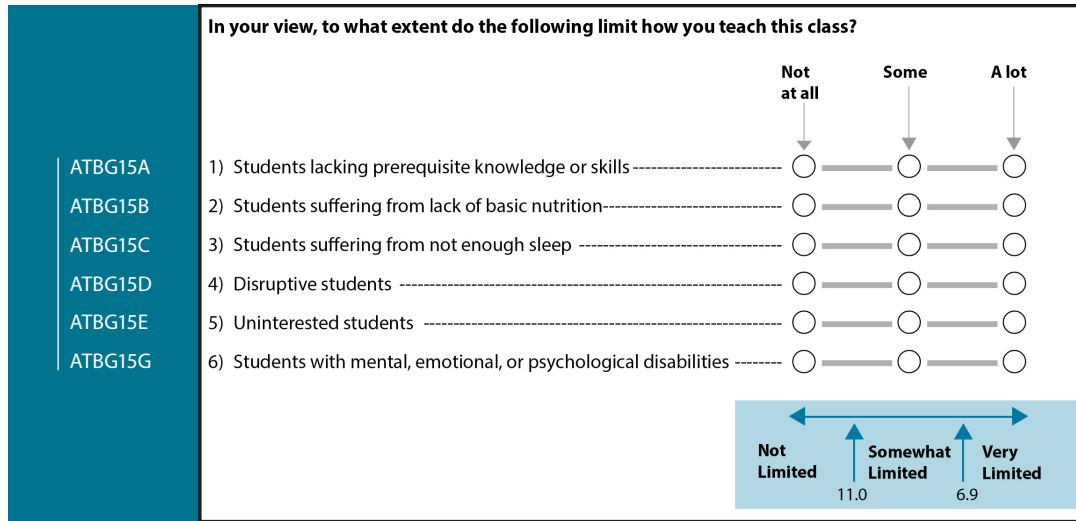
SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

A dash (-) indicates comparable data not available.

Teaching Limited by Student Needs Scale, Fourth Grade

The Teaching Limited by Student Needs (LSN) scale was created based on teachers' responses concerning six needs described below.

Items in the TIMSS 2015 Teaching Limited by Student Needs Scale, Fourth Grade



Item Parameters for the TIMSS 2015 Teaching Limited by Student Needs Scale, Fourth Grade

| Item | delta | tau_1 | tau_2 | Infit |
|---------|----------|----------|---------|-------|
| ATBG15A | 0.90362 | -2.02080 | 2.02080 | 1.02 |
| ATBG15B | -1.27753 | -1.05996 | 1.05996 | 1.04 |
| ATBG15C | -0.43516 | -1.62325 | 1.62325 | 0.98 |
| ATBG15D | 0.58656 | -1.51840 | 1.51840 | 0.97 |
| ATBG15E | 0.51242 | -1.88467 | 1.88467 | 0.92 |
| ATBG15G | -0.28991 | -1.50177 | 1.50177 | 1.10 |

Scale Transformation Constants for the TIMSS 2015 Teaching Limited by Student Needs Scale, Fourth Grade

Scale Transformation Constants

| | |
|--------------|---|
| A = 8.964842 | Transformed Scale Score = 8.964842 + 1.203519 • Logit Scale Score |
| B = 1.203519 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Teaching Limited by Student Needs Scale, Fourth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 3.80319 | |
| 1 | 5.34054 | |
| 2 | 6.20203 | |
| 3 | 6.88260 | 6.9 |
| 4 | 7.50773 | |
| 5 | 8.12884 | |
| 6 | 8.78577 | |
| 7 | 9.50093 | |
| 8 | 10.26124 | |
| 9 | 11.04392 | 11.0 |
| 10 | 11.87401 | |
| 11 | 12.86225 | |
| 12 | 14.51024 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Teaching Limited by Student Needs Scale, Fourth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|
| | | | ATBG15A | ATBG15B | ATBG15C | ATBG15D | ATBG15E | ATBG15G |
| Australia | 0.78 | 48 | 0.64 | 0.71 | 0.68 | 0.74 | 0.70 | 0.67 |
| Bahrain | 0.77 | 47 | 0.67 | 0.52 | 0.63 | 0.77 | 0.77 | 0.71 |
| Belgium (Flemish) | 0.67 | 38 | 0.66 | 0.45 | 0.68 | 0.63 | 0.68 | 0.57 |
| Bulgaria | 0.70 | 41 | 0.59 | 0.52 | 0.66 | 0.68 | 0.77 | 0.58 |
| Canada | 0.73 | 43 | 0.68 | 0.69 | 0.73 | 0.61 | 0.59 | 0.62 |
| Chile | 0.79 | 49 | 0.60 | 0.77 | 0.73 | 0.63 | 0.77 | 0.67 |
| Chinese Taipei | 0.78 | 48 | 0.59 | 0.70 | 0.71 | 0.75 | 0.74 | 0.64 |
| Croatia | 0.75 | 45 | 0.49 | 0.63 | 0.71 | 0.74 | 0.77 | 0.65 |
| Cyprus | 0.77 | 46 | 0.50 | 0.61 | 0.75 | 0.75 | 0.76 | 0.68 |
| Czech Republic | 0.63 | 35 | 0.70 | 0.28 | 0.44 | 0.65 | 0.72 | 0.64 |
| Denmark | 0.77 | 48 | 0.68 | 0.59 | 0.67 | 0.77 | 0.75 | 0.67 |
| England | 0.79 | 50 | 0.60 | 0.69 | 0.74 | 0.74 | 0.71 | 0.74 |
| Finland | 0.72 | 42 | 0.67 | 0.48 | 0.58 | 0.74 | 0.72 | 0.66 |
| France | 0.70 | 40 | 0.59 | 0.48 | 0.71 | 0.73 | 0.67 | 0.59 |
| Georgia | 0.69 | 39 | 0.59 | 0.57 | 0.67 | 0.71 | 0.58 | 0.63 |
| Germany | 0.74 | 44 | 0.69 | 0.60 | 0.70 | 0.68 | 0.58 | 0.71 |
| Hong Kong SAR | 0.71 | 41 | 0.67 | 0.49 | 0.60 | 0.66 | 0.70 | 0.69 |
| Hungary | 0.77 | 47 | 0.72 | 0.68 | 0.75 | 0.66 | 0.67 | 0.63 |
| Indonesia | 0.59 | 34 | 0.43 | 0.61 | 0.71 | 0.56 | 0.69 | 0.40 |
| Iran, Islamic Rep. of | 0.77 | 46 | 0.52 | 0.68 | 0.66 | 0.79 | 0.66 | 0.74 |
| Ireland | 0.75 | 44 | 0.61 | 0.74 | 0.66 | 0.67 | 0.71 | 0.58 |
| Italy | 0.81 | 52 | 0.69 | 0.73 | 0.75 | 0.79 | 0.72 | 0.63 |
| Japan | 0.75 | 44 | 0.71 | 0.27 | 0.69 | 0.76 | 0.75 | 0.69 |
| Jordan | 0.68 | 39 | 0.60 | 0.53 | 0.52 | 0.69 | 0.71 | 0.68 |
| Kazakhstan | 0.79 | 48 | 0.62 | 0.75 | 0.75 | 0.76 | 0.71 | 0.56 |
| Korea, Rep. of | 0.82 | 53 | 0.61 | 0.64 | 0.76 | 0.76 | 0.77 | 0.79 |
| Kuwait | 0.68 | 40 | 0.60 | 0.50 | 0.65 | 0.75 | 0.76 | 0.44 |
| Lithuania | 0.75 | 44 | 0.70 | 0.50 | 0.56 | 0.79 | 0.72 | 0.70 |
| Morocco | 0.70 | 40 | 0.64 | 0.59 | 0.59 | 0.73 | 0.69 | 0.56 |
| Netherlands | 0.73 | 42 | 0.57 | 0.61 | 0.62 | 0.72 | 0.73 | 0.63 |
| New Zealand | 0.79 | 48 | 0.59 | 0.75 | 0.80 | 0.72 | 0.58 | 0.71 |
| Northern Ireland | 0.75 | 46 | 0.65 | 0.65 | 0.79 | 0.54 | 0.75 | 0.65 |
| Norway (5) | 0.76 | 47 | 0.49 | 0.72 | 0.73 | 0.67 | 0.80 | 0.66 |
| Oman | 0.78 | 47 | 0.65 | 0.69 | 0.70 | 0.78 | 0.70 | 0.59 |
| Poland | 0.71 | 41 | 0.69 | 0.42 | 0.67 | 0.65 | 0.72 | 0.64 |
| Portugal | 0.76 | 46 | 0.61 | 0.73 | 0.72 | 0.69 | 0.71 | 0.61 |
| Qatar | 0.71 | 41 | 0.59 | 0.60 | 0.69 | 0.68 | 0.80 | 0.44 |
| Russian Federation | 0.81 | 51 | 0.60 | 0.73 | 0.82 | 0.75 | 0.67 | 0.70 |
| Saudi Arabia | 0.68 | 39 | 0.54 | 0.61 | 0.59 | 0.72 | 0.74 | 0.49 |
| Serbia | 0.72 | 42 | 0.63 | 0.57 | 0.65 | 0.74 | 0.75 | 0.56 |
| Singapore | 0.77 | 47 | 0.64 | 0.70 | 0.71 | 0.68 | 0.68 | 0.71 |
| Slovak Republic | 0.82 | 54 | 0.70 | 0.56 | 0.73 | 0.85 | 0.78 | 0.74 |
| Slovenia | 0.69 | 40 | 0.45 | 0.57 | 0.65 | 0.72 | 0.76 | 0.56 |
| South Africa (5) | 0.76 | 45 | 0.64 | 0.63 | 0.66 | 0.68 | 0.78 | 0.63 |
| Spain | 0.76 | 45 | 0.70 | 0.47 | 0.68 | 0.74 | 0.75 | 0.66 |
| Sweden | 0.75 | 45 | 0.66 | 0.53 | 0.67 | 0.76 | 0.71 | 0.65 |
| Turkey | 0.73 | 43 | 0.66 | 0.65 | 0.66 | 0.70 | 0.73 | 0.51 |
| United Arab Emirates | 0.76 | 45 | 0.66 | 0.62 | 0.67 | 0.75 | 0.75 | 0.56 |
| United States | 0.78 | 48 | 0.69 | 0.70 | 0.72 | 0.72 | 0.74 | 0.60 |
| Benchmarking Participants | | | | | | | | |
| Buenos Aires, Argentina | 0.81 | 51 | 0.60 | 0.78 | 0.73 | 0.70 | 0.72 | 0.72 |
| Ontario, Canada | 0.74 | 43 | 0.67 | 0.65 | 0.69 | 0.62 | 0.69 | 0.64 |
| Quebec, Canada | 0.58 | 34 | 0.67 | 0.70 | 0.77 | 0.49 | 0.20 | 0.46 |
| Norway (4) | 0.75 | 45 | 0.66 | 0.69 | 0.71 | 0.74 | 0.69 | 0.51 |
| Abu Dhabi, UAE | 0.76 | 46 | 0.68 | 0.52 | 0.66 | 0.76 | 0.74 | 0.67 |
| Dubai, UAE | 0.71 | 41 | 0.63 | 0.68 | 0.60 | 0.74 | 0.68 | 0.47 |
| Florida, US | 0.80 | 50 | 0.73 | 0.67 | 0.70 | 0.75 | 0.82 | 0.54 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Teaching Limited by Student Needs Scale, Fourth Grade, and TIMSS 2015 Achievement

| Country | Pearson's Correlation with Achievement | | | | Variance in Achievement Accounted for by Difference Between Regions of the Scale (η^2) | |
|----------------------------------|--|-------------|-------------------|-------------|---|-------------|
| | (r) | | (r ²) | | Mathematics | Science |
| | Mathematics | Science | Mathematics | Science | | |
| Australia | 0.28 | 0.23 | 0.08 | 0.05 | 0.07 | 0.04 |
| Bahrain | 0.09 | 0.07 | 0.01 | 0.00 | 0.01 | 0.01 |
| Belgium (Flemish) | 0.16 | 0.18 | 0.02 | 0.03 | 0.02 | 0.02 |
| Bulgaria | 0.19 | 0.21 | 0.03 | 0.05 | 0.01 | 0.02 |
| Canada | 0.24 | 0.20 | 0.06 | 0.04 | 0.06 | 0.04 |
| Chile | 0.23 | 0.27 | 0.05 | 0.07 | 0.06 | 0.07 |
| Chinese Taipei | 0.08 | 0.02 | 0.01 | 0.00 | 0.01 | 0.00 |
| Croatia | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cyprus | 0.10 | 0.07 | 0.01 | 0.00 | 0.01 | 0.00 |
| Czech Republic | 0.09 | 0.09 | 0.01 | 0.01 | 0.01 | 0.01 |
| Denmark | 0.14 | 0.13 | 0.02 | 0.02 | 0.02 | 0.01 |
| England | 0.26 | 0.19 | 0.07 | 0.04 | 0.04 | 0.03 |
| Finland | 0.15 | 0.17 | 0.02 | 0.03 | 0.02 | 0.02 |
| France | 0.19 | 0.20 | 0.04 | 0.04 | 0.01 | 0.02 |
| Georgia | 0.14 | 0.14 | 0.02 | 0.02 | 0.02 | 0.02 |
| Germany | 0.18 | 0.20 | 0.03 | 0.04 | 0.03 | 0.04 |
| Hong Kong SAR | 0.22 | 0.17 | 0.05 | 0.03 | 0.04 | 0.02 |
| Hungary | 0.21 | 0.22 | 0.04 | 0.05 | 0.03 | 0.04 |
| Indonesia | 0.14 | 0.08 | 0.02 | 0.01 | 0.01 | 0.01 |
| Iran, Islamic Rep. of | 0.16 | 0.17 | 0.03 | 0.03 | 0.02 | 0.02 |
| Ireland | 0.19 | 0.21 | 0.04 | 0.04 | 0.03 | 0.03 |
| Italy | 0.08 | 0.05 | 0.01 | 0.00 | 0.01 | 0.00 |
| Japan | 0.09 | 0.06 | 0.01 | 0.00 | 0.00 | 0.00 |
| Jordan | 0.11 | - | 0.01 | - | 0.01 | - |
| Kazakhstan | 0.17 | 0.17 | 0.03 | 0.03 | 0.02 | 0.02 |
| Korea, Rep. of | 0.06 | 0.05 | 0.00 | 0.00 | 0.01 | 0.00 |
| Kuwait | 0.18 | 0.16 | 0.03 | 0.03 | 0.03 | 0.02 |
| Lithuania | 0.11 | 0.09 | 0.01 | 0.01 | 0.01 | 0.01 |
| Morocco | 0.14 | 0.18 | 0.02 | 0.03 | 0.01 | 0.03 |
| Netherlands | 0.14 | 0.16 | 0.02 | 0.03 | 0.02 | 0.03 |
| New Zealand | 0.27 | 0.26 | 0.07 | 0.07 | 0.07 | 0.06 |
| Northern Ireland | 0.22 | 0.20 | 0.05 | 0.04 | 0.04 | 0.03 |
| Norway (5) | 0.12 | 0.13 | 0.01 | 0.02 | 0.01 | 0.01 |
| Oman | -0.04 | -0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Poland | 0.16 | 0.09 | 0.03 | 0.01 | 0.01 | 0.00 |
| Portugal | 0.14 | 0.11 | 0.02 | 0.01 | 0.02 | 0.01 |
| Qatar | 0.24 | 0.23 | 0.06 | 0.05 | 0.03 | 0.03 |
| Russian Federation | 0.12 | 0.13 | 0.01 | 0.02 | 0.02 | 0.02 |
| Saudi Arabia | 0.16 | 0.11 | 0.03 | 0.01 | 0.03 | 0.02 |
| Serbia | 0.05 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| Singapore | 0.40 | 0.34 | 0.16 | 0.12 | 0.12 | 0.08 |
| Slovak Republic | 0.21 | 0.25 | 0.04 | 0.06 | 0.03 | 0.04 |
| Slovenia | 0.01 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| South Africa (5) | 0.08 | - | 0.01 | - | 0.01 | - |
| Spain | 0.24 | 0.23 | 0.06 | 0.05 | 0.03 | 0.03 |
| Sweden | 0.18 | 0.20 | 0.03 | 0.04 | 0.04 | 0.04 |
| Turkey | 0.14 | 0.14 | 0.02 | 0.02 | 0.02 | 0.02 |
| United Arab Emirates | 0.33 | 0.34 | 0.11 | 0.11 | 0.09 | 0.09 |
| United States | 0.21 | 0.22 | 0.04 | 0.05 | 0.04 | 0.05 |
| International Median | 0.16 | 0.17 | 0.02 | 0.03 | 0.02 | 0.02 |
| Benchmarking Participants | | | | | | |
| Buenos Aires, Argentina | 0.21 | 0.19 | 0.04 | 0.04 | 0.06 | 0.07 |
| Ontario, Canada | 0.16 | 0.14 | 0.03 | 0.02 | 0.02 | 0.02 |
| Quebec, Canada | 0.21 | 0.19 | 0.04 | 0.04 | 0.04 | 0.03 |
| Norway (4) | 0.09 | 0.10 | 0.01 | 0.01 | 0.01 | 0.01 |
| Abu Dhabi, UAE | 0.32 | 0.34 | 0.10 | 0.11 | 0.08 | 0.07 |
| Dubai, UAE | 0.28 | 0.26 | 0.08 | 0.07 | 0.08 | 0.05 |
| Florida, US | 0.31 | 0.28 | 0.09 | 0.08 | 0.04 | 0.03 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

A dash (-) indicates comparable data not available.

Appendix 15B: TIMSS 2015 Context Questionnaire Scales, Eighth Grade

Challenges Facing Teachers Scale, Eighth Grade

The Challenges Facing Teachers (CFT) scale was created based on teachers' degree of agreement with the eight statements described below.

Items in the TIMSS 2015 Challenges Facing Teachers Scale, Eighth Grade

Indicate the extent to which you agree or disagree with each of the following statements.

| | Disagree a lot | Disagree a little | Agree a little | Agree a lot |
|---|-----------------------|-----------------------|-----------------------|-----------------------|
| BTBG11A 1) There are too many students in the classes ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| BTBG11B 2) I have too much material to cover in class ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| BTBG11C 3) I have too many teaching hours ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| BTBG11D 4) I need more time to prepare for class ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| BTBG11E 5) I need more time to assist individual students ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| BTBG11F 6) I feel too much pressure from parents ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| BTBG11G 7) I have difficulty keeping up with all the changes to the curriculum----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| BTBG11H 8) I have too many administrative tasks ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Few Challenges Some Challenges (10.3) Many Challenges (6.7)

Item Parameters for the TIMSS 2015 Challenges Facing Teachers Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|---------|----------|----------|----------|---------|-------|
| BTBG11A | 0.26540 | -0.81039 | 0.24920 | 0.56119 | 1.11 |
| BTBG11B | 0.52937 | -1.30760 | 0.16072 | 1.14688 | 1.02 |
| BTBG11C | -0.28947 | -0.97083 | -0.04654 | 1.01737 | 0.99 |
| BTBG11D | 0.28900 | -1.29421 | 0.29118 | 1.00303 | 0.92 |
| BTBG11E | 1.32631 | -1.39494 | 0.63027 | 0.76467 | 0.97 |
| BTBG11F | -0.97546 | -1.30536 | -0.17929 | 1.48465 | 1.08 |
| BTBG11G | -0.91502 | -1.36767 | 0.12377 | 1.24390 | 1.02 |
| BTBG11H | -0.23013 | -0.80736 | 0.14004 | 0.66732 | 1.04 |

Scale Transformation Constants for the TIMSS 2015 Challenges Facing Teachers Scale, Eighth Grade

| Scale Transformation Constants | |
|--------------------------------|--|
| A = 10.279046 | Transformed Scale Score = 10.279046 + 2.114581 • Logit Scale Score |
| B = 2.114581 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Challenges Facing Teachers Scale, Eighth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 1.29542 | |
| 1 | 3.81029 | |
| 2 | 5.08204 | |
| 3 | 5.97972 | |
| 4 | 6.69800 | 6.7 |
| 5 | 7.30575 | |
| 6 | 7.84015 | |
| 7 | 8.32300 | |
| 8 | 8.76809 | |
| 9 | 9.18765 | |
| 10 | 9.58747 | |
| 11 | 9.97417 | |
| 12 | 10.35346 | 10.3 |
| 13 | 10.73076 | |
| 14 | 11.11149 | |
| 15 | 11.50149 | |
| 16 | 11.90744 | |
| 17 | 12.33708 | |
| 18 | 12.79739 | |
| 19 | 13.30313 | |
| 20 | 13.87094 | |
| 21 | 14.52876 | |
| 22 | 15.32951 | |
| 23 | 16.43759 | |
| 24 | 18.66344 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Challenges Facing Teachers Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|---------|---------|
| | | | BTBGT1A | BTBGT1B | BTBGT1C | BTBGT1D | BTBGT1E | BTBGT1F | BTBGT1G | BTBGT1H |
| Australia | 0.81 | 44 | 0.56 | 0.66 | 0.72 | 0.78 | 0.70 | 0.57 | 0.61 | 0.66 |
| Bahrain | 0.74 | 36 | 0.64 | 0.70 | 0.73 | 0.76 | 0.48 | 0.37 | 0.45 | 0.58 |
| Botswana (9) | 0.50 | 24 | 0.56 | 0.54 | 0.41 | 0.69 | 0.59 | 0.09 | 0.37 | 0.44 |
| Canada | 0.75 | 37 | 0.52 | 0.62 | 0.60 | 0.72 | 0.63 | 0.50 | 0.57 | 0.66 |
| Chile | 0.68 | 34 | 0.42 | 0.56 | 0.67 | 0.78 | 0.75 | 0.38 | 0.29 | 0.65 |
| Chinese Taipei | 0.73 | 36 | 0.62 | 0.66 | 0.67 | 0.69 | 0.58 | 0.67 | 0.42 | 0.40 |
| Egypt | 0.64 | 29 | 0.60 | 0.61 | 0.71 | 0.57 | 0.44 | 0.44 | 0.48 | 0.38 |
| England | 0.80 | 43 | 0.58 | 0.70 | 0.74 | 0.79 | 0.72 | 0.43 | 0.60 | 0.63 |
| Georgia | 0.66 | 31 | 0.45 | 0.62 | 0.51 | 0.69 | 0.55 | 0.49 | 0.56 | 0.51 |
| Hong Kong SAR | 0.69 | 33 | 0.60 | 0.68 | 0.32 | 0.70 | 0.62 | 0.56 | 0.47 | 0.56 |
| Hungary | 0.76 | 39 | 0.43 | 0.63 | 0.63 | 0.75 | 0.74 | 0.63 | 0.54 | 0.61 |
| Iran, Islamic Rep. of | 0.62 | 28 | 0.44 | 0.42 | 0.42 | 0.63 | 0.56 | 0.48 | 0.64 | 0.56 |
| Ireland | 0.80 | 42 | 0.59 | 0.68 | 0.71 | 0.75 | 0.67 | 0.51 | 0.58 | 0.68 |
| Israel | 0.72 | 34 | 0.51 | 0.52 | 0.52 | 0.72 | 0.57 | 0.66 | 0.57 | 0.58 |
| Italy | 0.71 | 34 | 0.56 | 0.75 | 0.32 | 0.68 | 0.47 | 0.46 | 0.70 | 0.57 |
| Japan | 0.76 | 38 | 0.53 | 0.49 | 0.60 | 0.69 | 0.66 | 0.63 | 0.62 | 0.69 |
| Jordan | 0.74 | 36 | 0.54 | 0.58 | 0.73 | 0.70 | 0.54 | 0.62 | 0.53 | 0.53 |
| Kazakhstan | 0.67 | 31 | 0.43 | 0.31 | 0.57 | 0.63 | 0.50 | 0.64 | 0.66 | 0.62 |
| Korea, Rep. of | 0.82 | 45 | 0.65 | 0.72 | 0.76 | 0.78 | 0.71 | 0.48 | 0.59 | 0.63 |
| Kuwait | 0.74 | 36 | 0.53 | 0.54 | 0.66 | 0.72 | 0.59 | 0.65 | 0.59 | 0.49 |
| Lebanon | 0.81 | 42 | 0.62 | 0.68 | 0.67 | 0.77 | 0.71 | 0.47 | 0.60 | 0.62 |
| Lithuania | 0.66 | 30 | 0.46 | 0.57 | 0.43 | 0.65 | 0.57 | 0.56 | 0.58 | 0.52 |
| Malaysia | 0.59 | 27 | 0.36 | 0.21 | 0.60 | 0.71 | 0.44 | 0.53 | 0.49 | 0.66 |
| Malta | 0.77 | 39 | 0.57 | 0.59 | 0.67 | 0.68 | 0.65 | 0.54 | 0.63 | 0.65 |
| Morocco | 0.66 | 30 | 0.58 | 0.66 | 0.76 | 0.61 | 0.49 | 0.38 | 0.42 | 0.34 |
| New Zealand | 0.78 | 40 | 0.50 | 0.56 | 0.70 | 0.79 | 0.72 | 0.54 | 0.51 | 0.68 |
| Norway (9) | 0.78 | 40 | 0.61 | 0.63 | 0.68 | 0.77 | 0.62 | 0.48 | 0.50 | 0.70 |
| Oman | 0.73 | 35 | 0.61 | 0.65 | 0.67 | 0.66 | 0.56 | 0.53 | 0.50 | 0.52 |
| Qatar | 0.74 | 36 | 0.54 | 0.54 | 0.66 | 0.69 | 0.61 | 0.66 | 0.56 | 0.48 |
| Russian Federation | 0.66 | 30 | 0.49 | 0.57 | 0.64 | 0.69 | 0.55 | 0.45 | 0.59 | 0.35 |
| Saudi Arabia | 0.71 | 33 | 0.60 | 0.58 | 0.65 | 0.71 | 0.55 | 0.48 | 0.52 | 0.46 |
| Singapore | - | - | - | - | - | - | - | - | - | - |
| Slovenia | 0.72 | 34 | 0.48 | 0.63 | 0.66 | 0.73 | 0.58 | 0.55 | 0.53 | 0.50 |
| South Africa (9) | 0.70 | 34 | 0.49 | 0.46 | 0.58 | 0.72 | 0.66 | 0.51 | 0.59 | 0.58 |
| Sweden | 0.72 | 35 | 0.47 | 0.53 | 0.73 | 0.77 | 0.63 | 0.52 | 0.42 | 0.55 |
| Thailand | 0.74 | 37 | 0.46 | 0.63 | 0.73 | 0.68 | 0.54 | 0.62 | 0.59 | 0.56 |
| Turkey | 0.72 | 35 | 0.49 | 0.81 | 0.78 | 0.70 | 0.64 | 0.33 | 0.42 | 0.35 |
| United Arab Emirates | 0.82 | 45 | 0.61 | 0.71 | 0.74 | 0.78 | 0.69 | 0.65 | 0.53 | 0.64 |
| United States | 0.80 | 42 | 0.60 | 0.66 | 0.66 | 0.76 | 0.70 | 0.51 | 0.64 | 0.64 |
| Benchmarking Participants | | | | | | | | | | |
| Buenos Aires, Argentina | 0.79 | 41 | 0.58 | 0.53 | 0.58 | 0.83 | 0.80 | 0.57 | 0.51 | 0.65 |
| Ontario, Canada | 0.73 | 36 | 0.42 | 0.61 | 0.61 | 0.70 | 0.60 | 0.57 | 0.56 | 0.68 |
| Quebec, Canada | 0.71 | 34 | 0.44 | 0.53 | 0.64 | 0.73 | 0.67 | 0.38 | 0.55 | 0.63 |
| Norway (8) | 0.78 | 40 | 0.61 | 0.66 | 0.67 | 0.75 | 0.62 | 0.54 | 0.56 | 0.61 |
| Abu Dhabi, UAE | 0.78 | 41 | 0.62 | 0.64 | 0.72 | 0.78 | 0.70 | 0.55 | 0.48 | 0.62 |
| Dubai, UAE | 0.84 | 48 | 0.51 | 0.71 | 0.78 | 0.79 | 0.68 | 0.73 | 0.64 | 0.64 |
| Florida, US | 0.79 | 42 | 0.48 | 0.64 | 0.69 | 0.75 | 0.76 | 0.51 | 0.69 | 0.64 |

A dash (-) indicates comparable data not available.

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Challenges Facing Teachers Scale, Eighth Grade, and TIMSS 2015 Achievement

| Country | Pearson's Correlation with Achievement | | | | Variance in Achievement Accounted for by Difference Between Regions of the Scale (η^2) | |
|----------------------------------|--|---------|-------------------|---------|---|---------|
| | (r) | | (r ²) | | Mathematics | Science |
| | Mathematics | Science | Mathematics | Science | | |
| Australia | 0.03 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Bahrain | 0.08 | 0.09 | 0.01 | 0.01 | 0.01 | 0.00 |
| Botswana (9) | 0.02 | 0.09 | 0.00 | 0.01 | 0.00 | 0.01 |
| Canada | 0.02 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 |
| Chile | 0.05 | 0.04 | 0.00 | 0.00 | 0.00 | 0.02 |
| Chinese Taipei | -0.02 | -0.05 | 0.00 | 0.00 | 0.00 | 0.01 |
| Egypt | 0.10 | 0.09 | 0.01 | 0.01 | 0.01 | 0.02 |
| England | 0.09 | 0.12 | 0.01 | 0.01 | 0.01 | 0.02 |
| Georgia | -0.01 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| Hong Kong SAR | -0.01 | -0.01 | 0.00 | 0.00 | 0.01 | 0.01 |
| Hungary | 0.01 | -0.06 | 0.00 | 0.00 | 0.01 | 0.01 |
| Iran, Islamic Rep. of | 0.01 | -0.09 | 0.00 | 0.01 | 0.01 | 0.01 |
| Ireland | -0.06 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| Israel | -0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 |
| Italy | -0.02 | -0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Japan | 0.03 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 |
| Jordan | 0.03 | 0.08 | 0.00 | 0.01 | 0.00 | 0.00 |
| Kazakhstan | 0.14 | 0.09 | 0.02 | 0.01 | 0.01 | 0.00 |
| Korea, Rep. of | -0.02 | -0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Kuwait | 0.05 | 0.07 | 0.00 | 0.00 | 0.01 | 0.00 |
| Lebanon | 0.11 | 0.07 | 0.01 | 0.00 | 0.01 | 0.00 |
| Lithuania | -0.12 | -0.06 | 0.02 | 0.00 | 0.00 | 0.00 |
| Malaysia | 0.04 | 0.03 | 0.00 | 0.00 | 0.01 | 0.01 |
| Malta | -0.13 | 0.12 | 0.02 | 0.01 | 0.01 | 0.01 |
| Morocco | 0.06 | 0.09 | 0.00 | 0.01 | 0.00 | 0.01 |
| New Zealand | -0.07 | -0.03 | 0.01 | 0.00 | 0.02 | 0.00 |
| Norway (9) | -0.01 | -0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| Oman | 0.02 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Qatar | 0.08 | -0.01 | 0.01 | 0.00 | 0.00 | 0.01 |
| Russian Federation | 0.06 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Saudi Arabia | 0.15 | -0.01 | 0.02 | 0.00 | 0.01 | 0.00 |
| Singapore | - | - | - | - | - | - |
| Slovenia | 0.04 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| South Africa (9) | 0.28 | 0.23 | 0.08 | 0.05 | 0.11 | 0.03 |
| Sweden | -0.05 | -0.06 | 0.00 | 0.00 | 0.00 | 0.00 |
| Thailand | 0.04 | 0.04 | 0.00 | 0.00 | 0.01 | 0.01 |
| Turkey | 0.04 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 |
| United Arab Emirates | 0.17 | 0.17 | 0.03 | 0.03 | 0.01 | 0.01 |
| United States | -0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 |
| International Median | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Benchmarking Participants | | | | | | |
| Buenos Aires, Argentina | 0.14 | -0.08 | 0.02 | 0.01 | 0.04 | 0.01 |
| Ontario, Canada | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Quebec, Canada | 0.03 | 0.11 | 0.00 | 0.01 | 0.01 | 0.01 |
| Norway (8) | -0.04 | -0.09 | 0.00 | 0.01 | 0.00 | 0.01 |
| Abu Dhabi, UAE | 0.16 | 0.16 | 0.03 | 0.03 | 0.00 | 0.01 |
| Dubai, UAE | 0.20 | 0.13 | 0.04 | 0.02 | 0.02 | 0.01 |
| Florida, US | 0.04 | 0.02 | 0.00 | 0.00 | 0.01 | 0.01 |

A dash (-) indicates comparable data not available.

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Home Educational Resources Scale, Eighth Grade

The Home Educational Resources (HER) scale was created based on students' responses concerning the availability of three resources described below.

Items in the TIMSS 2015 Home Educational Resources Scale, Eighth Grade

| | | |
|---|--------------------------------|---------------------------------|
| <p>T BSBG04</p> | <p>T BSDG065¹</p> | <p>T BSDGEDUP¹</p> |
| <p>Number of books in the home:</p> <p>1) 0-10</p> <p>2) 11-25</p> <p>3) 26-100</p> <p>4) 101-200</p> <p>5) More than 200</p> | | |
| <p>Highest level of education of either parent:</p> <p>1) Finished some primary or lower secondary or did not go to school</p> <p>2) Finished lower secondary</p> <p>3) Finished upper secondary</p> <p>4) Finished post-secondary education</p> <p>5) Finished university or higher</p> | | |
| <p>Number of home study supports:</p> <p>1) None</p> <p>2) Internet connection or own room</p> <p>3) Both</p> | | |
| | | |

T Trend item—item was included in the same scale in TIMSS 2011 and was used for linking the TIMSS 2011 and TIMSS 2015 scales.

1 Derived variable. For more details, see Supplement 3 of the User Guide for the [TIMSS 2015 International Database](#).

Item Parameters for the TIMSS 2015 Home Educational Resources Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | tau_4 | Infit |
|----------|----------|----------|----------|---------|---------|-------|
| BSBG04 | 0.83301 | -1.03371 | -0.22069 | 0.78431 | 0.47009 | 1.00 |
| BSDG06S | -0.73962 | -0.64211 | 0.64211 | | | 0.97 |
| BSDGEDUP | -0.09339 | -0.73961 | -0.50760 | 0.77465 | 0.47256 | 0.97 |

Scale Transformation Constants for the TIMSS 2015 Home Educational Resources Scale, Eighth Grade

Scale Transformation Constants

A = 9.211881

B = 1.80992

Transformed Scale Score = 9.211881 + 1.80992 • Logit Scale Score



**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Home Educational Resources Scale, Eighth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 4.23163 | |
| 1 | 6.35011 | |
| 2 | 7.44587 | |
| 3 | 8.27061 | 8.3 |
| 4 | 8.97690 | |
| 5 | 9.62284 | |
| 6 | 10.26361 | |
| 7 | 10.91820 | |
| 8 | 11.62210 | |
| 9 | 12.45383 | 12.4 |
| 10 | 13.88377 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Home Educational Resources Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Factor Loadings for Each Item | | |
|----------------------------------|--|-------------------------------|-------------------------------|---------|----------|
| | | | BS3G04 | BS0G06S | BS3G06UP |
| Australia | 0.40 | 46 | 0.77 | 0.42 | 0.78 |
| Bahrain | 0.40 | 46 | 0.70 | 0.52 | 0.79 |
| Botswana (9) | 0.47 | 50 | 0.63 | 0.71 | 0.77 |
| Canada | 0.35 | 44 | 0.77 | 0.38 | 0.77 |
| Chile | 0.44 | 48 | 0.69 | 0.57 | 0.79 |
| Chinese Taipei | 0.46 | 48 | 0.81 | 0.34 | 0.82 |
| Egypt | 0.39 | 46 | 0.57 | 0.70 | 0.75 |
| England | 0.44 | 47 | 0.80 | 0.37 | 0.80 |
| Georgia | 0.54 | 53 | 0.79 | 0.58 | 0.79 |
| Hong Kong SAR | 0.50 | 51 | 0.75 | 0.56 | 0.80 |
| Hungary | 0.56 | 54 | 0.87 | 0.33 | 0.87 |
| Iran, Islamic Rep. of | 0.63 | 59 | 0.75 | 0.71 | 0.83 |
| Ireland | 0.42 | 47 | 0.80 | 0.30 | 0.82 |
| Israel | 0.51 | 68 | 0.82 | - | 0.82 |
| Italy | 0.46 | 48 | 0.80 | 0.37 | 0.82 |
| Japan | 0.34 | 44 | 0.73 | 0.45 | 0.76 |
| Jordan | 0.46 | 49 | 0.64 | 0.67 | 0.77 |
| Kazakhstan | 0.50 | 51 | 0.76 | 0.68 | 0.70 |
| Korea, Rep. of | 0.41 | 47 | 0.74 | 0.54 | 0.75 |
| Kuwait | 0.27 | 40 | 0.71 | 0.36 | 0.76 |
| Lebanon | 0.37 | 44 | 0.71 | 0.48 | 0.77 |
| Lithuania | 0.45 | 49 | 0.78 | 0.48 | 0.78 |
| Malaysia | 0.52 | 51 | 0.71 | 0.66 | 0.78 |
| Malta | 0.37 | 45 | 0.80 | 0.16 | 0.82 |
| Morocco | 0.55 | 54 | 0.73 | 0.69 | 0.77 |
| New Zealand | 0.43 | 48 | 0.77 | 0.57 | 0.73 |
| Norway (9) | 0.38 | 47 | 0.77 | 0.44 | 0.78 |
| Oman | 0.44 | 48 | 0.63 | 0.65 | 0.78 |
| Qatar | 0.34 | 43 | 0.71 | 0.43 | 0.78 |
| Russian Federation | 0.39 | 45 | 0.78 | 0.36 | 0.78 |
| Saudi Arabia | 0.38 | 45 | 0.68 | 0.50 | 0.79 |
| Singapore | 0.44 | 48 | 0.73 | 0.53 | 0.79 |
| Slovenia | 0.43 | 47 | 0.80 | 0.31 | 0.82 |
| South Africa (9) | 0.45 | 48 | 0.61 | 0.71 | 0.75 |
| Sweden | 0.39 | 46 | 0.79 | 0.46 | 0.75 |
| Thailand | 0.49 | 50 | 0.73 | 0.60 | 0.78 |
| Turkey | 0.62 | 58 | 0.78 | 0.70 | 0.80 |
| United Arab Emirates | 0.35 | 44 | 0.72 | 0.51 | 0.73 |
| United States | 0.47 | 49 | 0.73 | 0.55 | 0.80 |
| Benchmarking Participants | | | | | |
| Buenos Aires, Argentina | 0.58 | 54 | 0.78 | 0.58 | 0.83 |
| Ontario, Canada | 0.36 | 45 | 0.76 | 0.44 | 0.76 |
| Quebec, Canada | 0.38 | 45 | 0.80 | 0.27 | 0.80 |
| Norway (8) | 0.37 | 46 | 0.76 | 0.41 | 0.78 |
| Abu Dhabi, UAE | 0.34 | 43 | 0.72 | 0.48 | 0.74 |
| Dubai, UAE | 0.38 | 45 | 0.73 | 0.57 | 0.71 |
| Florida, US | 0.43 | 48 | 0.72 | 0.56 | 0.78 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

A dash (-) indicates comparable data not available.

Relationship Between the TIMSS 2015 Home Educational Resources Scale, Eighth Grade, and TIMSS 2015 Achievement

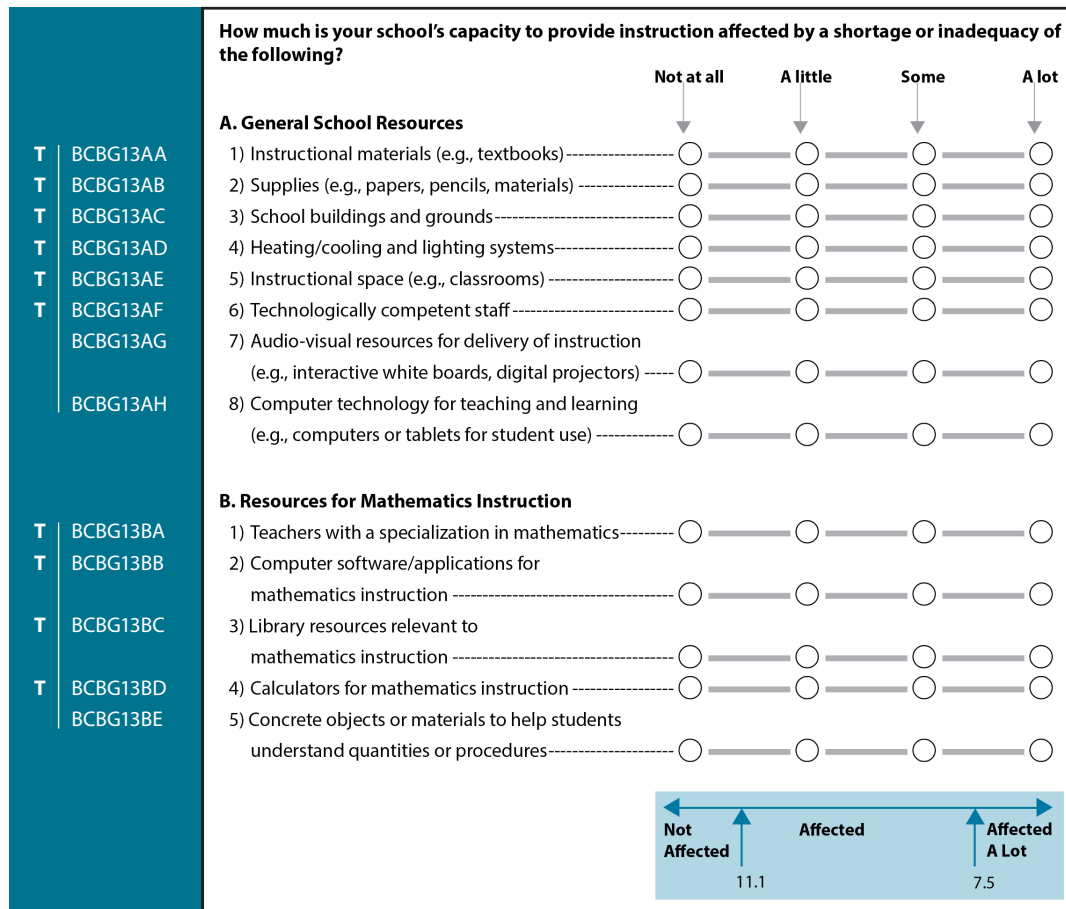
| Country | Pearson's Correlation with Achievement | | | | Variance in Achievement Accounted for by Difference Between Regions of the Scale (η^2) | |
|----------------------------------|--|-------------|-------------|-------------|---|-------------|
| | (r) | | (r) | | Mathematics | Science |
| | Mathematics | Science | Mathematics | Science | | |
| Australia | 0.38 | 0.45 | 0.15 | 0.20 | 0.09 | 0.13 |
| Bahrain | 0.26 | 0.26 | 0.07 | 0.07 | 0.03 | 0.03 |
| Botswana (9) | 0.18 | 0.18 | 0.03 | 0.03 | 0.03 | 0.03 |
| Canada | 0.33 | 0.40 | 0.11 | 0.16 | 0.07 | 0.10 |
| Chile | 0.38 | 0.38 | 0.15 | 0.14 | 0.08 | 0.08 |
| Chinese Taipei | 0.44 | 0.47 | 0.19 | 0.22 | 0.14 | 0.15 |
| Egypt | 0.21 | 0.20 | 0.05 | 0.04 | 0.04 | 0.03 |
| England | 0.48 | 0.52 | 0.23 | 0.27 | 0.17 | 0.19 |
| Georgia | 0.35 | 0.36 | 0.12 | 0.13 | 0.07 | 0.09 |
| Hong Kong SAR | 0.29 | 0.30 | 0.08 | 0.09 | 0.06 | 0.06 |
| Hungary | 0.60 | 0.57 | 0.37 | 0.32 | 0.27 | 0.24 |
| Iran, Islamic Rep. of | 0.40 | 0.41 | 0.16 | 0.17 | 0.13 | 0.14 |
| Ireland | 0.45 | 0.48 | 0.20 | 0.23 | 0.13 | 0.15 |
| Israel | 0.45 | 0.47 | 0.20 | 0.22 | 0.09 | 0.09 |
| Italy | 0.39 | 0.42 | 0.15 | 0.17 | 0.11 | 0.13 |
| Japan | 0.39 | 0.35 | 0.15 | 0.13 | 0.10 | 0.08 |
| Jordan | 0.28 | 0.33 | 0.08 | 0.11 | 0.05 | 0.07 |
| Kazakhstan | 0.17 | 0.18 | 0.03 | 0.03 | 0.02 | 0.02 |
| Korea, Rep. of | 0.35 | 0.33 | 0.12 | 0.11 | 0.10 | 0.09 |
| Kuwait | 0.28 | 0.28 | 0.08 | 0.08 | 0.04 | 0.04 |
| Lebanon | 0.23 | 0.26 | 0.05 | 0.07 | 0.04 | 0.04 |
| Lithuania | 0.41 | 0.43 | 0.17 | 0.18 | 0.10 | 0.11 |
| Malaysia | 0.32 | 0.33 | 0.10 | 0.11 | 0.07 | 0.07 |
| Malta | 0.39 | 0.41 | 0.15 | 0.17 | 0.11 | 0.12 |
| Morocco | 0.20 | 0.15 | 0.04 | 0.02 | 0.03 | 0.02 |
| New Zealand | 0.47 | 0.50 | 0.22 | 0.25 | 0.13 | 0.15 |
| Norway (9) | 0.38 | 0.42 | 0.15 | 0.17 | 0.10 | 0.12 |
| Oman | 0.21 | 0.17 | 0.04 | 0.03 | 0.03 | 0.02 |
| Qatar | 0.40 | 0.37 | 0.16 | 0.14 | 0.09 | 0.08 |
| Russian Federation | 0.22 | 0.26 | 0.05 | 0.07 | 0.02 | 0.03 |
| Saudi Arabia | 0.23 | 0.25 | 0.05 | 0.06 | 0.03 | 0.03 |
| Singapore | 0.38 | 0.42 | 0.15 | 0.18 | 0.09 | 0.11 |
| Slovenia | 0.34 | 0.38 | 0.12 | 0.14 | 0.06 | 0.08 |
| South Africa (9) | 0.30 | 0.31 | 0.09 | 0.10 | 0.07 | 0.07 |
| Sweden | 0.42 | 0.45 | 0.17 | 0.21 | 0.11 | 0.15 |
| Thailand | 0.32 | 0.33 | 0.10 | 0.11 | 0.07 | 0.08 |
| Turkey | 0.45 | 0.43 | 0.21 | 0.19 | 0.16 | 0.15 |
| United Arab Emirates | 0.35 | 0.34 | 0.12 | 0.11 | 0.07 | 0.07 |
| United States | 0.40 | 0.42 | 0.16 | 0.17 | 0.11 | 0.12 |
| International Median | 0.35 | 0.37 | 0.12 | 0.13 | 0.08 | 0.08 |
| Benchmarking Participants | | | | | | |
| Buenos Aires, Argentina | 0.44 | 0.41 | 0.19 | 0.17 | 0.13 | 0.11 |
| Ontario, Canada | 0.36 | 0.41 | 0.13 | 0.17 | 0.09 | 0.11 |
| Quebec, Canada | 0.36 | 0.42 | 0.13 | 0.17 | 0.07 | 0.10 |
| Norway (8) | 0.37 | 0.39 | 0.14 | 0.15 | 0.08 | 0.09 |
| Abu Dhabi, UAE | 0.35 | 0.34 | 0.12 | 0.11 | 0.08 | 0.07 |
| Dubai, UAE | 0.36 | 0.36 | 0.13 | 0.13 | 0.08 | 0.08 |
| Florida, US | 0.39 | 0.41 | 0.15 | 0.17 | 0.10 | 0.11 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Instruction Affected by Mathematics Resource Shortages—Principals’ Reports Scale, Eighth Grade

The Instruction Affected by Mathematics Resource Shortages—Principals’ Reports (MRS) scale was created based on principals’ responses concerning thirteen school and classroom resources described below.

Items in the TIMSS 2015 Instruction Affected by Mathematics Resource Shortages—Principals’ Reports Scale, Eighth Grade



T Trend item—item was included in the same scale in TIMSS 2011 and was used for linking the TIMSS 2011 and TIMSS 2015 scales.

Item Parameters for the TIMSS 2015 Instruction Affected by Mathematics Resource Shortages - Principals' Reports Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|----------|----------|----------|----------|---------|-------|
| BCBG13AA | -0.04723 | -0.20396 | 0.02271 | 0.18125 | 0.88 |
| BCBG13AB | -0.38064 | -0.32518 | 0.24639 | 0.07879 | 0.92 |
| BCBG13AC | 0.12618 | -0.78991 | 0.12928 | 0.66063 | 0.98 |
| BCBG13AD | -0.12528 | -0.57654 | -0.01616 | 0.59270 | 0.96 |
| BCBG13AE | 0.21910 | -0.43871 | -0.10609 | 0.54480 | 0.95 |
| BCBG13AF | 0.07215 | -1.21154 | -0.05087 | 1.26241 | 0.96 |
| BCBG13AG | 0.09524 | -1.07963 | -0.04438 | 1.12401 | 1.00 |
| BCBG13AH | 0.28516 | -1.19894 | -0.00568 | 1.20462 | 1.06 |
| BCBG13BA | 0.12677 | 0.02370 | -0.11510 | 0.09140 | 1.11 |
| BCBG13BB | 0.12244 | -1.32815 | -0.01581 | 1.34396 | 1.07 |
| BCBG13BC | -0.04954 | -1.36712 | 0.02456 | 1.34256 | 1.15 |
| BCBG13BD | -0.46499 | -0.67455 | 0.07619 | 0.59836 | 1.20 |
| BCBG13BE | 0.02064 | -1.30083 | -0.05970 | 1.36053 | 0.92 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Scale Transformation Constants for the TIMSS 2015 Instruction Affected by Mathematics Resource Shortages - Principals' Reports Scale, Eighth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 9.262831 | Transformed Scale Score = 9.262831 + 1.251401 • Logit Scale Score |
| B = 1.251401 | |

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Instruction Affected by Mathematics Resource Shortages -
Principals' Reports Scale, Eighth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 4.04996 | |
| 1 | 5.45622 | |
| 2 | 6.12504 | |
| 3 | 6.57408 | |
| 4 | 6.91534 | |
| 5 | 7.19218 | |
| 6 | 7.42599 | 7.5 |
| 7 | 7.62978 | |
| 8 | 7.81111 | |
| 9 | 7.97519 | |
| 10 | 8.12581 | |
| 11 | 8.26498 | |
| 12 | 8.39677 | |
| 13 | 8.52184 | |
| 14 | 8.64142 | |
| 15 | 8.75664 | |
| 16 | 8.86846 | |
| 17 | 8.97780 | |
| 18 | 9.08546 | |
| 19 | 9.19223 | |
| 20 | 9.30022 | |
| 21 | 9.40600 | |
| 22 | 9.51449 | |
| 23 | 9.62507 | |
| 24 | 9.73861 | |
| 25 | 9.85602 | |
| 26 | 9.97832 | |
| 27 | 10.10663 | |
| 28 | 10.24143 | |
| 29 | 10.38614 | |
| 30 | 10.54233 | |
| 31 | 10.71284 | |
| 32 | 10.90148 | |
| 33 | 11.11347 | 11.1 |
| 34 | 11.35656 | |
| 35 | 11.64345 | |
| 36 | 11.99552 | |
| 37 | 12.45578 | |
| 38 | 13.13639 | |
| 39 | 14.55441 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Instruction Affected by Mathematics Resource Shortages - Principals' Reports Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|--|
| | | | BCBG13AA | BCBG13AB | BCBG13AC | BCBG13AD | BCBG13AE | BCBG13AF | BCBG13AG | BCBG13AH | BCBG13BA | BCBG13BB | BCBG13BC | BCBG13BD | BCBG13BE | |
| Australia | 0.92 | 52 | 0.76 | 0.74 | 0.64 | 0.62 | 0.69 | 0.79 | 0.78 | 0.76 | 0.51 | 0.72 | 0.74 | 0.79 | 0.76 | |
| Bahrain | 0.96 | 64 | 0.92 | 0.88 | 0.85 | 0.90 | 0.89 | 0.87 | 0.87 | 0.81 | 0.78 | 0.71 | 0.54 | 0.64 | 0.62 | |
| Botswana (9) | 0.76 | 31 | 0.46 | 0.07 | 0.50 | 0.53 | 0.53 | 0.25 | 0.81 | 0.80 | -0.32 | 0.77 | 0.75 | 0.03 | 0.67 | |
| Canada | 0.90 | 45 | 0.70 | 0.66 | 0.53 | 0.36 | 0.58 | 0.71 | 0.71 | 0.74 | 0.67 | 0.79 | 0.81 | 0.72 | 0.65 | |
| Chile | 0.91 | 47 | 0.69 | 0.71 | 0.65 | 0.56 | 0.71 | 0.73 | 0.76 | 0.71 | 0.62 | 0.59 | 0.72 | 0.67 | 0.77 | |
| Chinese Taipei | 0.87 | 41 | 0.60 | 0.66 | 0.62 | 0.66 | 0.68 | 0.64 | 0.63 | 0.64 | 0.55 | 0.68 | 0.67 | 0.55 | 0.68 | |
| Egypt | 0.81 | 32 | 0.52 | 0.37 | 0.67 | 0.35 | 0.57 | 0.68 | 0.53 | 0.69 | 0.58 | 0.67 | 0.50 | 0.54 | 0.57 | |
| England | 0.89 | 45 | 0.76 | 0.68 | 0.67 | 0.72 | 0.57 | 0.64 | 0.75 | 0.69 | 0.44 | 0.73 | 0.69 | 0.60 | 0.69 | |
| Georgia | 0.88 | 43 | 0.53 | 0.73 | 0.70 | 0.62 | 0.75 | 0.68 | 0.66 | 0.77 | 0.60 | 0.64 | 0.67 | 0.47 | 0.63 | |
| Hong Kong SAR | 0.94 | 58 | 0.81 | 0.84 | 0.77 | 0.84 | 0.76 | 0.77 | 0.76 | 0.69 | 0.73 | 0.69 | 0.76 | 0.72 | 0.74 | |
| Hungary | 0.89 | 43 | 0.67 | 0.71 | 0.73 | 0.71 | 0.66 | 0.53 | 0.69 | 0.70 | 0.63 | 0.60 | 0.57 | 0.57 | 0.74 | |
| Iran, Islamic Rep. of | 0.89 | 44 | 0.75 | 0.74 | 0.71 | 0.75 | 0.76 | 0.74 | 0.66 | 0.60 | 0.67 | 0.57 | 0.50 | 0.50 | 0.60 | |
| Ireland | 0.89 | 44 | 0.67 | 0.70 | 0.60 | 0.63 | 0.63 | 0.62 | 0.77 | 0.62 | 0.57 | 0.76 | 0.50 | 0.70 | 0.79 | |
| Israel | 0.93 | 55 | 0.79 | 0.83 | 0.67 | 0.77 | 0.68 | 0.78 | 0.69 | 0.60 | 0.80 | 0.74 | 0.72 | 0.76 | 0.80 | |
| Italy | 0.82 | 34 | 0.57 | - | 0.53 | 0.44 | 0.48 | 0.54 | 0.65 | 0.67 | 0.51 | 0.73 | 0.56 | 0.59 | 0.68 | |
| Japan | 0.93 | 54 | 0.82 | 0.79 | 0.80 | 0.77 | 0.86 | 0.65 | 0.69 | 0.72 | 0.80 | 0.60 | 0.72 | 0.54 | 0.76 | |
| Jordan | 0.89 | 43 | 0.76 | 0.76 | 0.79 | 0.70 | 0.78 | 0.73 | 0.47 | 0.72 | 0.73 | 0.53 | 0.36 | 0.35 | 0.59 | |
| Kazakhstan | 0.94 | 57 | 0.73 | 0.70 | 0.70 | 0.80 | 0.77 | 0.80 | 0.80 | 0.75 | 0.83 | 0.69 | 0.86 | 0.62 | 0.78 | |
| Korea, Rep. of | 0.94 | 57 | 0.75 | 0.79 | 0.78 | 0.81 | 0.80 | 0.74 | 0.74 | 0.73 | 0.79 | 0.75 | 0.74 | 0.66 | 0.73 | |
| Kuwait | 0.94 | 56 | 0.82 | 0.79 | 0.79 | 0.85 | 0.85 | 0.78 | 0.70 | 0.69 | 0.87 | 0.64 | 0.48 | 0.70 | 0.70 | |
| Lebanon | 0.90 | 46 | 0.81 | 0.83 | 0.80 | 0.69 | 0.81 | 0.63 | 0.52 | 0.35 | 0.74 | 0.49 | 0.45 | 0.74 | 0.70 | |
| Lithuania | 0.90 | 45 | 0.60 | 0.65 | 0.67 | 0.64 | 0.56 | 0.64 | 0.72 | 0.74 | 0.58 | 0.73 | 0.72 | 0.65 | 0.77 | |
| Malaysia | 0.92 | 50 | 0.77 | 0.69 | 0.77 | 0.63 | 0.76 | 0.72 | 0.54 | 0.43 | 0.79 | 0.71 | 0.73 | 0.80 | 0.75 | |
| Malta | 0.89 | 48 | 0.82 | 0.77 | 0.66 | 0.68 | 0.66 | 0.82 | 0.74 | 0.71 | 0.84 | 0.54 | 0.41 | 0.74 | 0.50 | |
| Morocco | 0.69 | 39 | -0.27 | -0.14 | -0.38 | 0.29 | -0.59 | 0.70 | 0.67 | 0.76 | -0.62 | 0.82 | 0.83 | 0.74 | 0.72 | |
| New Zealand | 0.88 | 41 | 0.71 | 0.60 | 0.56 | 0.66 | 0.48 | 0.63 | 0.65 | 0.71 | 0.54 | 0.68 | 0.65 | 0.70 | 0.72 | |
| Norway (9) | 0.83 | 35 | 0.63 | 0.53 | 0.72 | 0.62 | 0.62 | 0.60 | 0.51 | 0.47 | 0.57 | 0.62 | 0.58 | 0.60 | 0.56 | |
| Oman | 0.92 | 53 | 0.80 | 0.72 | 0.69 | 0.82 | 0.80 | 0.81 | 0.75 | 0.62 | 0.77 | 0.69 | 0.65 | 0.58 | 0.71 | |
| Qatar | 0.98 | 79 | 0.90 | 0.90 | 0.88 | 0.94 | 0.90 | 0.93 | 0.90 | 0.92 | 0.92 | 0.87 | 0.82 | 0.76 | 0.90 | |
| Russian Federation | 0.88 | 41 | 0.65 | 0.57 | 0.55 | 0.71 | 0.56 | 0.66 | 0.70 | 0.66 | 0.58 | 0.73 | 0.67 | 0.54 | 0.70 | |
| Saudi Arabia | 0.90 | 47 | 0.73 | 0.66 | 0.70 | 0.81 | 0.77 | 0.68 | 0.58 | 0.76 | 0.69 | 0.61 | 0.35 | 0.70 | 0.74 | |
| Singapore | 0.98 | 80 | 0.93 | 0.87 | 0.87 | 0.89 | 0.91 | 0.86 | 0.87 | 0.90 | 0.91 | 0.89 | 0.89 | 0.92 | 0.91 | |
| Slovenia | 0.84 | 35 | 0.53 | 0.60 | 0.49 | 0.54 | 0.54 | 0.51 | 0.73 | 0.72 | 0.11 | 0.68 | 0.68 | 0.58 | 0.72 | |
| South Africa (9) | 0.84 | 36 | 0.42 | 0.20 | 0.50 | 0.70 | 0.49 | 0.67 | 0.78 | 0.78 | 0.28 | 0.74 | 0.69 | 0.50 | 0.71 | |
| Sweden | 0.85 | 38 | 0.72 | 0.69 | 0.59 | 0.60 | 0.54 | 0.63 | 0.65 | 0.62 | 0.66 | 0.65 | 0.37 | 0.48 | 0.70 | |
| Thailand | 0.92 | 52 | 0.78 | 0.80 | 0.73 | 0.70 | 0.73 | 0.74 | 0.64 | 0.80 | 0.67 | 0.66 | 0.72 | 0.62 | 0.74 | |
| Turkey | 0.88 | 41 | 0.65 | 0.63 | 0.65 | 0.67 | 0.67 | 0.54 | 0.68 | 0.63 | 0.59 | 0.62 | 0.61 | 0.53 | 0.79 | |
| United Arab Emirates | 0.96 | 70 | 0.87 | 0.84 | 0.85 | 0.87 | 0.86 | 0.88 | 0.85 | 0.86 | 0.87 | 0.75 | 0.76 | 0.73 | 0.84 | |
| United States | 0.91 | 49 | 0.71 | 0.66 | 0.66 | 0.64 | 0.69 | 0.68 | 0.77 | 0.68 | 0.69 | 0.79 | 0.69 | 0.67 | 0.77 | |
| Benchmarking Participants | | | | | | | | | | | | | | | | |
| Buenos Aires, Argentina | 0.95 | 62 | 0.84 | 0.82 | 0.77 | 0.83 | 0.79 | 0.79 | 0.66 | 0.73 | 0.68 | 0.74 | 0.89 | 0.83 | 0.81 | |
| Ontario, Canada | 0.88 | 43 | 0.63 | 0.65 | 0.59 | 0.22 | 0.56 | 0.67 | 0.69 | 0.77 | 0.54 | 0.76 | 0.82 | 0.70 | 0.70 | |
| Quebec, Canada | 0.91 | 49 | 0.79 | 0.72 | 0.66 | 0.74 | 0.74 | 0.66 | 0.66 | 0.68 | 0.75 | 0.69 | 0.67 | 0.77 | 0.56 | |
| Norway (8) | 0.84 | 36 | 0.66 | 0.61 | 0.72 | 0.63 | 0.62 | 0.62 | 0.56 | 0.47 | 0.58 | 0.57 | 0.54 | 0.63 | 0.57 | |
| Abu Dhabi, UAE | 0.96 | 66 | 0.87 | 0.85 | 0.84 | 0.83 | 0.85 | 0.86 | 0.83 | 0.78 | 0.85 | 0.62 | 0.72 | 0.77 | 0.82 | |
| Dubai, UAE | 0.97 | 76 | 0.91 | 0.89 | 0.85 | 0.91 | 0.83 | 0.94 | 0.88 | 0.90 | 0.91 | 0.86 | 0.83 | 0.71 | 0.91 | |
| Florida, US | 0.89 | 45 | 0.79 | 0.76 | 0.67 | 0.56 | 0.79 | 0.70 | 0.70 | 0.78 | 0.30 | 0.80 | 0.58 | 0.53 | 0.64 | |

A dash (-) indicates comparable data not available.

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Instruction Affected by Mathematics Resource Shortages - Principals' Reports Scale, Eighth Grade, and TIMSS 2015 Mathematics Achievement

| Country | Pearson's Correlation with Mathematics Achievement | | Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|----------------------------------|--|-----------|---|
| | (r) | (r^2) | |
| Australia | 0.22 | 0.05 | 0.02 |
| Bahrain | 0.16 | 0.03 | 0.05 |
| Botswana (9) | 0.21 | 0.04 | 0.06 |
| Cana | 0.11 | 0.01 | 0.02 |
| Chile | 0.18 | 0.03 | 0.03 |
| Chinese Taipei | 0.15 | 0.02 | 0.01 |
| Egypt | -0.14 | 0.02 | 0.01 |
| England | 0.18 | 0.03 | 0.02 |
| Georgia | 0.05 | 0.00 | 0.00 |
| Hong Kong SAR | 0.04 | 0.00 | 0.00 |
| Hungary | 0.05 | 0.00 | 0.00 |
| Iran, Islamic Rep. of | 0.13 | 0.02 | 0.03 |
| Ireland | 0.05 | 0.00 | 0.00 |
| Israel | 0.28 | 0.08 | 0.09 |
| Italy | 0.09 | 0.01 | 0.01 |
| Japan | 0.04 | 0.00 | 0.00 |
| Jordan | -0.14 | 0.02 | 0.04 |
| Kazakhstan | -0.05 | 0.00 | 0.01 |
| Korea, Rep. of | -0.06 | 0.00 | 0.00 |
| Kuwait | 0.19 | 0.04 | 0.08 |
| Lebanon | 0.08 | 0.01 | 0.03 |
| Lithuania | -0.06 | 0.00 | 0.00 |
| Malaysia | -0.15 | 0.02 | 0.01 |
| Malta | 0.09 | 0.01 | 0.01 |
| Morocco | -0.12 | 0.01 | 0.03 |
| New Zealand | 0.11 | 0.01 | 0.01 |
| Norway (9) | 0.06 | 0.00 | 0.00 |
| Oman | 0.00 | 0.00 | 0.01 |
| Qatar | 0.17 | 0.03 | 0.04 |
| Russian Federation | 0.07 | 0.00 | 0.01 |
| Saudi Arabia | -0.08 | 0.01 | 0.01 |
| Singapore | 0.02 | 0.00 | 0.00 |
| Slovenia | -0.03 | 0.00 | 0.00 |
| South Africa (9) | 0.20 | 0.04 | 0.07 |
| Sweden | -0.05 | 0.00 | 0.00 |
| Thailand | 0.15 | 0.02 | 0.01 |
| Turkey | 0.07 | 0.01 | 0.01 |
| United Arab Emirates | 0.24 | 0.06 | 0.08 |
| United States | 0.17 | 0.03 | 0.04 |
| International Median | 0.07 | 0.01 | 0.01 |
| Benchmarking Participants | | | |
| Buenos Aires, Argentina | 0.34 | 0.12 | 0.08 |
| Ontario, Canada | 0.05 | 0.00 | 0.00 |
| Quebec, Canada | 0.11 | 0.01 | 0.01 |
| Norway (8) | 0.03 | 0.00 | 0.00 |
| Abu Dhabi, UAE | 0.09 | 0.01 | 0.06 |
| Dubai, UAE | 0.28 | 0.08 | 0.08 |
| Florida, US | 0.11 | 0.01 | 0.02 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Item Parameters for the TIMSS 2015 Instruction Affected by Science Resource Shortages - Principals' Reports Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|----------|----------|----------|----------|---------|-------|
| BCBG13AA | -0.07780 | -0.22995 | 0.02106 | 0.20889 | 0.90 |
| BCBG13AB | -0.41924 | -0.35188 | 0.24401 | 0.10787 | 0.95 |
| BCBG13AC | 0.09925 | -0.82065 | 0.12894 | 0.69171 | 1.01 |
| BCBG13AD | -0.15762 | -0.60587 | -0.01709 | 0.62296 | 0.98 |
| BCBG13AE | 0.19292 | -0.46731 | -0.10673 | 0.57404 | 0.97 |
| BCBG13AF | 0.04432 | -1.24596 | -0.05161 | 1.29757 | 0.97 |
| BCBG13AG | 0.06683 | -1.11291 | -0.04548 | 1.15839 | 1.01 |
| BCBG13AH | 0.26152 | -1.23259 | -0.00701 | 1.23960 | 1.07 |
| BCBG13CA | 0.05892 | 0.12619 | -0.14295 | 0.01676 | 1.07 |
| BCBG13CB | 0.17201 | -1.33922 | -0.06466 | 1.40388 | 1.06 |
| BCBG13CC | -0.05514 | -1.36034 | 0.00995 | 1.35039 | 1.06 |
| BCBG13CD | -0.56666 | -0.75165 | 0.04489 | 0.70676 | 1.40 |
| BCBG13CE | 0.38069 | -0.81880 | -0.11198 | 0.93078 | 0.85 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Scale Transformation Constants for the TIMSS 2015 Instruction Affected by Science Resource Shortages - Principals' Reports Scale, Eighth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 9.315269 | Transformed Scale Score = 9.315269 + 1.309226 • Logit Scale Score |
| B = 1.309226 | |

Equivalence Table of Raw and Transformed Scale Scores for the TIMSS 2015 Instruction Affected by Science Resource Shortages - Principals' Reports Scale, Eighth Grade

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 3.88612 | |
| 1 | 5.35335 | |
| 2 | 6.04930 | |
| 3 | 6.51561 | |
| 4 | 6.86952 | |
| 5 | 7.15639 | |
| 6 | 7.39861 | 7.4 |
| 7 | 7.60979 | |
| 8 | 7.79773 | |
| 9 | 7.96788 | |
| 10 | 8.12416 | |
| 11 | 8.26869 | |
| 12 | 8.40566 | |
| 13 | 8.53569 | |
| 14 | 8.66008 | |
| 15 | 8.77999 | |
| 16 | 8.89646 | |
| 17 | 9.01042 | |
| 18 | 9.12273 | |
| 19 | 9.23419 | |
| 20 | 9.34677 | |
| 21 | 9.45769 | |
| 22 | 9.57129 | |
| 23 | 9.68719 | |
| 24 | 9.80631 | |
| 25 | 9.92960 | |
| 26 | 10.05811 | |
| 27 | 10.19300 | |
| 28 | 10.33482 | |
| 29 | 10.48712 | |
| 30 | 10.65148 | |
| 31 | 10.83088 | |
| 32 | 11.02928 | |
| 33 | 11.25210 | 11.2 |
| 34 | 11.50748 | |
| 35 | 11.80866 | |
| 36 | 12.17806 | |
| 37 | 12.66071 | |
| 38 | 13.37405 | |
| 39 | 14.85907 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Instruction Affected by Science Resource Shortages - Principals' Reports Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| | | | BCBG13AA | BCBG13AB | BCBG13AC | BCBG13AD | BCBG13AE | BCBG13AF | BCBG13AG | BCBG13AH | BCBG13CA | BCBG13CB | BCBG13CC | BCBG13CD | BCBG13CE |
| Australia | 0.92 | 52 | 0.74 | 0.73 | 0.64 | 0.61 | 0.68 | 0.78 | 0.77 | 0.78 | 0.61 | 0.74 | 0.76 | 0.79 | 0.74 |
| Bahrain | 0.96 | 68 | 0.92 | 0.88 | 0.85 | 0.90 | 0.89 | 0.87 | 0.87 | 0.80 | 0.85 | 0.75 | 0.70 | 0.50 | 0.85 |
| Botswana (9) | 0.76 | 31 | 0.47 | 0.12 | 0.50 | 0.54 | 0.53 | 0.29 | 0.79 | 0.78 | -0.29 | 0.74 | 0.72 | 0.35 | 0.63 |
| Canada | 0.90 | 47 | 0.69 | 0.63 | 0.58 | 0.39 | 0.64 | 0.73 | 0.69 | 0.72 | 0.70 | 0.77 | 0.86 | 0.67 | 0.74 |
| Chile | 0.91 | 48 | 0.63 | 0.63 | 0.68 | 0.60 | 0.70 | 0.72 | 0.75 | 0.69 | 0.64 | 0.71 | 0.78 | 0.63 | 0.78 |
| Chinese Taipei | 0.87 | 40 | 0.59 | 0.65 | 0.64 | 0.65 | 0.70 | 0.65 | 0.63 | 0.65 | 0.53 | 0.65 | 0.60 | 0.52 | 0.72 |
| Egypt | 0.82 | 34 | 0.55 | 0.40 | 0.71 | 0.31 | 0.60 | 0.66 | 0.52 | 0.68 | 0.62 | 0.67 | 0.58 | 0.44 | 0.67 |
| England | 0.89 | 47 | 0.75 | 0.68 | 0.71 | 0.68 | 0.56 | 0.63 | 0.78 | 0.71 | 0.56 | 0.74 | 0.70 | 0.60 | 0.78 |
| Georgia | 0.87 | 41 | 0.55 | 0.72 | 0.68 | 0.64 | 0.75 | 0.69 | 0.66 | 0.77 | 0.64 | 0.60 | 0.65 | 0.30 | 0.57 |
| Hong Kong SAR | 0.94 | 58 | 0.81 | 0.83 | 0.74 | 0.84 | 0.74 | 0.77 | 0.75 | 0.70 | 0.76 | 0.69 | 0.77 | 0.67 | 0.81 |
| Hungary | 0.89 | 44 | 0.65 | 0.71 | 0.73 | 0.71 | 0.69 | 0.53 | 0.70 | 0.70 | 0.57 | 0.65 | 0.67 | 0.56 | 0.68 |
| Iran, Islamic Rep. of | 0.89 | 44 | 0.74 | 0.73 | 0.71 | 0.76 | 0.78 | 0.75 | 0.63 | 0.56 | 0.68 | 0.61 | 0.56 | 0.22 | 0.69 |
| Ireland | 0.89 | 45 | 0.66 | 0.70 | 0.63 | 0.64 | 0.65 | 0.61 | 0.79 | 0.61 | 0.56 | 0.77 | 0.46 | 0.74 | 0.79 |
| Israel | 0.93 | 54 | 0.79 | 0.82 | 0.69 | 0.78 | 0.68 | 0.78 | 0.69 | 0.60 | 0.73 | 0.78 | 0.75 | 0.67 | 0.76 |
| Italy | 0.82 | 34 | 0.55 | - | 0.57 | 0.47 | 0.55 | 0.54 | 0.65 | 0.66 | 0.51 | 0.72 | 0.66 | 0.50 | 0.60 |
| Japan | 0.93 | 55 | 0.83 | 0.79 | 0.81 | 0.77 | 0.87 | 0.64 | 0.68 | 0.72 | 0.81 | 0.64 | 0.74 | 0.53 | 0.79 |
| Jordan | 0.90 | 45 | 0.77 | 0.76 | 0.81 | 0.68 | 0.78 | 0.71 | 0.45 | 0.72 | 0.75 | 0.54 | 0.45 | 0.30 | 0.77 |
| Kazakhstan | 0.94 | 57 | 0.76 | 0.69 | 0.67 | 0.80 | 0.76 | 0.82 | 0.79 | 0.73 | 0.80 | 0.76 | 0.82 | 0.56 | 0.80 |
| Korea, Rep. of | 0.94 | 59 | 0.76 | 0.79 | 0.77 | 0.80 | 0.78 | 0.73 | 0.73 | 0.75 | 0.81 | 0.80 | 0.81 | 0.64 | 0.80 |
| Kuwait | 0.94 | 57 | 0.82 | 0.79 | 0.77 | 0.84 | 0.86 | 0.76 | 0.70 | 0.70 | 0.86 | 0.72 | 0.60 | 0.51 | 0.83 |
| Lebanon | 0.91 | 48 | 0.80 | 0.84 | 0.80 | 0.67 | 0.82 | 0.63 | 0.53 | 0.33 | 0.79 | 0.70 | 0.49 | 0.66 | 0.74 |
| Lithuania | 0.89 | 44 | 0.64 | 0.68 | 0.67 | 0.67 | 0.54 | 0.66 | 0.70 | 0.72 | 0.56 | 0.77 | 0.73 | 0.54 | 0.69 |
| Malaysia | 0.91 | 50 | 0.77 | 0.70 | 0.78 | 0.62 | 0.77 | 0.70 | 0.52 | 0.44 | 0.80 | 0.76 | 0.76 | 0.67 | 0.80 |
| Malta | 0.90 | 50 | 0.79 | 0.73 | 0.65 | 0.66 | 0.65 | 0.82 | 0.76 | 0.70 | 0.77 | 0.48 | 0.54 | 0.67 | 0.85 |
| Morocco | 0.69 | 35 | -0.25 | -0.09 | -0.37 | 0.32 | -0.59 | 0.69 | 0.71 | 0.76 | -0.60 | 0.71 | 0.81 | 0.81 | 0.35 |
| New Zealand | 0.89 | 44 | 0.73 | 0.61 | 0.57 | 0.67 | 0.51 | 0.66 | 0.62 | 0.69 | 0.64 | 0.69 | 0.75 | 0.70 | 0.72 |
| Norway (9) | 0.83 | 33 | 0.60 | 0.50 | 0.71 | 0.59 | 0.60 | 0.60 | 0.54 | 0.49 | 0.55 | 0.59 | 0.58 | 0.45 | 0.67 |
| Oman | 0.99 | 60 | 0.81 | 0.74 | 0.68 | 0.81 | 0.78 | 0.81 | 0.77 | 0.66 | 0.81 | 0.76 | 0.73 | 0.49 | 1.10 |
| Qatar | 0.98 | 79 | 0.90 | 0.89 | 0.88 | 0.94 | 0.90 | 0.93 | 0.91 | 0.92 | 0.93 | 0.85 | 0.85 | 0.73 | 0.94 |
| Russian Federation | 0.88 | 43 | 0.64 | 0.58 | 0.53 | 0.69 | 0.55 | 0.66 | 0.71 | 0.69 | 0.63 | 0.76 | 0.70 | 0.55 | 0.76 |
| Saudi Arabia | 0.91 | 50 | 0.72 | 0.65 | 0.73 | 0.81 | 0.76 | 0.68 | 0.60 | 0.75 | 0.76 | 0.71 | 0.57 | 0.64 | 0.76 |
| Singapore | 0.98 | 80 | 0.93 | 0.87 | 0.87 | 0.90 | 0.90 | 0.86 | 0.87 | 0.89 | 0.91 | 0.90 | 0.87 | 0.91 | 0.93 |
| Slovenia | 0.83 | 34 | 0.49 | 0.59 | 0.50 | 0.52 | 0.56 | 0.50 | 0.73 | 0.74 | 0.12 | 0.67 | 0.69 | 0.52 | 0.72 |
| South Africa (9) | 0.86 | 40 | 0.38 | 0.18 | 0.50 | 0.69 | 0.48 | 0.66 | 0.77 | 0.75 | 0.51 | 0.78 | 0.73 | 0.66 | 0.77 |
| Sweden | 0.85 | 37 | 0.72 | 0.67 | 0.60 | 0.59 | 0.53 | 0.62 | 0.67 | 0.64 | 0.63 | 0.60 | 0.35 | 0.51 | 0.69 |
| Thailand | 0.92 | 53 | 0.77 | 0.79 | 0.73 | 0.72 | 0.73 | 0.61 | 0.80 | 0.71 | 0.77 | 0.75 | 0.57 | 0.74 | 0.74 |
| Turkey | 0.88 | 42 | 0.67 | 0.63 | 0.65 | 0.71 | 0.71 | 0.53 | 0.68 | 0.62 | 0.63 | 0.65 | 0.61 | 0.43 | 0.80 |
| United Arab Emirates | 0.97 | 71 | 0.87 | 0.85 | 0.85 | 0.88 | 0.86 | 0.88 | 0.84 | 0.85 | 0.88 | 0.78 | 0.80 | 0.73 | 0.89 |
| United States | 0.91 | 50 | 0.70 | 0.63 | 0.65 | 0.63 | 0.70 | 0.69 | 0.78 | 0.72 | 0.69 | 0.79 | 0.75 | 0.65 | 0.74 |
| Benchmarking Participants | | | | | | | | | | | | | | | |
| Buenos Aires, Argentina | 0.94 | 60 | 0.83 | 0.82 | 0.78 | 0.82 | 0.79 | 0.78 | 0.65 | 0.72 | 0.69 | 0.73 | 0.85 | 0.81 | 0.77 |
| Ontario, Canada | 0.88 | 42 | 0.62 | 0.63 | 0.62 | 0.26 | 0.63 | 0.70 | 0.66 | 0.74 | 0.56 | 0.72 | 0.83 | 0.65 | 0.70 |
| Quebec, Canada | 0.93 | 54 | 0.78 | 0.70 | 0.71 | 0.74 | 0.78 | 0.64 | 0.68 | 0.68 | 0.81 | 0.72 | 0.85 | 0.69 | 0.74 |
| Norway (8) | 0.84 | 35 | 0.63 | 0.57 | 0.72 | 0.61 | 0.61 | 0.62 | 0.58 | 0.49 | 0.56 | 0.56 | 0.55 | 0.47 | 0.68 |
| Abu Dhabi, UAE | 0.96 | 68 | 0.88 | 0.84 | 0.84 | 0.84 | 0.85 | 0.85 | 0.82 | 0.78 | 0.87 | 0.66 | 0.80 | 0.78 | 0.88 |
| Dubai, UAE | 0.98 | 78 | 0.91 | 0.89 | 0.85 | 0.91 | 0.85 | 0.93 | 0.88 | 0.91 | 0.92 | 0.88 | 0.88 | 0.72 | 0.94 |
| Florida, US | 0.91 | 49 | 0.75 | 0.73 | 0.75 | 0.51 | 0.81 | 0.66 | 0.65 | 0.77 | 0.52 | 0.78 | 0.65 | 0.61 | 0.80 |

A dash (-) indicates comparable data not available.

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Instruction Affected by Science Resource Shortages - Principals' Reports Scale, Eighth Grade, and TIMSS 2015 Science Achievement

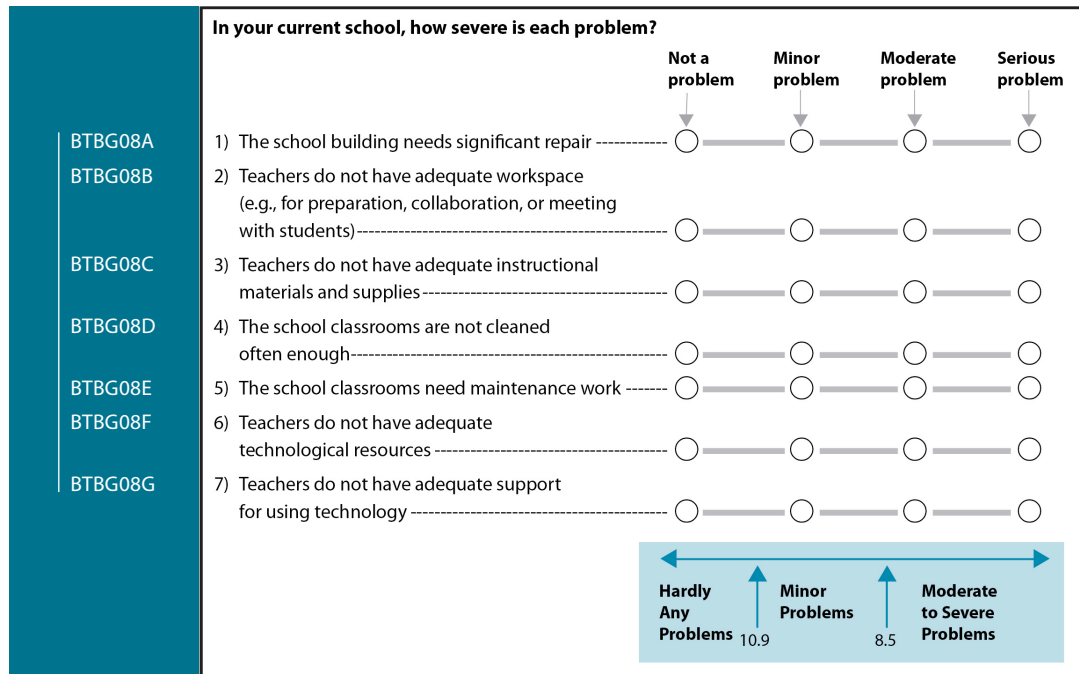
| Country | Pearson's Correlation with Science Achievement | | Variance in Science Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|----------------------------------|--|-------------------|---|
| | (r) | (r ²) | |
| Australia | 0.19 | 0.04 | 0.01 |
| Bahrain | 0.17 | 0.03 | 0.03 |
| Botswana (9) | 0.20 | 0.04 | 0.05 |
| Canada | 0.07 | 0.01 | 0.01 |
| Chile | 0.18 | 0.03 | 0.04 |
| Chinese Taipei | 0.15 | 0.02 | 0.03 |
| Egypt | -0.12 | 0.02 | 0.02 |
| England | 0.15 | 0.02 | 0.01 |
| Georgia | 0.07 | 0.01 | 0.01 |
| Hong Kong SAR | 0.05 | 0.00 | 0.00 |
| Hungary | 0.03 | 0.00 | 0.00 |
| Iran, Islamic Rep. of | 0.13 | 0.02 | 0.03 |
| Ireland | 0.03 | 0.00 | 0.00 |
| Israel | 0.28 | 0.08 | 0.06 |
| Italy | 0.09 | 0.01 | 0.00 |
| Japan | 0.02 | 0.00 | 0.00 |
| Jordan | -0.13 | 0.02 | 0.04 |
| Kazakhstan | -0.08 | 0.01 | 0.01 |
| Korea, Rep. of | -0.04 | 0.00 | 0.00 |
| Kuwait | 0.14 | 0.02 | 0.07 |
| Lebanon | 0.09 | 0.01 | 0.05 |
| Lithuania | -0.05 | 0.00 | 0.00 |
| Malaysia | -0.16 | 0.02 | 0.02 |
| Malta | 0.09 | 0.01 | 0.01 |
| Morocco | -0.08 | 0.01 | 0.02 |
| New Zealand | 0.12 | 0.01 | 0.01 |
| Norway (9) | 0.09 | 0.01 | 0.01 |
| Oman | -0.02 | 0.00 | 0.00 |
| Qatar | 0.15 | 0.02 | 0.03 |
| Russian Federation | 0.10 | 0.01 | 0.00 |
| Saudi Arabia | -0.07 | 0.00 | 0.02 |
| Singapore | 0.02 | 0.00 | 0.00 |
| Slovenia | -0.02 | 0.00 | 0.00 |
| South Africa (9) | 0.17 | 0.03 | 0.07 |
| Sweden | -0.06 | 0.00 | 0.00 |
| Thailand | 0.11 | 0.01 | 0.01 |
| Turkey | 0.06 | 0.00 | 0.01 |
| United Arab Emirates | 0.21 | 0.04 | 0.07 |
| United States | 0.17 | 0.03 | 0.02 |
| International Median | 0.09 | 0.01 | 0.01 |
| Benchmarking Participants | | | |
| Buenos Aires, Argentina | 0.30 | 0.09 | 0.08 |
| Ontario, Canada | 0.02 | 0.00 | 0.00 |
| Quebec, Canada | 0.12 | 0.02 | 0.01 |
| Norway (8) | 0.05 | 0.00 | 0.00 |
| Abu Dhabi, UAE | 0.06 | 0.00 | 0.05 |
| Dubai, UAE | 0.24 | 0.06 | 0.07 |
| Florida, US | -0.01 | 0.00 | 0.05 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Problems with School Conditions and Resources–Teachers’ Reports Scale, Eighth Grade

The Problems with School Conditions and Resources–Teachers’ Reports (SCR) scale was created based on teachers’ responses concerning seven conditions and resources described below.

Items in the TIMSS 2015 Problems with School Conditions and Resources–Teachers’ Reports Scale, Eighth Grade



Item Parameters for the TIMSS 2015 Problems with School Conditions and Resources - Teachers' Reports Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|---------|----------|----------|----------|---------|-------|
| BTBG08A | 0.18329 | -1.18267 | -0.15059 | 1.33326 | 1.18 |
| BTBG08B | 0.10371 | -1.12918 | 0.03675 | 1.09243 | 1.13 |
| BTBG08C | 0.06452 | -1.43644 | -0.01153 | 1.44797 | 0.91 |
| BTBG08D | -0.83481 | -1.03008 | -0.01533 | 1.04541 | 1.16 |
| BTBG08E | 0.01912 | -1.27930 | -0.26537 | 1.54467 | 0.94 |
| BTBG08F | 0.31141 | -1.20361 | -0.08650 | 1.29011 | 0.89 |
| BTBG08G | 0.15276 | -1.24345 | -0.12380 | 1.36725 | 0.97 |

Scale Transformation Constants for the TIMSS 2015 Problems with School Conditions and Resources - Teachers' Reports Scale, Eighth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 8.583007 | Transformed Scale Score = 8.583007 + 1.253975 • Logit Scale Score |
| B = 1.253975 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Equivalence Table of Raw and Transformed Scale Scores for the TIMSS 2015 Problems with School Conditions and Resources - Teachers' Reports Scale, Eighth Grade

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 3.65135 | |
| 1 | 5.09647 | |
| 2 | 5.80756 | |
| 3 | 6.30783 | |
| 4 | 6.70551 | |
| 5 | 7.04380 | |
| 6 | 7.34972 | |
| 7 | 7.63174 | |
| 8 | 7.89851 | |
| 9 | 8.15652 | |
| 10 | 8.41086 | 8.5 |
| 11 | 8.66588 | |
| 12 | 8.92566 | |
| 13 | 9.19445 | |
| 14 | 9.47709 | |
| 15 | 9.77810 | |
| 16 | 10.10696 | |
| 17 | 10.47588 | |
| 18 | 10.90666 | 10.9 |
| 19 | 11.44067 | |
| 20 | 12.19170 | |
| 21 | 13.67660 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Problems with School Conditions and Resources - Teachers' Reports Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|---------|
| | | | BTBC08A | BTBC08B | BTBC08C | BTBC08D | BTBC08E | BTBC08F | BTBC08G |
| Australia | 0.84 | 52 | 0.74 | 0.64 | 0.77 | 0.53 | 0.80 | 0.77 | 0.73 |
| Bahrain | 0.87 | 57 | 0.66 | 0.80 | 0.80 | 0.75 | 0.78 | 0.79 | 0.71 |
| Botswana (9) | 0.78 | 43 | 0.73 | 0.70 | 0.65 | 0.59 | 0.71 | 0.66 | 0.53 |
| Canada | 0.84 | 51 | 0.66 | 0.62 | 0.76 | 0.69 | 0.79 | 0.78 | 0.72 |
| Chile | 0.88 | 58 | 0.70 | 0.76 | 0.83 | 0.63 | 0.77 | 0.83 | 0.81 |
| Chinese Taipei | 0.85 | 54 | 0.60 | 0.72 | 0.76 | 0.62 | 0.79 | 0.81 | 0.81 |
| Egypt | 0.86 | 55 | 0.64 | 0.75 | 0.80 | 0.66 | 0.73 | 0.76 | 0.81 |
| England | 0.82 | 48 | 0.74 | 0.59 | 0.73 | 0.56 | 0.75 | 0.73 | 0.71 |
| Georgia | 0.85 | 52 | 0.73 | 0.70 | 0.75 | 0.62 | 0.77 | 0.79 | 0.69 |
| Hong Kong SAR | 0.85 | 54 | 0.59 | 0.73 | 0.76 | 0.73 | 0.75 | 0.80 | 0.75 |
| Hungary | 0.85 | 54 | 0.72 | 0.75 | 0.81 | 0.51 | 0.79 | 0.81 | 0.69 |
| Iran, Islamic Rep. of | 0.86 | 55 | 0.72 | 0.75 | 0.79 | 0.56 | 0.78 | 0.81 | 0.76 |
| Ireland | 0.83 | 51 | 0.74 | 0.69 | 0.81 | 0.60 | 0.79 | 0.67 | 0.66 |
| Israel | 0.87 | 56 | 0.70 | 0.71 | 0.80 | 0.67 | 0.78 | 0.79 | 0.79 |
| Italy | 0.85 | 53 | 0.72 | 0.63 | 0.79 | 0.66 | 0.72 | 0.76 | 0.77 |
| Japan | 0.80 | 46 | 0.69 | 0.69 | 0.72 | 0.47 | 0.72 | 0.73 | 0.71 |
| Jordan | 0.90 | 62 | 0.74 | 0.78 | 0.81 | 0.70 | 0.81 | 0.84 | 0.83 |
| Kazakhstan | 0.88 | 58 | 0.72 | 0.79 | 0.81 | 0.63 | 0.81 | 0.81 | 0.76 |
| Korea, Rep. of | 0.87 | 57 | 0.72 | 0.73 | 0.78 | 0.60 | 0.78 | 0.83 | 0.82 |
| Kuwait | 0.90 | 62 | 0.70 | 0.78 | 0.81 | 0.77 | 0.79 | 0.85 | 0.80 |
| Lebanon | 0.87 | 58 | 0.67 | 0.80 | 0.82 | 0.65 | 0.74 | 0.81 | 0.80 |
| Lithuania | 0.81 | 48 | 0.60 | 0.65 | 0.81 | 0.48 | 0.70 | 0.80 | 0.74 |
| Malaysia | 0.85 | 53 | 0.67 | 0.68 | 0.75 | 0.66 | 0.76 | 0.79 | 0.76 |
| Malta | 0.84 | 52 | 0.73 | 0.62 | 0.79 | 0.65 | 0.82 | 0.69 | 0.72 |
| Morocco | 0.83 | 50 | 0.65 | 0.71 | 0.74 | 0.57 | 0.74 | 0.77 | 0.74 |
| New Zealand | 0.84 | 51 | 0.68 | 0.68 | 0.75 | 0.63 | 0.77 | 0.77 | 0.70 |
| Norway (9) | 0.83 | 50 | 0.80 | 0.63 | 0.75 | 0.56 | 0.80 | 0.72 | 0.63 |
| Oman | 0.86 | 55 | 0.68 | 0.69 | 0.79 | 0.66 | 0.74 | 0.81 | 0.79 |
| Qatar | 0.88 | 58 | 0.62 | 0.67 | 0.76 | 0.75 | 0.82 | 0.84 | 0.85 |
| Russian Federation | 0.86 | 54 | 0.67 | 0.72 | 0.83 | 0.53 | 0.73 | 0.83 | 0.80 |
| Saudi Arabia | 0.90 | 62 | 0.74 | 0.76 | 0.79 | 0.72 | 0.82 | 0.85 | 0.83 |
| Singapore | 0.85 | 54 | 0.70 | 0.73 | 0.75 | 0.65 | 0.78 | 0.77 | 0.74 |
| Slovenia | 0.86 | 55 | 0.69 | 0.72 | 0.83 | 0.60 | 0.76 | 0.82 | 0.76 |
| South Africa (9) | 0.91 | 66 | 0.82 | 0.80 | 0.80 | 0.72 | 0.87 | 0.84 | 0.81 |
| Sweden | 0.82 | 49 | 0.68 | 0.67 | 0.72 | 0.61 | 0.78 | 0.75 | 0.68 |
| Thailand | 0.87 | 56 | 0.67 | 0.70 | 0.83 | 0.69 | 0.79 | 0.81 | 0.75 |
| Turkey | 0.88 | 59 | 0.69 | 0.76 | 0.82 | 0.59 | 0.81 | 0.85 | 0.82 |
| United Arab Emirates | 0.88 | 58 | 0.75 | 0.72 | 0.80 | 0.69 | 0.78 | 0.79 | 0.79 |
| United States | 0.84 | 51 | 0.72 | 0.69 | 0.74 | 0.64 | 0.79 | 0.71 | 0.72 |
| Benchmarking Participants | | | | | | | | | |
| Buenos Aires, Argentina | 0.91 | 65 | 0.77 | 0.82 | 0.74 | 0.73 | 0.87 | 0.84 | 0.86 |
| Ontario, Canada | 0.83 | 50 | 0.65 | 0.56 | 0.76 | 0.66 | 0.80 | 0.80 | 0.71 |
| Quebec, Canada | 0.86 | 54 | 0.70 | 0.63 | 0.80 | 0.74 | 0.82 | 0.75 | 0.71 |
| Norway (8) | 0.82 | 48 | 0.72 | 0.72 | 0.74 | 0.60 | 0.77 | 0.71 | 0.59 |
| Abu Dhabi, UAE | 0.87 | 58 | 0.73 | 0.72 | 0.80 | 0.67 | 0.78 | 0.82 | 0.81 |
| Dubai, UAE | 0.85 | 53 | 0.79 | 0.69 | 0.79 | 0.56 | 0.74 | 0.72 | 0.75 |
| Florida, US | 0.83 | 51 | 0.60 | 0.64 | 0.72 | 0.71 | 0.80 | 0.78 | 0.74 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Problems with School Conditions and Resources - Teachers' Reports Scale, Eighth Grade, and TIMSS 2015 Achievement

| Country | Pearson's Correlation with Achievement | | | | Variance in Achievement Accounted for by Difference Between Regions of the Scale (η^2) | |
|----------------------------------|--|-------------|-------------------|-------------|---|-------------|
| | (r) | | (r ²) | | Mathematics | Science |
| | Mathematics | Science | Mathematics | Science | | |
| Australia | 0.17 | 0.10 | 0.03 | 0.01 | 0.02 | 0.01 |
| Bahrain | 0.07 | 0.11 | 0.00 | 0.01 | 0.01 | 0.01 |
| Botswana (9) | 0.13 | 0.13 | 0.02 | 0.02 | 0.01 | 0.03 |
| Canada | 0.05 | 0.09 | 0.00 | 0.01 | 0.01 | 0.01 |
| Chile | 0.18 | 0.22 | 0.03 | 0.05 | 0.03 | 0.03 |
| Chinese Taipei | 0.13 | 0.08 | 0.02 | 0.01 | 0.02 | 0.01 |
| Egypt | 0.14 | 0.13 | 0.02 | 0.02 | 0.01 | 0.02 |
| England | 0.02 | 0.07 | 0.00 | 0.00 | 0.01 | 0.01 |
| Georgia | 0.06 | 0.07 | 0.00 | 0.00 | 0.00 | 0.00 |
| Hong Kong SAR | 0.10 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 |
| Hungary | -0.01 | -0.07 | 0.00 | 0.01 | 0.00 | 0.00 |
| Iran, Islamic Rep. of | 0.23 | 0.23 | 0.05 | 0.05 | 0.06 | 0.04 |
| Ireland | 0.06 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 |
| Israel | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 |
| Italy | 0.01 | 0.02 | 0.00 | 0.00 | 0.01 | 0.01 |
| Japan | 0.02 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| Jordan | 0.23 | 0.19 | 0.05 | 0.04 | 0.03 | 0.03 |
| Kazakhstan | 0.08 | 0.08 | 0.01 | 0.01 | 0.01 | 0.01 |
| Korea, Rep. of | 0.05 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Kuwait | 0.07 | 0.09 | 0.00 | 0.01 | 0.00 | 0.01 |
| Lebanon | 0.13 | 0.20 | 0.02 | 0.04 | 0.02 | 0.03 |
| Lithuania | 0.07 | -0.02 | 0.00 | 0.00 | 0.01 | 0.00 |
| Malaysia | 0.07 | 0.05 | 0.01 | 0.00 | 0.00 | 0.02 |
| Malta | 0.07 | 0.10 | 0.01 | 0.01 | 0.01 | 0.01 |
| Morocco | 0.12 | 0.12 | 0.01 | 0.01 | 0.01 | 0.02 |
| New Zealand | 0.08 | 0.14 | 0.01 | 0.02 | 0.01 | 0.01 |
| Norway (9) | 0.06 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Oman | 0.04 | 0.07 | 0.00 | 0.00 | 0.00 | 0.00 |
| Qatar | -0.08 | -0.13 | 0.01 | 0.02 | 0.01 | 0.01 |
| Russian Federation | 0.05 | 0.09 | 0.00 | 0.01 | 0.00 | 0.01 |
| Saudi Arabia | 0.18 | 0.16 | 0.03 | 0.03 | 0.02 | 0.03 |
| Singapore | 0.07 | 0.12 | 0.00 | 0.01 | 0.00 | 0.02 |
| Slovenia | 0.02 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| South Africa (9) | 0.41 | 0.41 | 0.17 | 0.17 | 0.19 | 0.15 |
| Sweden | -0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 |
| Thailand | 0.12 | 0.14 | 0.01 | 0.02 | 0.01 | 0.02 |
| Turkey | 0.16 | 0.20 | 0.03 | 0.04 | 0.01 | 0.02 |
| United Arab Emirates | 0.18 | 0.17 | 0.03 | 0.03 | 0.02 | 0.02 |
| United States | 0.08 | 0.12 | 0.01 | 0.01 | 0.00 | 0.02 |
| International Median | 0.07 | 0.09 | 0.01 | 0.01 | 0.01 | 0.01 |
| Benchmarking Participants | | | | | | |
| Buenos Aires, Argentina | 0.32 | 0.18 | 0.10 | 0.03 | 0.11 | 0.01 |
| Ontario, Canada | 0.03 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| Quebec, Canada | 0.03 | 0.12 | 0.00 | 0.02 | 0.01 | 0.02 |
| Norway (8) | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Abu Dhabi, UAE | 0.10 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 |
| Dubai, UAE | 0.23 | 0.24 | 0.05 | 0.06 | 0.05 | 0.05 |
| Florida, US | 0.12 | 0.15 | 0.02 | 0.02 | 0.02 | 0.02 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Safe and Orderly School–Teachers’ Reports Scale, Eighth Grade

The Safe and Orderly School–Teachers’ Reports (SOS) scale was created based on teachers’ degree of agreement with the eight statements described below.

Items in the TIMSS 2015 Safe and Orderly School–Teachers’ Reports Scale, Eighth Grade¹

| | | Thinking about your current school, indicate the extent to which you agree or disagree with each of the following statements. | | | |
|---|---------|---|----------------|-------------------|----------------|
| | | Agree a lot | Agree a little | Disagree a little | Disagree a lot |
| T | BTBG07A | 1) This school is located in a safe neighborhood ----- ○-----○-----○-----○ | | | |
| T | BTBG07B | 2) I feel safe at this school ----- ○-----○-----○-----○ | | | |
| T | BTBG07C | 3) This school’s security policies and practices are sufficient ----- ○-----○-----○-----○ | | | |
| T | BTBG07D | 4) The students behave in an orderly manner ----- ○-----○-----○-----○ | | | |
| T | BTBG07E | 5) The students are respectful of the teachers ----- ○-----○-----○-----○ | | | |
| | BTBG07F | 6) The students respect school property ----- ○-----○-----○-----○ | | | |
| | BTBG07G | 7) This school has clear rules about student conduct ----- ○-----○-----○-----○ | | | |
| | BTBG07H | 8) This school’s rules are enforced in a fair and consistent manner ----- ○-----○-----○-----○ | | | |

Very Safe and Orderly Safe and Orderly Less than Safe and Orderly

10.6 7.2

T Trend item—item was included in the same scale in TIMSS 2011 and was used for linking the TIMSS 2011 and TIMSS 2015 scales.

¹ For the purpose of scaling, categories in which there were very few respondents were combined. The categories “Disagree a little” and “Disagree a lot” were combined for all variables. The scale statistics that are reported herein reflect analysis of the items following collapsing.

Item Parameters for the TIMSS 2015 Safe and Orderly School - Teachers' Reports Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | Infit |
|---------|----------|----------|---------|-------|
| BTBG07A | -0.80503 | -1.12750 | 1.12750 | 1.25 |
| BTBG07B | -1.38913 | -1.25587 | 1.25587 | 1.00 |
| BTBG07C | -0.51907 | -1.43177 | 1.43177 | 1.02 |
| BTBG07D | 0.92295 | -1.81668 | 1.81668 | 0.92 |
| BTBG07E | 0.58019 | -1.77905 | 1.77905 | 0.92 |
| BTBG07F | 1.54089 | -1.74888 | 1.74888 | 0.94 |
| BTBG07G | -0.48566 | -1.36955 | 1.36955 | 1.13 |
| BTBG07H | 0.15486 | -1.50409 | 1.50409 | 1.07 |

Scale Transformation Constants for the TIMSS 2015 Safe and Orderly School - Teachers' Reports Scale, Eighth Grade

| Scale Transformation Constants | |
|--------------------------------|--|
| A = 8.92966 | Transformed Scale Score = 8.92966 + 1.031502 • Logit Scale Score |
| B = 1.031502 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Safe and Orderly School - Teachers' Reports Scale, Eighth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 4.21352 | |
| 1 | 5.50950 | |
| 2 | 6.20806 | |
| 3 | 6.73583 | |
| 4 | 7.18910 | 7.2 |
| 5 | 7.60560 | |
| 6 | 8.00514 | |
| 7 | 8.40086 | |
| 8 | 8.79988 | |
| 9 | 9.21200 | |
| 10 | 9.64573 | |
| 11 | 10.11020 | |
| 12 | 10.61839 | 10.6 |
| 13 | 11.18541 | |
| 14 | 11.83862 | |
| 15 | 12.65468 | |
| 16 | 14.06211 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Safe and Orderly School - Teachers' Reports Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|---------|---------|
| | | | BTB007A | BTB007B | BTB007C | BTB007D | BTB007E | BTB007F | BTB007G | BTB007H |
| Australia | 0.90 | 60 | 0.65 | 0.75 | 0.72 | 0.86 | 0.87 | 0.81 | 0.72 | 0.78 |
| Bahrain | 0.86 | 52 | 0.55 | 0.63 | 0.68 | 0.74 | 0.80 | 0.77 | 0.75 | 0.80 |
| Botswana (9) | 0.84 | 47 | 0.67 | 0.74 | 0.67 | 0.75 | 0.77 | 0.69 | 0.55 | 0.64 |
| Canada | 0.87 | 53 | 0.58 | 0.58 | 0.64 | 0.83 | 0.82 | 0.81 | 0.74 | 0.76 |
| Chile | 0.85 | 51 | 0.44 | 0.64 | 0.74 | 0.82 | 0.80 | 0.72 | 0.72 | 0.77 |
| Chinese Taipei | 0.89 | 57 | 0.70 | 0.78 | 0.71 | 0.79 | 0.77 | 0.75 | 0.78 | 0.78 |
| Egypt | 0.87 | 53 | 0.60 | 0.67 | 0.70 | 0.74 | 0.73 | 0.78 | 0.80 | 0.76 |
| England | 0.86 | 51 | 0.49 | 0.62 | 0.59 | 0.83 | 0.82 | 0.81 | 0.70 | 0.79 |
| Georgia | 0.78 | 41 | 0.60 | 0.67 | 0.75 | 0.63 | 0.68 | 0.53 | 0.57 | 0.65 |
| Hong Kong SAR | 0.81 | 44 | 0.48 | 0.59 | 0.58 | 0.74 | 0.78 | 0.75 | 0.65 | 0.65 |
| Hungary | 0.87 | 52 | 0.54 | 0.69 | 0.75 | 0.80 | 0.80 | 0.77 | 0.66 | 0.73 |
| Iran, Islamic Rep. of | 0.84 | 47 | 0.58 | 0.68 | 0.69 | 0.75 | 0.71 | 0.71 | 0.71 | 0.65 |
| Ireland | 0.86 | 51 | 0.71 | 0.62 | 0.63 | 0.84 | 0.84 | 0.79 | 0.53 | 0.68 |
| Israel | 0.84 | 48 | 0.49 | 0.62 | 0.60 | 0.79 | 0.77 | 0.76 | 0.72 | 0.74 |
| Italy | 0.85 | 49 | 0.68 | 0.76 | 0.67 | 0.72 | 0.73 | 0.72 | 0.65 | 0.65 |
| Japan | 0.84 | 48 | 0.65 | 0.70 | 0.62 | 0.79 | 0.76 | 0.78 | 0.56 | 0.67 |
| Jordan | 0.88 | 54 | 0.60 | 0.70 | 0.75 | 0.77 | 0.74 | 0.74 | 0.77 | 0.77 |
| Kazakhstan | 0.86 | 51 | 0.59 | 0.68 | 0.68 | 0.78 | 0.73 | 0.72 | 0.75 | 0.80 |
| Korea, Rep. of | 0.88 | 55 | 0.68 | 0.75 | 0.76 | 0.76 | 0.79 | 0.72 | 0.72 | 0.75 |
| Kuwait | 0.86 | 51 | 0.50 | 0.64 | 0.72 | 0.76 | 0.73 | 0.73 | 0.79 | 0.77 |
| Lebanon | 0.85 | 50 | 0.44 | 0.48 | 0.64 | 0.76 | 0.82 | 0.82 | 0.77 | 0.83 |
| Lithuania | 0.86 | 51 | 0.43 | 0.76 | 0.78 | 0.73 | 0.76 | 0.73 | 0.69 | 0.73 |
| Malaysia | 0.86 | 50 | 0.61 | 0.65 | 0.71 | 0.75 | 0.73 | 0.72 | 0.71 | 0.75 |
| Malta | 0.87 | 52 | 0.51 | 0.67 | 0.72 | 0.83 | 0.78 | 0.80 | 0.69 | 0.73 |
| Morocco | 0.89 | 56 | 0.67 | 0.78 | 0.78 | 0.81 | 0.79 | 0.75 | 0.69 | 0.73 |
| New Zealand | 0.88 | 55 | 0.58 | 0.64 | 0.69 | 0.83 | 0.85 | 0.80 | 0.73 | 0.75 |
| Norway (9) | 0.77 | 39 | 0.51 | 0.46 | 0.45 | 0.78 | 0.79 | 0.72 | 0.55 | 0.63 |
| Oman | 0.86 | 52 | 0.40 | 0.54 | 0.70 | 0.84 | 0.83 | 0.78 | 0.76 | 0.78 |
| Qatar | 0.83 | 46 | 0.33 | 0.61 | 0.57 | 0.76 | 0.75 | 0.76 | 0.76 | 0.78 |
| Russian Federation | 0.84 | 47 | 0.59 | 0.62 | 0.68 | 0.75 | 0.75 | 0.78 | 0.55 | 0.74 |
| Saudi Arabia | 0.86 | 51 | 0.59 | 0.66 | 0.73 | 0.76 | 0.74 | 0.79 | 0.67 | 0.74 |
| Singapore | 0.89 | 58 | 0.58 | 0.73 | 0.71 | 0.83 | 0.82 | 0.82 | 0.77 | 0.79 |
| Slovenia | 0.87 | 53 | 0.65 | 0.73 | 0.78 | 0.76 | 0.76 | 0.73 | 0.68 | 0.71 |
| South Africa (9) | 0.88 | 55 | 0.73 | 0.78 | 0.75 | 0.79 | 0.72 | 0.80 | 0.64 | 0.72 |
| Sweden | 0.86 | 51 | 0.56 | 0.62 | 0.75 | 0.78 | 0.77 | 0.76 | 0.67 | 0.77 |
| Thailand | 0.86 | 50 | 0.57 | 0.70 | 0.75 | 0.76 | 0.73 | 0.71 | 0.72 | 0.70 |
| Turkey | 0.88 | 56 | 0.72 | 0.76 | 0.80 | 0.78 | 0.77 | 0.71 | 0.72 | 0.69 |
| United Arab Emirates | 0.86 | 51 | 0.48 | 0.56 | 0.63 | 0.79 | 0.78 | 0.82 | 0.80 | 0.79 |
| United States | 0.90 | 59 | 0.60 | 0.71 | 0.74 | 0.87 | 0.86 | 0.84 | 0.70 | 0.77 |
| Benchmarking Participants | | | | | | | | | | |
| Buenos Aires, Argentina | 0.80 | 45 | 0.31 | 0.70 | 0.78 | 0.74 | 0.73 | 0.70 | 0.56 | 0.69 |
| Ontario, Canada | 0.87 | 53 | 0.58 | 0.62 | 0.61 | 0.84 | 0.83 | 0.80 | 0.75 | 0.76 |
| Quebec, Canada | 0.85 | 49 | 0.50 | 0.50 | 0.66 | 0.81 | 0.79 | 0.80 | 0.72 | 0.74 |
| Norway (8) | 0.79 | 41 | 0.40 | 0.56 | 0.58 | 0.79 | 0.80 | 0.73 | 0.56 | 0.61 |
| Abu Dhabi, UAE | 0.86 | 51 | 0.49 | 0.53 | 0.62 | 0.78 | 0.78 | 0.83 | 0.78 | 0.78 |
| Dubai, UAE | 0.87 | 52 | 0.35 | 0.61 | 0.63 | 0.82 | 0.77 | 0.82 | 0.83 | 0.81 |
| Florida, US | 0.90 | 59 | 0.71 | 0.71 | 0.74 | 0.85 | 0.84 | 0.81 | 0.72 | 0.75 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Safe and Orderly School - Teachers' Reports Scale, Eighth Grade, and TIMSS 2015 Achievement

| Country | Pearson's Correlation with Achievement | | | | Variance in Achievement Accounted for by Difference Between Regions of the Scale (η^2) | |
|----------------------------------|--|-------------|-------------------|-------------|---|-------------|
| | (r) | | (r ²) | | Mathematics | Science |
| | Mathematics | Science | Mathematics | Science | | |
| Australia | 0.29 | 0.20 | 0.08 | 0.04 | 0.07 | 0.04 |
| Bahrain | 0.14 | 0.15 | 0.02 | 0.02 | 0.01 | 0.01 |
| Botswana (9) | 0.10 | 0.08 | 0.01 | 0.01 | 0.01 | 0.01 |
| Canada | 0.04 | 0.10 | 0.00 | 0.01 | 0.01 | 0.02 |
| Chile | 0.28 | 0.27 | 0.08 | 0.07 | 0.06 | 0.06 |
| Chinese Taipei | 0.13 | 0.09 | 0.02 | 0.01 | 0.01 | 0.00 |
| Egypt | 0.15 | 0.20 | 0.02 | 0.04 | 0.02 | 0.03 |
| England | 0.22 | 0.21 | 0.05 | 0.04 | 0.04 | 0.04 |
| Georgia | 0.06 | 0.04 | 0.00 | 0.00 | 0.02 | 0.00 |
| Hong Kong SAR | 0.25 | 0.13 | 0.06 | 0.02 | 0.03 | 0.01 |
| Hungary | 0.21 | 0.21 | 0.04 | 0.04 | 0.03 | 0.03 |
| Iran, Islamic Rep. of | 0.18 | 0.20 | 0.03 | 0.04 | 0.02 | 0.02 |
| Ireland | 0.25 | 0.20 | 0.06 | 0.04 | 0.07 | 0.05 |
| Israel | 0.20 | 0.08 | 0.04 | 0.01 | 0.03 | 0.01 |
| Italy | 0.17 | 0.15 | 0.03 | 0.02 | 0.03 | 0.02 |
| Japan | 0.07 | 0.12 | 0.01 | 0.01 | 0.00 | 0.01 |
| Jordan | 0.15 | 0.17 | 0.02 | 0.03 | 0.02 | 0.03 |
| Kazakhstan | 0.05 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Korea, Rep. of | 0.05 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 |
| Kuwait | 0.14 | 0.17 | 0.02 | 0.03 | 0.00 | 0.03 |
| Lebanon | 0.07 | 0.07 | 0.00 | 0.01 | 0.01 | 0.01 |
| Lithuania | 0.07 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Malaysia | 0.18 | 0.09 | 0.03 | 0.01 | 0.05 | 0.00 |
| Malta | 0.20 | 0.16 | 0.04 | 0.03 | 0.03 | 0.03 |
| Morocco | 0.13 | 0.12 | 0.02 | 0.01 | 0.01 | 0.01 |
| New Zealand | 0.17 | 0.28 | 0.03 | 0.08 | 0.02 | 0.07 |
| Norway (9) | 0.11 | 0.09 | 0.01 | 0.01 | 0.01 | 0.01 |
| Oman | 0.14 | 0.10 | 0.02 | 0.01 | 0.02 | 0.01 |
| Qatar | 0.12 | 0.11 | 0.01 | 0.01 | 0.00 | 0.02 |
| Russian Federation | 0.15 | 0.09 | 0.02 | 0.01 | 0.01 | 0.01 |
| Saudi Arabia | 0.18 | 0.18 | 0.03 | 0.03 | 0.02 | 0.03 |
| Singapore | 0.20 | 0.21 | 0.04 | 0.04 | 0.02 | 0.02 |
| Slovenia | 0.05 | 0.06 | 0.00 | 0.00 | 0.01 | 0.00 |
| South Africa (9) | 0.23 | 0.24 | 0.05 | 0.06 | 0.05 | 0.05 |
| Sweden | 0.13 | 0.16 | 0.02 | 0.02 | 0.01 | 0.03 |
| Thailand | 0.08 | 0.04 | 0.01 | 0.00 | 0.01 | 0.00 |
| Turkey | 0.19 | 0.20 | 0.04 | 0.04 | 0.05 | 0.02 |
| United Arab Emirates | 0.29 | 0.28 | 0.08 | 0.08 | 0.05 | 0.07 |
| United States | 0.28 | 0.22 | 0.08 | 0.05 | 0.07 | 0.05 |
| International Median | 0.15 | 0.15 | 0.02 | 0.02 | 0.02 | 0.02 |
| Benchmarking Participants | | | | | | |
| Buenos Aires, Argentina | 0.06 | 0.17 | 0.00 | 0.03 | 0.00 | 0.01 |
| Ontario, Canada | 0.07 | 0.06 | 0.00 | 0.00 | 0.01 | 0.01 |
| Quebec, Canada | 0.13 | 0.26 | 0.02 | 0.07 | 0.01 | 0.07 |
| Norway (8) | 0.11 | 0.05 | 0.01 | 0.00 | 0.01 | 0.00 |
| Abu Dhabi, UAE | 0.26 | 0.24 | 0.07 | 0.06 | 0.04 | 0.06 |
| Dubai, UAE | 0.25 | 0.29 | 0.06 | 0.09 | 0.05 | 0.07 |
| Florida, US | 0.17 | 0.18 | 0.03 | 0.03 | 0.04 | 0.03 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

School Discipline Problems–Principals’ Reports Scale, Eighth Grade

The School Discipline Problems–Principals’ Reports (DAS) scale was created based on principals’ responses concerning the eleven potential school problems described below.

Items in the TIMSS 2015 School Discipline Problems–Principals’ Reports Scale, Eighth Grade

| | | To what degree is each of the following a problem among eighth grade students in your school? | | | | |
|---|---------|--|---------------|------------------|-----------------|---|
| | | Not a problem | Minor problem | Moderate problem | Serious problem | |
| T | BCBG15A | 1) Arriving late at school ----- | ○ | ○ | ○ | ○ |
| T | BCBG15B | 2) Absenteeism (i.e., unjustified absences) ----- | ○ | ○ | ○ | ○ |
| T | BCBG15C | 3) Classroom disturbance ----- | ○ | ○ | ○ | ○ |
| T | BCBG15D | 4) Cheating ----- | ○ | ○ | ○ | ○ |
| T | BCBG15E | 5) Profanity ----- | ○ | ○ | ○ | ○ |
| T | BCBG15F | 6) Vandalism ----- | ○ | ○ | ○ | ○ |
| T | BCBG15G | 7) Theft ----- | ○ | ○ | ○ | ○ |
| T | BCBG15H | 8) Intimidation or verbal abuse among students (including texting, emailing, etc.) ----- | ○ | ○ | ○ | ○ |
| T | BCBG15I | 9) Physical injury to other students ----- | ○ | ○ | ○ | ○ |
| T | BCBG15J | 10) Intimidation or verbal abuse of teachers or staff (including texting, emailing, etc.) ----- | ○ | ○ | ○ | ○ |
| T | BCBG15K | 11) Physical injury to teachers or staff ----- | ○ | ○ | ○ | ○ |

Hardly Any Problems Minor Problems Moderate to Severe Problems

10.8 8.0

T Trend item—item was included in the same scale in TIMSS 2011 and was used for linking the TIMSS 2011 and TIMSS 2015 scales.

Item Parameters for the TIMSS 2015 School Discipline Problems - Principals' Reports Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|---------|----------|----------|----------|----------|-------|
| BCBG15A | 0.35543 | -2.45404 | -0.50450 | 2.95854 | 1.38 |
| BCBG15B | 0.81556 | -1.87731 | -0.68567 | 2.56298 | 1.13 |
| BCBG15C | 0.70602 | -2.36267 | -0.37850 | 2.74117 | 1.00 |
| BCBG15D | -0.17898 | -1.54132 | -0.62883 | 2.17015 | 1.09 |
| BCBG15E | 0.40992 | -1.72903 | -0.46635 | 2.19538 | 0.88 |
| BCBG15F | 0.06453 | -0.93256 | -0.64660 | 1.57916 | 0.84 |
| BCBG15G | -0.34720 | -0.36836 | -1.00450 | 1.37286 | 0.83 |
| BCBG15H | 0.40049 | -1.81251 | -0.70589 | 2.51840 | 0.90 |
| BCBG15I | -0.28471 | -0.92448 | -0.85294 | 1.77742 | 0.78 |
| BCBG15J | -0.70539 | -0.40379 | -0.86401 | 1.26780 | 0.87 |
| BCBG15K | -1.23567 | 1.05912 | -0.69101 | -0.36811 | 0.86 |

Scale Transformation Constants for the TIMSS 2015 School Discipline Problems - Principals' Reports Scale, Eighth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 8.418512 | Transformed Scale Score = 8.418512 + 0.981214 • Logit Scale Score |
| B = 0.981214 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 School Discipline Problems - Principals' Reports Scale, Eighth
Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 4.07274 | |
| 1 | 5.16684 | |
| 2 | 5.67741 | |
| 3 | 6.01327 | |
| 4 | 6.26434 | |
| 5 | 6.46647 | |
| 6 | 6.63787 | |
| 7 | 6.78911 | |
| 8 | 6.92690 | |
| 9 | 7.05599 | |
| 10 | 7.17997 | |
| 11 | 7.30166 | |
| 12 | 7.42228 | |
| 13 | 7.54644 | |
| 14 | 7.67382 | |
| 15 | 7.80615 | |
| 16 | 7.94503 | 8.0 |
| 17 | 8.09232 | |
| 18 | 8.24902 | |
| 19 | 8.41762 | |
| 20 | 8.60012 | |
| 21 | 8.79847 | |
| 22 | 9.01619 | |
| 23 | 9.25431 | |
| 24 | 9.51506 | |
| 25 | 9.79961 | |
| 26 | 10.10915 | |
| 27 | 10.44316 | |
| 28 | 10.80339 | 10.8 |
| 29 | 11.19421 | |
| 30 | 11.62747 | |
| 31 | 12.13360 | |
| 32 | 12.80087 | |
| 33 | 14.02734 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 School Discipline Problems - Principals' Reports Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| | | | BCBG15A | BCBG15B | BCBG15C | BCBG15D | BCBG15E | BCBG15F | BCBG15G | BCBG15H | BCBG15I | BCBG15J | BCBG15K |
| Australia | 0.87 | 44 | 0.64 | 0.67 | 0.74 | 0.58 | 0.75 | 0.80 | 0.62 | 0.66 | 0.73 | 0.69 | 0.36 |
| Bahrain | 0.97 | 75 | 0.72 | 0.83 | 0.84 | 0.84 | 0.86 | 0.91 | 0.90 | 0.89 | 0.86 | 0.93 | 0.90 |
| Botswana (9) | 0.89 | 47 | 0.57 | 0.63 | 0.63 | 0.74 | 0.72 | 0.68 | 0.80 | 0.75 | 0.75 | 0.67 | 0.55 |
| Canada | 0.87 | 45 | 0.64 | 0.63 | 0.71 | 0.59 | 0.76 | 0.79 | 0.78 | 0.71 | 0.71 | 0.68 | 0.26 |
| Chile | 0.88 | 48 | 0.57 | 0.63 | 0.68 | 0.65 | 0.83 | 0.78 | 0.76 | 0.74 | 0.77 | 0.71 | 0.37 |
| Chinese Taipei | 0.90 | 50 | 0.67 | 0.75 | 0.76 | 0.68 | 0.77 | 0.79 | 0.77 | 0.67 | 0.74 | 0.67 | 0.39 |
| Egypt | 0.95 | 67 | 0.54 | 0.54 | 0.82 | 0.77 | 0.90 | 0.87 | 0.90 | 0.88 | 0.88 | 0.89 | 0.87 |
| England | 0.81 | 35 | 0.68 | 0.73 | 0.82 | 0.24 | 0.65 | 0.61 | 0.42 | 0.70 | 0.60 | 0.55 | 0.09 |
| Georgia | 0.91 | 55 | 0.59 | 0.66 | 0.70 | 0.57 | 0.78 | 0.74 | 0.84 | 0.72 | 0.81 | 0.84 | 0.84 |
| Hong Kong SAR | 0.86 | 44 | 0.73 | 0.69 | 0.71 | 0.60 | 0.68 | 0.76 | 0.69 | 0.60 | 0.70 | 0.65 | 0.44 |
| Hungary | 0.90 | 51 | 0.58 | 0.58 | 0.78 | 0.68 | 0.75 | 0.80 | 0.72 | 0.83 | 0.84 | 0.76 | 0.42 |
| Iran, Islamic Rep. of | 0.92 | 58 | 0.69 | 0.74 | 0.71 | 0.69 | 0.81 | 0.76 | 0.80 | 0.79 | 0.80 | 0.78 | 0.76 |
| Ireland | 0.88 | 46 | 0.66 | 0.64 | 0.71 | 0.60 | 0.78 | 0.73 | 0.62 | 0.76 | 0.65 | 0.78 | 0.50 |
| Israel | 0.95 | 66 | 0.68 | 0.78 | 0.77 | 0.82 | 0.81 | 0.81 | 0.84 | 0.83 | 0.86 | 0.86 | 0.84 |
| Italy | 0.91 | 52 | 0.47 | 0.68 | 0.56 | 0.41 | 0.57 | 0.86 | 0.85 | 0.68 | 0.86 | 0.89 | 0.85 |
| Japan | 0.92 | 60 | 0.62 | 0.40 | 0.85 | 0.82 | 0.90 | 0.85 | 0.77 | 0.71 | 0.85 | 0.77 | 0.83 |
| Jordan | 0.95 | 68 | 0.67 | 0.70 | 0.73 | 0.80 | 0.87 | 0.86 | 0.89 | 0.88 | 0.90 | 0.87 | 0.86 |
| Kazakhstan | 0.97 | 80 | 0.84 | 0.90 | 0.88 | 0.66 | 0.92 | 0.95 | 0.94 | 0.94 | 0.94 | 0.95 | 0.88 |
| Korea, Rep. of | 0.94 | 63 | 0.68 | 0.80 | 0.74 | 0.83 | 0.83 | 0.84 | 0.80 | 0.78 | 0.86 | 0.81 | 0.73 |
| Kuwait | 0.95 | 66 | 0.49 | 0.66 | 0.72 | 0.86 | 0.89 | 0.87 | 0.87 | 0.84 | 0.89 | 0.90 | 0.86 |
| Lebanon | 0.97 | 79 | 0.82 | 0.86 | 0.82 | 0.83 | 0.90 | 0.92 | 0.94 | 0.88 | 0.94 | 0.92 | 0.92 |
| Lithuania | 0.85 | 40 | 0.62 | 0.65 | 0.71 | 0.66 | 0.74 | 0.61 | 0.56 | 0.77 | 0.63 | 0.65 | 0.08 |
| Malaysia | 0.88 | 49 | 0.56 | 0.48 | 0.64 | 0.77 | 0.83 | 0.80 | 0.79 | 0.77 | 0.72 | 0.71 | 0.52 |
| Malta | 0.93 | 60 | 0.64 | 0.86 | 0.80 | 0.77 | 0.83 | 0.83 | 0.80 | 0.73 | 0.84 | 0.84 | 0.52 |
| Morocco | 0.94 | 65 | 0.49 | 0.65 | 0.84 | 0.79 | 0.85 | 0.88 | 0.92 | 0.82 | 0.87 | 0.87 | 0.82 |
| New Zealand | 0.88 | 46 | 0.65 | 0.64 | 0.69 | 0.53 | 0.79 | 0.70 | 0.64 | 0.68 | 0.74 | 0.77 | 0.61 |
| Norway (9) | 0.83 | 38 | 0.60 | 0.57 | 0.69 | 0.63 | 0.71 | 0.65 | 0.47 | 0.70 | 0.68 | 0.69 | 0.33 |
| Oman | 0.97 | 74 | 0.73 | 0.82 | 0.78 | 0.86 | 0.90 | 0.86 | 0.90 | 0.89 | 0.90 | 0.91 | 0.90 |
| Qatar | 0.97 | 78 | 0.55 | 0.76 | 0.83 | 0.93 | 0.92 | 0.93 | 0.95 | 0.92 | 0.95 | 0.92 | 0.93 |
| Russian Federation | 0.81 | 36 | 0.66 | 0.63 | 0.66 | 0.56 | 0.61 | 0.65 | 0.68 | 0.72 | 0.65 | 0.38 | 0.07 |
| Saudi Arabia | 0.97 | 73 | 0.56 | 0.70 | 0.82 | 0.92 | 0.86 | 0.90 | 0.91 | 0.91 | 0.93 | 0.92 | 0.92 |
| Singapore | 0.88 | 50 | 0.65 | 0.69 | 0.68 | 0.68 | 0.75 | 0.71 | 0.80 | 0.76 | 0.69 | 0.64 | - |
| Slovenia | 0.90 | 50 | 0.71 | 0.67 | 0.75 | 0.74 | 0.82 | 0.74 | 0.61 | 0.77 | 0.81 | 0.70 | 0.29 |
| South Africa (9) | 0.91 | 51 | 0.73 | 0.81 | 0.69 | 0.70 | 0.74 | 0.80 | 0.78 | 0.77 | 0.76 | 0.64 | 0.38 |
| Sweden | 0.84 | 39 | 0.63 | 0.75 | 0.56 | 0.46 | 0.73 | 0.68 | 0.67 | 0.68 | 0.74 | 0.62 | 0.19 |
| Thailand | 0.89 | 48 | 0.66 | 0.63 | 0.70 | 0.79 | 0.64 | 0.80 | 0.80 | 0.76 | 0.77 | 0.55 | 0.46 |
| Turkey | 0.95 | 66 | 0.71 | 0.72 | 0.78 | 0.80 | 0.73 | 0.83 | 0.87 | 0.86 | 0.88 | 0.88 | 0.84 |
| United Arab Emirates | 0.93 | 60 | 0.67 | 0.73 | 0.77 | 0.78 | 0.84 | 0.84 | 0.78 | 0.79 | 0.82 | 0.81 | 0.68 |
| United States | 0.88 | 46 | 0.67 | 0.65 | 0.71 | 0.56 | 0.75 | 0.72 | 0.73 | 0.71 | 0.76 | 0.70 | 0.36 |
| Benchmarking Participants | | | | | | | | | | | | | |
| Buenos Aires, Argentina | 0.86 | 46 | 0.66 | 0.72 | 0.74 | 0.61 | 0.68 | 0.70 | 0.76 | 0.65 | 0.83 | 0.60 | 0.39 |
| Ontario, Canada | 0.88 | 46 | 0.64 | 0.59 | 0.73 | 0.62 | 0.77 | 0.81 | 0.80 | 0.77 | 0.69 | 0.61 | 0.24 |
| Quebec, Canada | 0.87 | 46 | 0.61 | 0.61 | 0.63 | 0.51 | 0.83 | 0.78 | 0.77 | 0.66 | 0.81 | 0.80 | 0.27 |
| Norway (8) | 0.79 | 34 | 0.44 | 0.64 | 0.61 | 0.73 | 0.71 | 0.60 | 0.59 | 0.48 | 0.57 | 0.44 | 0.52 |
| Abu Dhabi, UAE | 0.90 | 55 | 0.66 | 0.71 | 0.75 | 0.69 | 0.82 | 0.83 | 0.76 | 0.76 | 0.78 | 0.78 | 0.61 |
| Dubai, UAE | 0.92 | 57 | 0.55 | 0.62 | 0.77 | 0.82 | 0.84 | 0.82 | 0.79 | 0.72 | 0.82 | 0.74 | 0.75 |
| Florida, US | 0.91 | 53 | 0.80 | 0.76 | 0.76 | 0.71 | 0.83 | 0.49 | 0.81 | 0.75 | 0.83 | 0.82 | 0.25 |

A dash (-) indicates comparable data not available.

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 School Discipline Problems - Principals' Reports Scale, Eighth Grade, and TIMSS 2015 Achievement

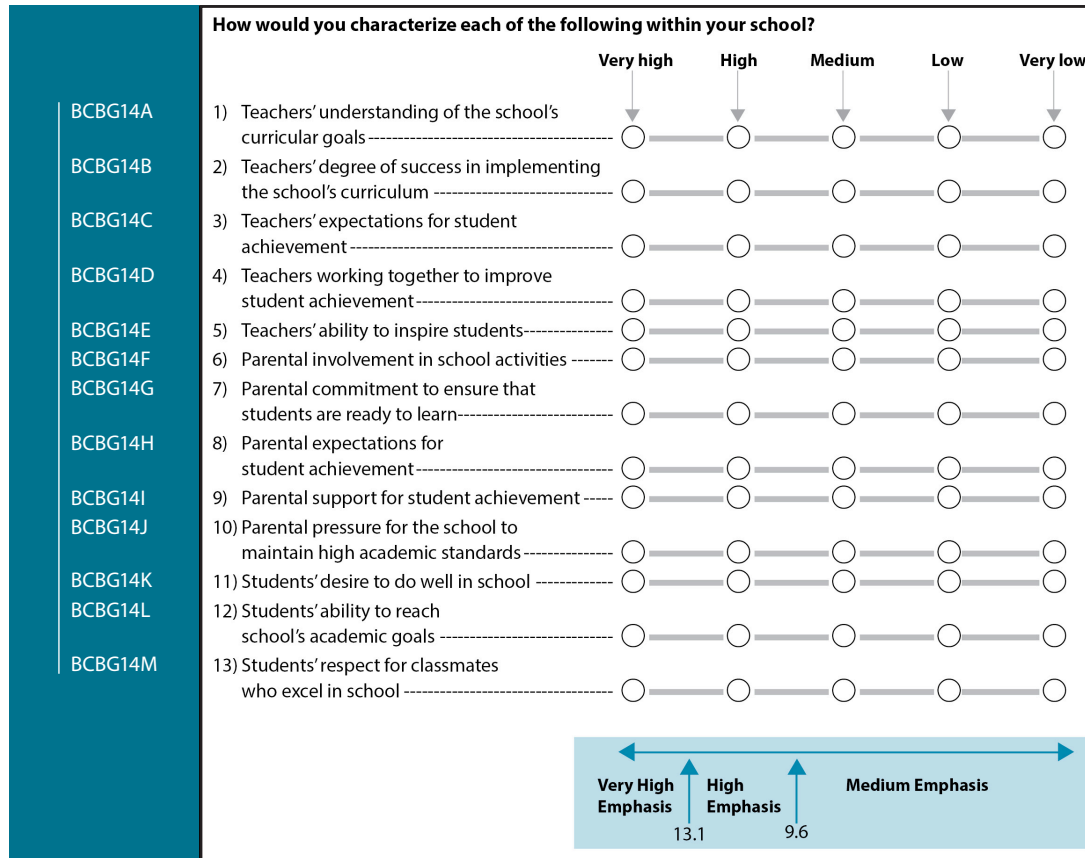
| Country | Pearson's Correlation with Achievement | | | | Variance in Achievement Accounted for by Difference Between Regions of the Scale (η^2) | |
|----------------------------------|--|-------------|-------------|-------------|---|-------------|
| | (r) | | (r) | | Mathematics | Science |
| | Mathematics | Science | Mathematics | Science | | |
| Australia | 0.29 | 0.26 | 0.08 | 0.07 | 0.07 | 0.05 |
| Bahrain | 0.14 | 0.15 | 0.02 | 0.02 | 0.02 | 0.04 |
| Botswana (9) | 0.23 | 0.21 | 0.05 | 0.04 | 0.04 | 0.04 |
| Canada | 0.10 | 0.08 | 0.01 | 0.01 | 0.01 | 0.01 |
| Chile | 0.22 | 0.23 | 0.05 | 0.05 | 0.04 | 0.04 |
| Chinese Taipei | 0.24 | 0.23 | 0.06 | 0.06 | 0.06 | 0.05 |
| Egypt | 0.02 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| England | 0.23 | 0.22 | 0.05 | 0.05 | 0.02 | 0.02 |
| Georgia | -0.07 | -0.04 | 0.01 | -0.00 | 0.00 | 0.00 |
| Hong Kong SAR | 0.27 | 0.23 | 0.07 | 0.05 | 0.04 | 0.03 |
| Hungary | 0.29 | 0.28 | 0.08 | 0.08 | 0.09 | 0.08 |
| Iran, Islamic Rep. of | 0.11 | 0.09 | 0.01 | 0.01 | 0.01 | 0.01 |
| Ireland | 0.20 | 0.18 | 0.04 | 0.03 | 0.03 | 0.03 |
| Israel | 0.22 | 0.22 | 0.05 | 0.05 | 0.04 | 0.05 |
| Italy | -0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Japan | 0.08 | 0.07 | 0.01 | 0.01 | 0.01 | 0.01 |
| Jordan | 0.01 | 0.02 | 0.00 | 0.00 | 0.01 | 0.01 |
| Kazakhstan | 0.08 | 0.10 | 0.01 | 0.01 | 0.01 | 0.02 |
| Korea, Rep. of | -0.07 | -0.05 | 0.01 | -0.00 | 0.00 | 0.00 |
| Kuwait | 0.15 | 0.21 | 0.02 | 0.04 | 0.03 | 0.04 |
| Lebanon | 0.05 | 0.03 | 0.00 | 0.00 | 0.01 | 0.01 |
| Lithuania | 0.09 | 0.08 | 0.01 | 0.01 | 0.01 | 0.01 |
| Malaysia | 0.17 | 0.18 | 0.03 | 0.03 | 0.02 | 0.02 |
| Malta | 0.26 | 0.27 | 0.07 | 0.07 | 0.09 | 0.10 |
| Morocco | 0.05 | 0.06 | 0.00 | 0.00 | 0.01 | 0.01 |
| New Zealand | 0.18 | 0.19 | 0.03 | 0.03 | 0.03 | 0.03 |
| Norway (9) | 0.08 | 0.10 | 0.01 | 0.01 | 0.00 | 0.00 |
| Oman | 0.10 | 0.08 | 0.01 | 0.01 | 0.01 | 0.01 |
| Qatar | 0.04 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Russian Federation | 0.19 | 0.21 | 0.04 | 0.04 | 0.01 | 0.02 |
| Saudi Arabia | 0.09 | 0.15 | 0.01 | 0.02 | 0.02 | 0.04 |
| Singapore | 0.26 | 0.24 | 0.07 | 0.06 | 0.03 | 0.03 |
| Slovenia | 0.07 | 0.08 | 0.00 | 0.01 | 0.00 | 0.00 |
| South Africa (9) | 0.20 | 0.19 | 0.04 | 0.04 | 0.05 | 0.04 |
| Sweden | 0.16 | 0.18 | 0.02 | 0.03 | 0.03 | 0.03 |
| Thailand | 0.11 | 0.12 | 0.01 | 0.01 | 0.01 | 0.02 |
| Turkey | 0.13 | 0.13 | 0.02 | 0.02 | 0.03 | 0.03 |
| United Arab Emirates | 0.24 | 0.25 | 0.06 | 0.06 | 0.03 | 0.03 |
| United States | 0.27 | 0.28 | 0.07 | 0.08 | 0.05 | 0.05 |
| International Median | 0.14 | 0.15 | 0.02 | 0.02 | 0.02 | 0.02 |
| Benchmarking Participants | | | | | | |
| Buenos Aires, Argentina | 0.32 | 0.28 | 0.10 | 0.08 | 0.06 | 0.04 |
| Ontario, Canada | 0.08 | 0.05 | 0.01 | 0.00 | 0.01 | 0.00 |
| Quebec, Canada | 0.10 | 0.08 | 0.01 | 0.01 | 0.01 | 0.01 |
| Norway (8) | 0.05 | 0.07 | 0.00 | 0.00 | 0.01 | 0.01 |
| Abu Dhabi, UAE | 0.18 | 0.19 | 0.03 | 0.04 | 0.01 | 0.01 |
| Dubai, UAE | 0.30 | 0.31 | 0.09 | 0.10 | 0.05 | 0.06 |
| Florida, US | 0.03 | 0.02 | 0.00 | 0.00 | 0.10 | 0.11 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

School Emphasis on Academic Success–Principals’ Reports Scale, Eighth Grade

The School Emphasis on Academic Success–Principals’ Reports (EAS) scale was created based on teachers’ responses characterizing the thirteen aspects described below.

Items in the TIMSS 2015 School Emphasis on Academic Success–Principals’ Reports Scale, Eighth Grade¹



¹ For the purpose of scaling, categories in which there were very few respondents were combined. The categories “Low” and “Very low” were combined for all variables. The scale statistics that are reported herein reflect analysis of the items following collapsing.

Item Parameters for the TIMSS 2015 School Emphasis on Academic Success - Principals' Reports Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|---------|----------|----------|----------|---------|-------|
| BCBG14A | -1.76385 | -3.28017 | -0.07481 | 3.35498 | 1.08 |
| BCBG14B | -1.17365 | -3.50530 | 0.06625 | 3.43905 | 0.96 |
| BCBG14C | -0.88646 | -3.14005 | -0.04034 | 3.18039 | 0.95 |
| BCBG14D | -0.76453 | -2.71198 | -0.12909 | 2.84107 | 1.08 |
| BCBG14E | -0.49217 | -3.19184 | 0.00480 | 3.18704 | 0.95 |
| BCBG14F | 1.62433 | -2.27811 | 0.09269 | 2.18542 | 1.11 |
| BCBG14G | 1.38302 | -2.36022 | 0.06460 | 2.29562 | 0.85 |
| BCBG14H | -0.06276 | -2.26101 | -0.22820 | 2.48921 | 1.03 |
| BCBG14I | 1.13998 | -2.47307 | 0.03842 | 2.43465 | 0.79 |
| BCBG14J | 0.78562 | -2.02339 | -0.09617 | 2.11956 | 1.23 |
| BCBG14K | 0.20569 | -3.16759 | 0.13127 | 3.03632 | 0.87 |
| BCBG14L | 0.44841 | -3.54657 | 0.11136 | 3.43521 | 0.81 |
| BCBG14M | -0.44363 | -2.97276 | -0.18570 | 3.15846 | 1.15 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Scale Transformation Constants for the TIMSS 2015 School Emphasis on Academic Success - Principals' Reports Scale, Eighth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 9.587978 | Transformed Scale Score = 9.587978 + 1.101886 • Logit Scale Score |
| B = 1.101886 | |

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 School Emphasis on Academic Success - Principals' Reports Scale,
Eighth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 1.93343 | |
| 1 | 3.33811 | |
| 2 | 4.10092 | |
| 3 | 4.66995 | |
| 4 | 5.14483 | |
| 5 | 5.56379 | |
| 6 | 5.94753 | |
| 7 | 6.30527 | |
| 8 | 6.64249 | |
| 9 | 6.96191 | |
| 10 | 7.26508 | |
| 11 | 7.55352 | |
| 12 | 7.82881 | |
| 13 | 8.09374 | |
| 14 | 8.35031 | |
| 15 | 8.60068 | |
| 16 | 8.84696 | |
| 17 | 9.09098 | |
| 18 | 9.33426 | |
| 19 | 9.57780 | 9.6 |
| 20 | 9.82234 | |
| 21 | 10.06789 | |
| 22 | 10.31430 | |
| 23 | 10.56114 | |
| 24 | 10.80795 | |
| 25 | 11.05447 | |
| 26 | 11.30073 | |
| 27 | 11.54716 | |
| 28 | 11.79471 | |
| 29 | 12.04479 | |
| 30 | 12.29937 | |
| 31 | 12.56014 | |
| 32 | 12.83181 | |
| 33 | 13.11864 | 13.1 |
| 34 | 13.42815 | |
| 35 | 13.76917 | |
| 36 | 14.16268 | |
| 37 | 14.64698 | |
| 38 | 15.31745 | |
| 39 | 16.63263 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 School Emphasis on Academic Success - Principals' Reports Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--|
| | | | BCBG14A | BCBG14B | BCBG14C | BCBG14D | BCBG14E | BCBG14F | BCBG14G | BCBG14H | BCBG14I | BCBG14J | BCBG14K | BCBG14L | BCBG14M | |
| Australia | 0.94 | 60 | 0.70 | 0.75 | 0.83 | 0.72 | 0.82 | 0.72 | 0.83 | 0.83 | 0.83 | 0.77 | 0.79 | 0.68 | 0.74 | |
| Bahrain | 0.93 | 55 | 0.59 | 0.71 | 0.79 | 0.68 | 0.79 | 0.81 | 0.81 | 0.78 | 0.87 | 0.70 | 0.78 | 0.84 | 0.45 | |
| Botswana (9) | 0.86 | 39 | 0.58 | 0.59 | 0.69 | 0.67 | 0.70 | 0.62 | 0.64 | 0.52 | 0.71 | 0.49 | 0.70 | 0.60 | 0.60 | |
| Canada | 0.94 | 58 | 0.74 | 0.78 | 0.78 | 0.63 | 0.75 | 0.73 | 0.85 | 0.81 | 0.85 | 0.75 | 0.77 | 0.74 | 0.68 | |
| Chile | 0.92 | 51 | 0.74 | 0.79 | 0.73 | 0.62 | 0.76 | 0.68 | 0.75 | 0.76 | 0.69 | 0.70 | 0.75 | 0.70 | 0.64 | |
| Chinese Taipei | 0.93 | 56 | 0.64 | 0.73 | 0.77 | 0.68 | 0.77 | 0.82 | 0.83 | 0.80 | 0.79 | 0.70 | 0.78 | 0.82 | 0.58 | |
| Egypt | 0.88 | 42 | 0.50 | 0.61 | 0.44 | 0.53 | 0.50 | 0.73 | 0.69 | 0.76 | 0.76 | 0.69 | 0.71 | 0.74 | 0.60 | |
| England | 0.95 | 61 | 0.69 | 0.77 | 0.78 | 0.63 | 0.80 | 0.84 | 0.89 | 0.81 | 0.84 | 0.84 | 0.81 | 0.72 | 0.72 | |
| Georgia | 0.89 | 43 | 0.69 | 0.67 | 0.74 | 0.70 | 0.74 | 0.63 | 0.59 | 0.59 | 0.74 | 0.59 | 0.63 | 0.56 | 0.65 | |
| Hong Kong SAR | 0.92 | 52 | 0.59 | 0.65 | 0.74 | 0.63 | 0.74 | 0.54 | 0.83 | 0.79 | 0.84 | 0.73 | 0.79 | 0.81 | 0.58 | |
| Hungary | 0.89 | 45 | 0.37 | 0.61 | 0.57 | 0.42 | 0.65 | 0.70 | 0.80 | 0.76 | 0.72 | 0.68 | 0.81 | 0.75 | 0.72 | |
| Iran, Islamic Rep. of | 0.91 | 49 | 0.63 | 0.73 | 0.60 | 0.65 | 0.71 | 0.66 | 0.79 | 0.67 | 0.76 | 0.72 | 0.77 | 0.77 | 0.61 | |
| Ireland | 0.93 | 56 | 0.63 | 0.64 | 0.81 | 0.61 | 0.70 | 0.64 | 0.85 | 0.82 | 0.82 | 0.79 | 0.84 | 0.82 | 0.65 | |
| Israel | 0.89 | 44 | 0.62 | 0.72 | 0.73 | 0.48 | 0.58 | 0.59 | 0.72 | 0.72 | 0.80 | 0.55 | 0.73 | 0.71 | 0.60 | |
| Italy | 0.87 | 40 | 0.65 | 0.62 | 0.49 | 0.47 | 0.64 | 0.62 | 0.70 | 0.66 | 0.63 | 0.68 | 0.71 | 0.69 | 0.62 | |
| Japan | 0.89 | 44 | 0.60 | 0.63 | 0.75 | 0.55 | 0.53 | 0.55 | 0.73 | 0.70 | 0.77 | 0.54 | 0.78 | 0.76 | 0.67 | |
| Jordan | 0.91 | 49 | 0.65 | 0.65 | 0.55 | 0.73 | 0.72 | 0.69 | 0.78 | 0.71 | 0.71 | 0.69 | 0.73 | 0.77 | 0.66 | |
| Kazakhstan | 0.92 | 52 | 0.61 | 0.63 | 0.63 | 0.75 | 0.80 | 0.75 | 0.82 | 0.71 | 0.80 | 0.71 | 0.74 | 0.75 | 0.66 | |
| Korea, Rep. of | 0.90 | 46 | 0.44 | 0.57 | 0.77 | 0.60 | 0.62 | 0.77 | 0.81 | 0.75 | 0.81 | 0.59 | 0.67 | 0.79 | 0.52 | |
| Kuwait | 0.91 | 48 | 0.63 | 0.62 | 0.69 | 0.67 | 0.71 | 0.68 | 0.80 | 0.71 | 0.77 | 0.64 | 0.71 | 0.77 | 0.58 | |
| Lebanon | 0.90 | 46 | 0.61 | 0.68 | 0.66 | 0.69 | 0.59 | 0.70 | 0.75 | 0.77 | 0.75 | 0.56 | 0.70 | 0.73 | 0.54 | |
| Lithuania | 0.89 | 43 | 0.54 | 0.58 | 0.59 | 0.65 | 0.74 | 0.67 | 0.73 | 0.73 | 0.70 | 0.44 | 0.73 | 0.70 | 0.65 | |
| Malaysia | 0.91 | 49 | 0.44 | 0.63 | 0.60 | 0.61 | 0.68 | 0.72 | 0.79 | 0.79 | 0.80 | 0.63 | 0.80 | 0.77 | 0.70 | |
| Malta | 0.93 | 55 | 0.78 | 0.82 | 0.66 | 0.68 | 0.67 | 0.72 | 0.78 | 0.72 | 0.82 | 0.72 | 0.80 | 0.81 | 0.59 | |
| Morocco | 0.88 | 41 | 0.58 | 0.54 | 0.59 | 0.63 | 0.64 | 0.57 | 0.75 | 0.73 | 0.69 | 0.71 | 0.64 | 0.68 | 0.55 | |
| New Zealand | 0.90 | 48 | 0.65 | 0.69 | 0.71 | 0.61 | 0.74 | 0.62 | 0.76 | 0.66 | 0.79 | 0.73 | 0.76 | 0.70 | 0.48 | |
| Norway (9) | 0.88 | 43 | 0.46 | 0.59 | 0.76 | 0.59 | 0.62 | 0.80 | 0.71 | 0.66 | 0.76 | 0.54 | 0.61 | 0.66 | 0.63 | |
| Oman | 0.90 | 46 | 0.65 | 0.68 | 0.62 | 0.62 | 0.65 | 0.70 | 0.77 | 0.78 | 0.78 | 0.50 | 0.64 | 0.71 | 0.61 | |
| Qatar | 0.92 | 52 | 0.56 | 0.72 | 0.75 | 0.67 | 0.69 | 0.67 | 0.85 | 0.70 | 0.74 | 0.73 | 0.81 | 0.77 | 0.65 | |
| Russian Federation | 0.83 | 37 | 0.60 | 0.68 | 0.55 | 0.60 | 0.65 | 0.72 | 0.70 | 0.39 | 0.64 | 0.01 | 0.67 | 0.70 | 0.59 | |
| Saudi Arabia | 0.90 | 47 | 0.62 | 0.64 | 0.62 | 0.66 | 0.61 | 0.72 | 0.73 | 0.76 | 0.68 | 0.60 | 0.77 | 0.83 | 0.66 | |
| Singapore | 0.93 | 56 | 0.58 | 0.72 | 0.77 | 0.70 | 0.77 | 0.64 | 0.83 | 0.75 | 0.83 | 0.72 | 0.81 | 0.80 | 0.72 | |
| Slovenia | 0.84 | 36 | 0.72 | 0.76 | 0.71 | 0.76 | 0.79 | 0.50 | 0.55 | 0.27 | 0.56 | 0.40 | 0.54 | 0.54 | 0.48 | |
| South Africa (9) | 0.89 | 45 | 0.57 | 0.63 | 0.63 | 0.75 | 0.70 | 0.72 | 0.74 | 0.52 | 0.76 | 0.56 | 0.69 | 0.76 | 0.68 | |
| Sweden | 0.91 | 48 | 0.56 | 0.68 | 0.71 | 0.63 | 0.69 | 0.62 | 0.76 | 0.80 | 0.79 | 0.70 | 0.64 | 0.73 | 0.64 | |
| Thailand | 0.91 | 48 | 0.62 | 0.72 | 0.63 | 0.65 | 0.67 | 0.76 | 0.78 | 0.66 | 0.77 | 0.66 | 0.71 | 0.76 | 0.62 | |
| Turkey | 0.91 | 49 | 0.61 | 0.65 | 0.67 | 0.56 | 0.70 | 0.71 | 0.78 | 0.66 | 0.81 | 0.76 | 0.81 | 0.79 | 0.57 | |
| United Arab Emirates | 0.93 | 56 | 0.72 | 0.71 | 0.81 | 0.73 | 0.72 | 0.73 | 0.77 | 0.72 | 0.79 | 0.70 | 0.82 | 0.80 | 0.66 | |
| United States | 0.93 | 55 | 0.61 | 0.70 | 0.74 | 0.66 | 0.71 | 0.79 | 0.84 | 0.80 | 0.82 | 0.69 | 0.78 | 0.73 | 0.75 | |
| Benchmarking Participants | | | | | | | | | | | | | | | | |
| Buenos Aires, Argentina | 0.87 | 42 | 0.70 | 0.62 | 0.67 | 0.58 | 0.61 | 0.60 | 0.66 | 0.64 | 0.74 | 0.70 | 0.60 | 0.62 | 0.62 | |
| Ontario, Canada | 0.93 | 56 | 0.74 | 0.77 | 0.79 | 0.48 | 0.65 | 0.70 | 0.85 | 0.80 | 0.85 | 0.78 | 0.79 | 0.76 | 0.65 | |
| Quebec, Canada | 0.94 | 58 | 0.76 | 0.73 | 0.72 | 0.79 | 0.79 | 0.79 | 0.83 | 0.77 | 0.82 | 0.69 | 0.71 | 0.72 | 0.73 | |
| Norway (8) | 0.88 | 42 | 0.47 | 0.60 | 0.76 | 0.57 | 0.64 | 0.81 | 0.71 | 0.63 | 0.77 | 0.52 | 0.59 | 0.65 | 0.63 | |
| Abu Dhabi, UAE | 0.92 | 52 | 0.72 | 0.72 | 0.82 | 0.69 | 0.74 | 0.70 | 0.78 | 0.66 | 0.75 | 0.64 | 0.84 | 0.74 | 0.57 | |
| Dubai, UAE | 0.94 | 60 | 0.74 | 0.77 | 0.83 | 0.78 | 0.80 | 0.71 | 0.73 | 0.74 | 0.83 | 0.70 | 0.83 | 0.85 | 0.75 | |
| Florida, US | 0.94 | 60 | 0.68 | 0.81 | 0.79 | 0.72 | 0.62 | 0.87 | 0.89 | 0.81 | 0.81 | 0.73 | 0.86 | 0.63 | 0.75 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 School Emphasis on Academic Success - Principals' Reports Scale, Eighth Grade, and TIMSS 2015 Achievement

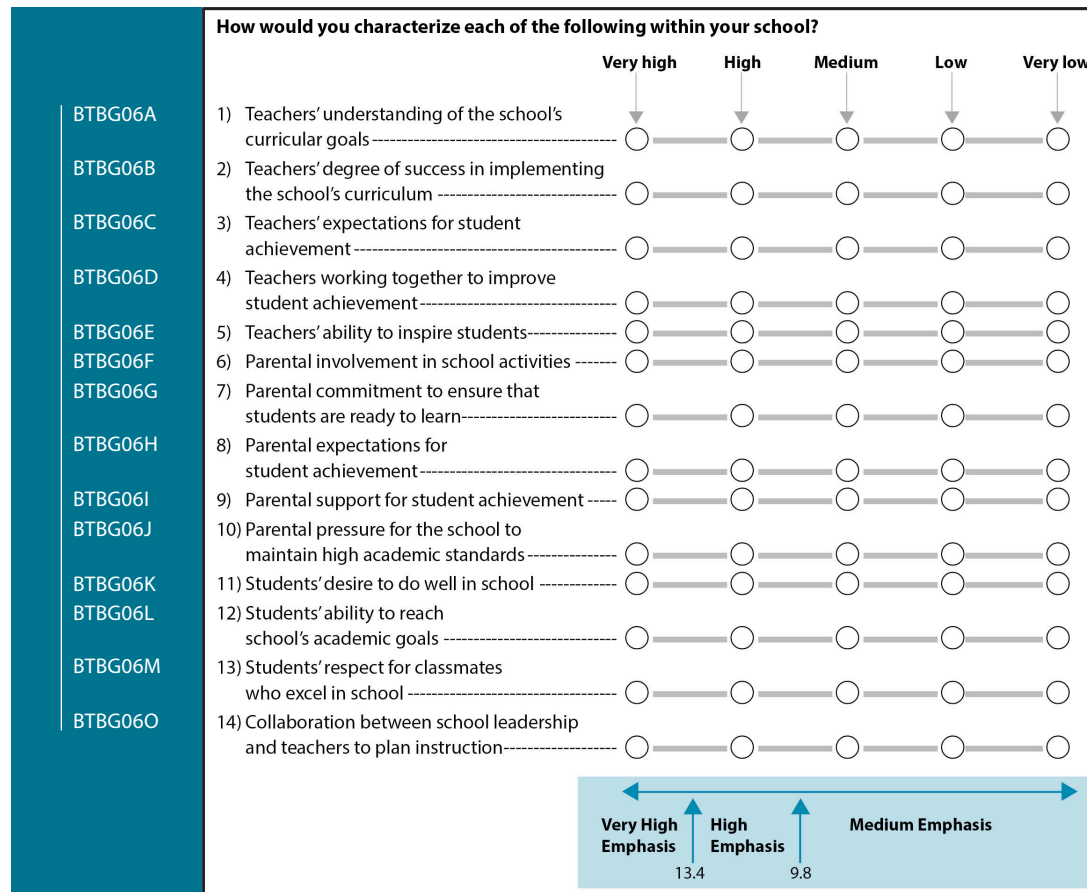
| Country | Pearson's Correlation with Achievement | | | | Variance in Achievement Accounted for by Difference Between Regions of the Scale (η^2) | |
|----------------------------------|--|-------------|-------------|-------------|---|-------------|
| | (r) | | (r) | | Mathematics | Science |
| | Mathematics | Science | Mathematics | Science | | |
| Australia | 0.32 | 0.27 | 0.10 | 0.07 | 0.09 | 0.07 |
| Bahrain | 0.24 | 0.21 | 0.06 | 0.04 | 0.08 | 0.05 |
| Botswana (9) | 0.34 | 0.31 | 0.12 | 0.10 | 0.13 | 0.11 |
| Canada | 0.21 | 0.14 | 0.05 | 0.02 | 0.04 | 0.02 |
| Chile | 0.30 | 0.30 | 0.09 | 0.09 | 0.07 | 0.06 |
| Chinese Taipei | 0.36 | 0.35 | 0.13 | 0.12 | 0.10 | 0.10 |
| Egypt | 0.09 | 0.09 | 0.01 | 0.01 | 0.00 | 0.01 |
| England | 0.38 | 0.35 | 0.14 | 0.13 | 0.14 | 0.12 |
| Georgia | 0.06 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 |
| Hong Kong SAR | 0.33 | 0.31 | 0.11 | 0.09 | 0.13 | 0.11 |
| Hungary | 0.43 | 0.42 | 0.19 | 0.17 | 0.12 | 0.12 |
| Iran, Islamic Rep. of | 0.31 | 0.30 | 0.10 | 0.09 | 0.07 | 0.06 |
| Ireland | 0.22 | 0.21 | 0.05 | 0.04 | 0.04 | 0.04 |
| Israel | 0.25 | 0.23 | 0.06 | 0.05 | 0.04 | 0.04 |
| Italy | 0.07 | 0.07 | 0.00 | 0.00 | 0.00 | 0.00 |
| Japan | 0.24 | 0.20 | 0.06 | 0.04 | 0.03 | 0.03 |
| Jordan | 0.27 | 0.26 | 0.07 | 0.07 | 0.06 | 0.05 |
| Kazakhstan | 0.14 | 0.10 | 0.02 | 0.01 | 0.00 | 0.00 |
| Korea, Rep. of | 0.19 | 0.15 | 0.03 | 0.02 | 0.02 | 0.01 |
| Kuwait | 0.22 | 0.26 | 0.05 | 0.07 | 0.04 | 0.06 |
| Lebanon | 0.28 | 0.28 | 0.08 | 0.08 | 0.07 | 0.08 |
| Lithuania | 0.14 | 0.13 | 0.02 | 0.02 | 0.01 | 0.01 |
| Malaysia | 0.21 | 0.22 | 0.04 | 0.05 | 0.05 | 0.04 |
| Malta | 0.32 | 0.32 | 0.10 | 0.10 | 0.06 | 0.06 |
| Morocco | 0.28 | 0.24 | 0.08 | 0.06 | 0.08 | 0.06 |
| New Zealand | 0.26 | 0.25 | 0.07 | 0.06 | 0.06 | 0.06 |
| Norway (9) | 0.18 | 0.18 | 0.03 | 0.03 | 0.03 | 0.03 |
| Oman | 0.11 | 0.10 | 0.01 | 0.01 | 0.01 | 0.01 |
| Qatar | 0.21 | 0.23 | 0.05 | 0.05 | 0.03 | 0.04 |
| Russian Federation | 0.21 | 0.24 | 0.05 | 0.06 | 0.03 | 0.03 |
| Saudi Arabia | 0.17 | 0.21 | 0.03 | 0.04 | 0.04 | 0.05 |
| Singapore | 0.34 | 0.33 | 0.11 | 0.11 | 0.10 | 0.09 |
| Slovenia | 0.09 | 0.08 | 0.01 | 0.01 | 0.01 | 0.01 |
| South Africa (9) | 0.20 | 0.19 | 0.04 | 0.04 | 0.04 | 0.04 |
| Sweden | 0.22 | 0.23 | 0.05 | 0.05 | 0.04 | 0.05 |
| Thailand | 0.13 | 0.12 | 0.02 | 0.02 | 0.01 | 0.01 |
| Turkey | 0.37 | 0.35 | 0.14 | 0.12 | 0.13 | 0.11 |
| United Arab Emirates | 0.32 | 0.31 | 0.10 | 0.10 | 0.09 | 0.08 |
| United States | 0.33 | 0.31 | 0.11 | 0.10 | 0.07 | 0.06 |
| International Median | 0.24 | 0.23 | 0.06 | 0.05 | 0.04 | 0.05 |
| Benchmarking Participants | | | | | | |
| Buenos Aires, Argentina | 0.33 | 0.28 | 0.11 | 0.08 | 0.07 | 0.05 |
| Ontario, Canada | 0.18 | 0.11 | 0.03 | 0.01 | 0.02 | 0.01 |
| Quebec, Canada | 0.15 | 0.16 | 0.02 | 0.03 | 0.02 | 0.03 |
| Norway (8) | 0.18 | 0.18 | 0.03 | 0.03 | 0.03 | 0.03 |
| Abu Dhabi, UAE | 0.30 | 0.27 | 0.09 | 0.07 | 0.06 | 0.04 |
| Dubai, UAE | 0.28 | 0.28 | 0.08 | 0.08 | 0.09 | 0.10 |
| Florida, US | 0.30 | 0.26 | 0.09 | 0.07 | 0.04 | 0.03 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

School Emphasis on Academic Success– Teachers’ Reports Scale, Eighth Grade

The School Emphasis on Academic Success–Teachers’ Reports (EAS) scale was created based on teachers’ responses characterizing the fourteen aspects described below.

Items in the TIMSS 2015 School Emphasis on Academic Success–Teachers’ Reports Scale, Eighth Grade¹



¹ For the purpose of scaling, categories in which there were very few respondents were combined. The categories “Low” and “Very low” were combined for all variables. The scale statistics that are reported herein reflect analysis of the items following collapsing.

Item Parameters for the TIMSS 2015 School Emphasis on Academic Success - Teachers' Reports Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|---------|----------|----------|----------|---------|-------|
| BTBG06A | -1.68045 | -2.66063 | -0.27020 | 2.93083 | 1.09 |
| BTBG06B | -1.23725 | -3.06845 | -0.05158 | 3.12003 | 1.03 |
| BTBG06C | -0.74602 | -2.64414 | 0.01364 | 2.63050 | 1.06 |
| BTBG06D | -0.90371 | -2.10492 | -0.18604 | 2.29096 | 1.11 |
| BTBG06E | -0.96090 | -2.89984 | -0.06546 | 2.96530 | 1.01 |
| BTBG06F | 1.23541 | -1.97221 | 0.09341 | 1.87880 | 1.01 |
| BTBG06G | 1.38741 | -2.14973 | 0.06550 | 2.08423 | 0.81 |
| BTBG06H | 0.11852 | -2.02680 | -0.08263 | 2.10943 | 1.03 |
| BTBG06I | 1.09297 | -2.17010 | 0.06285 | 2.10725 | 0.84 |
| BTBG06J | 0.81054 | -1.85391 | -0.02340 | 1.87731 | 1.08 |
| BTBG06K | 0.44514 | -2.56091 | 0.08041 | 2.48050 | 0.90 |
| BTBG06L | 0.78421 | -2.99698 | 0.22187 | 2.77511 | 0.86 |
| BTBG06M | 0.06382 | -2.32494 | -0.24518 | 2.57012 | 1.13 |
| BTBG06O | -0.40969 | -1.72466 | -0.33054 | 2.05520 | 1.28 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Scale Transformation Constants for the TIMSS 2015 School Emphasis on Academic Success - Teachers' Reports Scale, Eighth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 9.648219 | Transformed Scale Score = 9.648219 + 1.396196 • Logit Scale Score |
| B = 1.396196 | |

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 School Emphasis on Academic Success - Teachers' Reports Scale,
Eighth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 0.62601 | |
| 1 | 2.37454 | |
| 2 | 3.30485 | |
| 3 | 3.99189 | |
| 4 | 4.55434 | |
| 5 | 5.03713 | |
| 6 | 5.46429 | |
| 7 | 5.84928 | |
| 8 | 6.20193 | |
| 9 | 6.52956 | |
| 10 | 6.83772 | |
| 11 | 7.13072 | |
| 12 | 7.41200 | |
| 13 | 7.68391 | |
| 14 | 7.94962 | |
| 15 | 8.21035 | |
| 16 | 8.46755 | |
| 17 | 8.72250 | |
| 18 | 8.97609 | |
| 19 | 9.22901 | |
| 20 | 9.48165 | |
| 21 | 9.73421 | 9.8 |
| 22 | 9.98673 | |
| 23 | 10.23910 | |
| 24 | 10.49131 | |
| 25 | 10.74338 | |
| 26 | 10.99555 | |
| 27 | 11.24826 | |
| 28 | 11.50221 | |
| 29 | 11.75840 | |
| 30 | 12.01811 | |
| 31 | 12.28292 | |
| 32 | 12.55479 | |
| 33 | 12.83506 | |
| 34 | 13.12842 | |
| 35 | 13.43840 | 13.4 |
| 36 | 13.77078 | |
| 37 | 14.13422 | |
| 38 | 14.54168 | |
| 39 | 15.01763 | |
| 40 | 15.61090 | |
| 41 | 16.44334 | |
| 42 | 18.09479 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 School Emphasis on Academic Success - Teachers' Reports Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| | | | BTB006A | BTB006B | BTB006C | BTB006D | BTB006E | BTB006F | BTB006G | BTB006H | BTB006I | BTB006J | BTB006K | BTB006L | BTB006M | BTB006O |
| Australia | 0.92 | 51 | 0.61 | 0.69 | 0.73 | 0.59 | 0.69 | 0.67 | 0.84 | 0.78 | 0.82 | 0.70 | 0.79 | 0.74 | 0.67 | 0.60 |
| Bahrain | 0.89 | 42 | 0.49 | 0.66 | 0.70 | 0.51 | 0.68 | 0.60 | 0.75 | 0.56 | 0.75 | 0.56 | 0.75 | 0.75 | 0.70 | 0.55 |
| Botswana (9) | 0.84 | 34 | 0.50 | 0.51 | 0.50 | 0.55 | 0.54 | 0.65 | 0.71 | 0.49 | 0.65 | 0.61 | 0.69 | 0.59 | 0.59 | 0.56 |
| Canada | 0.90 | 45 | 0.59 | 0.66 | 0.62 | 0.56 | 0.66 | 0.70 | 0.81 | 0.76 | 0.81 | 0.67 | 0.71 | 0.69 | 0.58 | 0.55 |
| Chile | 0.90 | 45 | 0.53 | 0.71 | 0.67 | 0.56 | 0.55 | 0.72 | 0.74 | 0.75 | 0.76 | 0.68 | 0.73 | 0.74 | 0.62 | 0.59 |
| Chinese Taipei | 0.91 | 47 | 0.51 | 0.40 | 0.68 | 0.59 | 0.71 | 0.74 | 0.75 | 0.80 | 0.81 | 0.69 | 0.79 | 0.77 | 0.55 | 0.64 |
| Egypt | 0.90 | 44 | 0.61 | 0.62 | 0.60 | 0.64 | 0.64 | 0.74 | 0.73 | 0.61 | 0.70 | 0.66 | 0.74 | 0.71 | 0.58 | 0.65 |
| England | 0.92 | 50 | 0.57 | 0.70 | 0.70 | 0.67 | 0.67 | 0.69 | 0.80 | 0.79 | 0.78 | 0.71 | 0.74 | 0.75 | 0.73 | 0.50 |
| Georgia | 0.88 | 40 | 0.55 | 0.58 | 0.62 | 0.65 | 0.63 | 0.69 | 0.72 | 0.66 | 0.71 | 0.61 | 0.63 | 0.56 | 0.57 | 0.58 |
| Hong Kong SAR | 0.90 | 42 | 0.40 | 0.54 | 0.70 | 0.60 | 0.65 | 0.59 | 0.76 | 0.76 | 0.75 | 0.70 | 0.69 | 0.76 | 0.51 | 0.54 |
| Hungary | 0.90 | 45 | 0.47 | 0.67 | 0.63 | 0.41 | 0.71 | 0.70 | 0.81 | 0.74 | 0.83 | 0.68 | 0.76 | 0.72 | 0.69 | 0.46 |
| Iran, Islamic Rep. of | 0.91 | 45 | 0.57 | 0.62 | 0.63 | 0.66 | 0.67 | 0.76 | 0.77 | 0.63 | 0.71 | 0.69 | 0.74 | 0.70 | 0.62 | 0.63 |
| Ireland | 0.92 | 48 | 0.57 | 0.68 | 0.77 | 0.55 | 0.63 | 0.69 | 0.83 | 0.76 | 0.80 | 0.76 | 0.77 | 0.71 | 0.65 | 0.51 |
| Israel | 0.87 | 39 | 0.56 | 0.66 | 0.59 | 0.54 | 0.60 | 0.62 | 0.73 | 0.61 | 0.72 | 0.56 | 0.70 | 0.66 | 0.59 | 0.50 |
| Italy | 0.87 | 38 | 0.62 | 0.72 | 0.62 | 0.57 | 0.56 | 0.67 | 0.67 | 0.55 | 0.61 | 0.62 | 0.58 | 0.70 | 0.45 | 0.59 |
| Japan | 0.87 | 39 | 0.60 | 0.55 | 0.65 | 0.49 | 0.59 | 0.44 | 0.75 | 0.71 | 0.74 | 0.53 | 0.71 | 0.71 | 0.54 | 0.58 |
| Jordan | 0.88 | 40 | 0.45 | 0.66 | 0.42 | 0.56 | 0.62 | 0.71 | 0.79 | 0.65 | 0.74 | 0.64 | 0.66 | 0.72 | 0.53 | 0.57 |
| Kazakhstan | 0.90 | 44 | 0.54 | 0.58 | 0.64 | 0.63 | 0.67 | 0.73 | 0.76 | 0.74 | 0.77 | 0.63 | 0.70 | 0.67 | 0.58 | 0.58 |
| Korea, Rep. of | 0.91 | 46 | 0.55 | 0.60 | 0.72 | 0.63 | 0.62 | 0.75 | 0.80 | 0.71 | 0.79 | 0.65 | 0.68 | 0.74 | 0.59 | 0.59 |
| Kuwait | 0.90 | 44 | 0.59 | 0.62 | 0.54 | 0.54 | 0.62 | 0.74 | 0.78 | 0.66 | 0.77 | 0.64 | 0.67 | 0.76 | 0.63 | 0.63 |
| Lebanon | 0.90 | 44 | 0.55 | 0.61 | 0.57 | 0.58 | 0.50 | 0.69 | 0.82 | 0.70 | 0.82 | 0.73 | 0.67 | 0.75 | 0.66 | 0.55 |
| Lithuania | 0.88 | 40 | 0.63 | 0.64 | 0.64 | 0.60 | 0.62 | 0.69 | 0.73 | 0.66 | 0.68 | 0.49 | 0.66 | 0.68 | 0.56 | 0.56 |
| Malaysia | 0.88 | 41 | 0.50 | 0.54 | 0.55 | 0.56 | 0.63 | 0.71 | 0.77 | 0.68 | 0.74 | 0.51 | 0.76 | 0.71 | 0.65 | 0.54 |
| Malta | 0.91 | 46 | 0.48 | 0.63 | 0.73 | 0.56 | 0.62 | 0.72 | 0.79 | 0.71 | 0.78 | 0.73 | 0.76 | 0.73 | 0.63 | 0.58 |
| Morocco | 0.88 | 41 | 0.50 | 0.59 | 0.54 | 0.61 | 0.62 | 0.70 | 0.78 | 0.64 | 0.74 | 0.73 | 0.68 | 0.67 | 0.48 | 0.66 |
| New Zealand | 0.90 | 45 | 0.59 | 0.64 | 0.70 | 0.53 | 0.66 | 0.63 | 0.78 | 0.74 | 0.74 | 0.74 | 0.75 | 0.66 | 0.62 | 0.56 |
| Norway (9) | 0.86 | 37 | 0.54 | 0.60 | 0.65 | 0.53 | 0.57 | 0.71 | 0.69 | 0.65 | 0.72 | 0.57 | 0.63 | 0.58 | 0.55 | 0.39 |
| Oman | 0.90 | 43 | 0.55 | 0.56 | 0.67 | 0.62 | 0.59 | 0.71 | 0.77 | 0.72 | 0.76 | 0.56 | 0.69 | 0.77 | 0.60 | 0.54 |
| Qatar | 0.89 | 41 | 0.34 | 0.36 | 0.65 | 0.40 | 0.61 | 0.68 | 0.81 | 0.75 | 0.80 | 0.63 | 0.80 | 0.78 | 0.71 | 0.37 |
| Russian Federation | 0.85 | 36 | 0.56 | 0.65 | 0.63 | 0.64 | 0.65 | 0.64 | 0.68 | 0.54 | 0.63 | 0.09 | 0.61 | 0.66 | 0.59 | 0.59 |
| Saudi Arabia | 0.90 | 43 | 0.64 | 0.68 | 0.53 | 0.70 | 0.66 | 0.72 | 0.77 | 0.61 | 0.73 | 0.61 | 0.73 | 0.64 | 0.50 | 0.63 |
| Singapore | 0.90 | 44 | 0.59 | 0.63 | 0.70 | 0.56 | 0.65 | 0.66 | 0.74 | 0.72 | 0.77 | 0.64 | 0.69 | 0.72 | 0.61 | 0.60 |
| Slovenia | 0.82 | 31 | 0.60 | 0.67 | 0.63 | 0.68 | 0.67 | 0.58 | 0.59 | 0.37 | 0.55 | 0.28 | 0.55 | 0.49 | 0.52 | 0.54 |
| South Africa (9) | 0.91 | 46 | 0.56 | 0.59 | 0.59 | 0.60 | 0.60 | 0.72 | 0.80 | 0.63 | 0.79 | 0.68 | 0.74 | 0.79 | 0.71 | 0.63 |
| Sweden | 0.86 | 37 | 0.58 | 0.64 | 0.66 | 0.58 | 0.59 | 0.64 | 0.72 | 0.63 | 0.62 | 0.52 | 0.64 | 0.59 | 0.51 | 0.55 |
| Thailand | 0.89 | 43 | 0.53 | 0.63 | 0.63 | 0.62 | 0.59 | 0.68 | 0.73 | 0.71 | 0.79 | 0.66 | 0.69 | 0.72 | 0.55 | 0.60 |
| Turkey | 0.89 | 41 | 0.46 | 0.58 | 0.64 | 0.50 | 0.53 | 0.73 | 0.78 | 0.71 | 0.78 | 0.70 | 0.72 | 0.75 | 0.51 | 0.50 |
| United Arab Emirates | 0.91 | 45 | 0.49 | 0.57 | 0.71 | 0.58 | 0.61 | 0.71 | 0.81 | 0.71 | 0.78 | 0.67 | 0.76 | 0.78 | 0.66 | 0.46 |
| United States | 0.92 | 49 | 0.51 | 0.64 | 0.67 | 0.54 | 0.67 | 0.77 | 0.84 | 0.79 | 0.84 | 0.75 | 0.77 | 0.68 | 0.66 | 0.49 |
| Benchmarking Participants | | | | | | | | | | | | | | | | |
| Buenos Aires, Argentina | 0.88 | 40 | 0.55 | 0.61 | 0.61 | 0.56 | 0.59 | 0.74 | 0.79 | 0.68 | 0.76 | 0.70 | 0.57 | 0.57 | 0.56 | 0.43 |
| Ontario, Canada | 0.89 | 43 | 0.56 | 0.62 | 0.65 | 0.45 | 0.60 | 0.73 | 0.83 | 0.78 | 0.80 | 0.73 | 0.70 | 0.67 | 0.50 | 0.42 |
| Quebec, Canada | 0.91 | 47 | 0.60 | 0.70 | 0.53 | 0.61 | 0.73 | 0.69 | 0.80 | 0.70 | 0.81 | 0.62 | 0.71 | 0.72 | 0.68 | 0.67 |
| Norway (8) | 0.85 | 35 | 0.45 | 0.50 | 0.62 | 0.47 | 0.56 | 0.71 | 0.66 | 0.73 | 0.72 | 0.57 | 0.68 | 0.64 | 0.51 | 0.36 |
| Abu Dhabi, UAE | 0.90 | 43 | 0.42 | 0.53 | 0.70 | 0.50 | 0.59 | 0.66 | 0.80 | 0.66 | 0.78 | 0.69 | 0.80 | 0.79 | 0.65 | 0.39 |
| Dubai, UAE | 0.91 | 48 | 0.61 | 0.63 | 0.73 | 0.64 | 0.64 | 0.72 | 0.79 | 0.73 | 0.76 | 0.64 | 0.76 | 0.76 | 0.64 | 0.58 |
| Florida, US | 0.92 | 51 | 0.64 | 0.67 | 0.57 | 0.60 | 0.73 | 0.79 | 0.81 | 0.79 | 0.80 | 0.74 | 0.74 | 0.79 | 0.74 | 0.53 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 School Emphasis on Academic Success - Teachers' Reports Scale, Eighth Grade, and TIMSS 2015 Achievement

| Country | Pearson's Correlation with Achievement | | | | Variance in Achievement Accounted for by Difference Between Regions of the Scale (η^2) | |
|----------------------------------|--|-------------|-------------------|-------------|---|-------------|
| | (r) | | (r ²) | | Mathematics | Science |
| | Mathematics | Science | Mathematics | Science | | |
| Australia | 0.26 | 0.24 | 0.07 | 0.06 | 0.07 | 0.03 |
| Bahrain | 0.16 | 0.22 | 0.03 | 0.05 | 0.04 | 0.04 |
| Botswana (9) | 0.24 | 0.19 | 0.06 | 0.04 | 0.04 | 0.03 |
| Canada | 0.18 | 0.15 | 0.03 | 0.02 | 0.03 | 0.02 |
| Chile | 0.27 | 0.30 | 0.07 | 0.09 | 0.06 | 0.05 |
| Chinese Taipei | 0.24 | 0.21 | 0.06 | 0.04 | 0.05 | 0.05 |
| Egypt | 0.18 | 0.20 | 0.03 | 0.04 | 0.02 | 0.04 |
| England | 0.30 | 0.30 | 0.09 | 0.09 | 0.10 | 0.07 |
| Georgia | 0.11 | 0.12 | 0.01 | 0.01 | 0.01 | 0.01 |
| Hong Kong SAR | 0.39 | 0.31 | 0.15 | 0.09 | 0.11 | 0.07 |
| Hungary | 0.40 | 0.33 | 0.16 | 0.11 | 0.11 | 0.05 |
| Iran, Islamic Rep. of | 0.32 | 0.33 | 0.10 | 0.11 | 0.08 | 0.08 |
| Ireland | 0.25 | 0.22 | 0.06 | 0.05 | 0.07 | 0.05 |
| Israel | 0.28 | 0.14 | 0.08 | 0.02 | 0.08 | 0.03 |
| Italy | 0.15 | 0.13 | 0.02 | 0.02 | 0.00 | 0.00 |
| Japan | 0.19 | 0.15 | 0.04 | 0.02 | 0.02 | 0.02 |
| Jordan | 0.18 | 0.23 | 0.03 | 0.05 | 0.02 | 0.04 |
| Kazakhstan | 0.11 | 0.01 | 0.01 | 0.00 | 0.03 | 0.00 |
| Korea, Rep. of | 0.12 | 0.11 | 0.02 | 0.01 | 0.02 | 0.01 |
| Kuwait | 0.23 | 0.23 | 0.05 | 0.05 | 0.08 | 0.04 |
| Lebanon | 0.18 | 0.19 | 0.03 | 0.03 | 0.04 | 0.02 |
| Lithuania | 0.20 | 0.10 | 0.04 | 0.01 | 0.04 | 0.01 |
| Malaysia | 0.24 | 0.15 | 0.06 | 0.02 | 0.03 | 0.02 |
| Malta | 0.26 | 0.21 | 0.07 | 0.05 | 0.03 | 0.03 |
| Morocco | 0.11 | 0.13 | 0.01 | 0.02 | 0.02 | 0.03 |
| New Zealand | 0.20 | 0.25 | 0.04 | 0.06 | 0.02 | 0.05 |
| Norway (9) | 0.13 | 0.13 | 0.02 | 0.02 | 0.01 | 0.01 |
| Oman | 0.16 | 0.08 | 0.02 | 0.01 | 0.02 | 0.00 |
| Qatar | 0.23 | 0.20 | 0.05 | 0.04 | 0.06 | 0.03 |
| Russian Federation | 0.18 | 0.12 | 0.03 | 0.01 | 0.02 | 0.02 |
| Saudi Arabia | 0.14 | 0.17 | 0.02 | 0.03 | 0.07 | 0.02 |
| Singapore | 0.29 | 0.32 | 0.08 | 0.10 | 0.06 | 0.11 |
| Slovenia | 0.05 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 |
| South Africa (9) | 0.22 | 0.21 | 0.05 | 0.04 | 0.04 | 0.07 |
| Sweden | 0.20 | 0.17 | 0.04 | 0.03 | 0.03 | 0.02 |
| Thailand | 0.20 | 0.17 | 0.04 | 0.03 | 0.04 | 0.03 |
| Turkey | 0.31 | 0.31 | 0.09 | 0.10 | 0.05 | 0.07 |
| United Arab Emirates | 0.26 | 0.32 | 0.07 | 0.10 | 0.06 | 0.09 |
| United States | 0.27 | 0.26 | 0.07 | 0.07 | 0.07 | 0.05 |
| International Median | 0.20 | 0.20 | 0.04 | 0.04 | 0.04 | 0.03 |
| Benchmarking Participants | | | | | | |
| Buenos Aires, Argentina | 0.15 | 0.17 | 0.02 | 0.03 | 0.01 | 0.04 |
| Ontario, Canada | 0.17 | 0.12 | 0.03 | 0.01 | 0.02 | 0.01 |
| Quebec, Canada | 0.06 | 0.18 | 0.00 | 0.03 | 0.01 | 0.04 |
| Norway (8) | 0.17 | 0.16 | 0.03 | 0.02 | 0.02 | 0.01 |
| Abu Dhabi, UAE | 0.16 | 0.29 | 0.03 | 0.08 | 0.02 | 0.08 |
| Dubai, UAE | 0.29 | 0.26 | 0.08 | 0.07 | 0.10 | 0.06 |
| Florida, US | 0.36 | 0.18 | 0.13 | 0.03 | 0.11 | 0.04 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Student Bullying Scale, Eighth Grade

The Student Bullying (SB) scale was created based on students' responses to how often they experienced the nine bullying behaviors described below.

Items in the TIMSS 2015 Student Bullying Scale, Eighth Grade

During this school year, how often have other students from your school done any of the following things to you (including through texting or the Internet)?

| | Never | A few times a year | Once or twice a month | At least once a week |
|--|-----------------------|-----------------------|-----------------------|-----------------------|
| BSBG16A 1) Made fun of me or called me names----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| BSBG16B 2) Left me out of their games or activities----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| BSBG16C 3) Spread lies about me----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| BSBG16D 4) Stole something from me----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| BSBG16E 5) Hit or hurt me (e.g., shoving, hitting, kicking)----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| BSBG16F 6) Made me do things I didn't want to do----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| BSBG16G 7) Shared embarrassing information about me----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| BSBG16H 8) Posted embarrassing things about me online----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| BSBG16I 9) Threatened me----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Item Parameters for the TIMSS 2015 Student Bullying Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|---------|----------|----------|----------|----------|-------|
| BSBG16A | 0.89179 | 0.05940 | -0.30863 | 0.24923 | 1.09 |
| BSBG16B | 0.19770 | -0.01912 | 0.16738 | -0.14826 | 1.17 |
| BSBG16C | 0.34002 | -0.23740 | -0.12720 | 0.36460 | 0.98 |
| BSBG16D | 0.07870 | 0.05469 | -0.03394 | -0.02075 | 1.10 |
| BSBG16E | -0.01022 | 0.16315 | -0.02603 | -0.13712 | 1.00 |
| BSBG16F | -0.32348 | 0.09818 | 0.17832 | -0.27650 | 0.93 |
| BSBG16G | -0.07434 | 0.01975 | -0.05531 | 0.03556 | 0.91 |
| BSBG16H | -0.65156 | 0.44861 | 0.29035 | -0.73896 | 0.95 |
| BSBG16I | -0.44861 | 0.40213 | 0.17194 | -0.57407 | 0.89 |

Scale Transformation Constants for the TIMSS 2015 Student Bullying Scale, Eighth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 7.415134 | Transformed Scale Score = 7.415134 + 1.807351 • Logit Scale Score |
| B = 1.807351 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Student Bullying Scale, Eighth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 2.46657 | |
| 1 | 4.10309 | |
| 2 | 4.76912 | |
| 3 | 5.19497 | |
| 4 | 5.51718 | |
| 5 | 5.78147 | |
| 6 | 6.01006 | |
| 7 | 6.21894 | |
| 8 | 6.41095 | |
| 9 | 6.59120 | |
| 10 | 6.76349 | |
| 11 | 6.93080 | |
| 12 | 7.09541 | |
| 13 | 7.25929 | 7.3 |
| 14 | 7.42473 | |
| 15 | 7.59182 | |
| 16 | 7.76410 | |
| 17 | 7.94315 | |
| 18 | 8.13155 | |
| 19 | 8.33231 | |
| 20 | 8.54672 | |
| 21 | 8.78408 | |
| 22 | 9.05164 | |
| 23 | 9.36313 | 9.3 |
| 24 | 9.74130 | |
| 25 | 10.24057 | |
| 26 | 11.00609 | |
| 27 | 12.78394 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Student Bullying Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|
| | | | B5BGT16A | B5BGT16B | B5BGT16C | B5BGT16D | B5BGT16E | B5BGT16F | B5BGT16G | B5BGT16H | B5BGT16I |
| Australia | 0.87 | 49 | 0.73 | 0.68 | 0.77 | 0.64 | 0.68 | 0.70 | 0.76 | 0.64 | 0.72 |
| Bahrain | 0.86 | 48 | 0.61 | 0.66 | 0.72 | 0.61 | 0.73 | 0.73 | 0.77 | 0.65 | 0.76 |
| Botswana (9) | 0.74 | 33 | 0.49 | 0.50 | 0.63 | 0.41 | 0.59 | 0.63 | 0.68 | 0.58 | 0.61 |
| Canada | 0.84 | 46 | 0.71 | 0.65 | 0.74 | 0.61 | 0.65 | 0.68 | 0.74 | 0.62 | 0.65 |
| Chile | 0.83 | 46 | 0.63 | 0.65 | 0.70 | 0.57 | 0.70 | 0.70 | 0.78 | 0.67 | 0.68 |
| Chinese Taipei | 0.83 | 44 | 0.71 | 0.59 | 0.71 | 0.57 | 0.66 | 0.70 | 0.74 | 0.61 | 0.69 |
| Egypt | 0.85 | 47 | 0.60 | 0.58 | 0.68 | 0.61 | 0.75 | 0.74 | 0.76 | 0.71 | 0.72 |
| England | 0.85 | 47 | 0.71 | 0.68 | 0.76 | 0.61 | 0.68 | 0.66 | 0.73 | 0.64 | 0.71 |
| Georgia | 0.76 | 41 | 0.51 | 0.47 | 0.63 | 0.55 | 0.62 | 0.72 | 0.76 | 0.71 | 0.72 |
| Hong Kong SAR | 0.83 | 45 | 0.49 | 0.61 | 0.68 | 0.65 | 0.70 | 0.75 | 0.74 | 0.67 | 0.71 |
| Hungary | 0.78 | 38 | 0.68 | 0.62 | 0.65 | 0.49 | 0.62 | 0.60 | 0.70 | 0.56 | 0.62 |
| Iran, Islamic Rep. of | 0.80 | 41 | 0.59 | 0.55 | 0.65 | 0.55 | 0.69 | 0.69 | 0.73 | 0.54 | 0.72 |
| Ireland | 0.84 | 44 | 0.70 | 0.62 | 0.75 | 0.57 | 0.67 | 0.64 | 0.74 | 0.62 | 0.67 |
| Israel | - | - | - | - | - | - | - | - | - | - | - |
| Italy | 0.77 | 36 | 0.71 | 0.65 | 0.67 | 0.42 | 0.62 | 0.60 | 0.69 | 0.41 | 0.58 |
| Japan | 0.81 | 42 | 0.69 | 0.65 | 0.71 | 0.59 | 0.66 | 0.72 | 0.68 | 0.49 | 0.58 |
| Jordan | 0.86 | 49 | 0.62 | 0.62 | 0.69 | 0.60 | 0.77 | 0.74 | 0.77 | 0.70 | 0.76 |
| Kazakhstan | 0.77 | 40 | 0.57 | 0.48 | 0.67 | 0.59 | 0.64 | 0.66 | 0.73 | 0.68 | 0.63 |
| Korea, Rep. of | 0.76 | 39 | 0.61 | 0.57 | 0.68 | 0.47 | 0.68 | 0.68 | 0.72 | 0.51 | 0.65 |
| Kuwait | 0.81 | 42 | 0.54 | 0.55 | 0.68 | 0.58 | 0.70 | 0.66 | 0.72 | 0.64 | 0.70 |
| Lebanon | 0.88 | 52 | 0.65 | 0.66 | 0.72 | 0.70 | 0.73 | 0.75 | 0.75 | 0.78 | 0.75 |
| Lithuania | 0.83 | 44 | 0.69 | 0.58 | 0.73 | 0.58 | 0.69 | 0.66 | 0.72 | 0.63 | 0.70 |
| Malaysia | 0.81 | 42 | 0.50 | 0.61 | 0.69 | 0.55 | 0.67 | 0.70 | 0.70 | 0.68 | 0.69 |
| Malta | 0.87 | 50 | 0.67 | 0.68 | 0.74 | 0.66 | 0.72 | 0.71 | 0.76 | 0.69 | 0.74 |
| Morocco | 0.81 | 41 | 0.57 | 0.57 | 0.61 | 0.52 | 0.71 | 0.70 | 0.72 | 0.65 | 0.69 |
| New Zealand | 0.87 | 50 | 0.69 | 0.68 | 0.77 | 0.67 | 0.70 | 0.69 | 0.75 | 0.67 | 0.71 |
| Norway (9) | 0.83 | 43 | 0.73 | 0.63 | 0.71 | 0.58 | 0.62 | 0.65 | 0.71 | 0.62 | 0.61 |
| Oman | 0.81 | 41 | 0.63 | 0.43 | 0.71 | 0.58 | 0.66 | 0.64 | 0.74 | 0.60 | 0.69 |
| Qatar | 0.88 | 53 | 0.66 | 0.69 | 0.74 | 0.63 | 0.75 | 0.75 | 0.80 | 0.73 | 0.78 |
| Russian Federation | 0.79 | 40 | 0.70 | 0.49 | 0.71 | 0.52 | 0.70 | 0.58 | 0.75 | 0.59 | 0.57 |
| Saudi Arabia | 0.86 | 49 | 0.60 | 0.61 | 0.70 | 0.65 | 0.73 | 0.74 | 0.77 | 0.71 | 0.76 |
| Singapore | 0.84 | 45 | 0.64 | 0.62 | 0.73 | 0.61 | 0.68 | 0.67 | 0.75 | 0.63 | 0.68 |
| Slovenia | 0.84 | 45 | 0.68 | 0.68 | 0.75 | 0.57 | 0.64 | 0.62 | 0.79 | 0.59 | 0.65 |
| South Africa (9) | 0.78 | 38 | 0.57 | 0.56 | 0.63 | 0.41 | 0.63 | 0.65 | 0.74 | 0.62 | 0.66 |
| Sweden | 0.83 | 43 | 0.71 | 0.61 | 0.74 | 0.59 | 0.67 | 0.63 | 0.69 | 0.63 | 0.66 |
| Thailand | 0.80 | 40 | 0.53 | 0.55 | 0.65 | 0.56 | 0.66 | 0.71 | 0.75 | 0.61 | 0.63 |
| Turkey | 0.81 | 42 | 0.57 | 0.60 | 0.66 | 0.54 | 0.69 | 0.67 | 0.75 | 0.66 | 0.70 |
| United Arab Emirates | 0.85 | 47 | 0.62 | 0.62 | 0.71 | 0.61 | 0.72 | 0.70 | 0.76 | 0.66 | 0.73 |
| United States | 0.86 | 48 | 0.72 | 0.68 | 0.74 | 0.63 | 0.70 | 0.65 | 0.76 | 0.66 | 0.70 |
| Benchmarking Participants | | | | | | | | | | | |
| Buenos Aires, Argentina | 0.79 | 40 | 0.68 | 0.59 | 0.66 | 0.47 | 0.66 | 0.67 | 0.69 | 0.60 | 0.64 |
| Ontario, Canada | 0.85 | 46 | 0.72 | 0.65 | 0.77 | 0.60 | 0.66 | 0.68 | 0.75 | 0.61 | 0.66 |
| Quebec, Canada | 0.81 | 42 | 0.70 | 0.63 | 0.72 | 0.55 | 0.57 | 0.66 | 0.71 | 0.62 | 0.63 |
| Norway (8) | 0.85 | 46 | 0.74 | 0.68 | 0.77 | 0.57 | 0.62 | 0.72 | 0.71 | 0.66 | 0.65 |
| Abu Dhabi, UAE | 0.86 | 49 | 0.65 | 0.64 | 0.71 | 0.60 | 0.75 | 0.72 | 0.78 | 0.67 | 0.76 |
| Dubai, UAE | 0.84 | 45 | 0.63 | 0.63 | 0.73 | 0.59 | 0.71 | 0.67 | 0.74 | 0.63 | 0.69 |
| Florida, US | 0.85 | 46 | 0.71 | 0.65 | 0.72 | 0.63 | 0.70 | 0.62 | 0.74 | 0.67 | 0.69 |

A dash (-) indicates comparable data not available.

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Student Bullying Scale, Eighth Grade, and TIMSS 2015 Achievement

| Country | Pearson's Correlation with Achievement | | | | Variance in Achievement Accounted for by Difference Between Regions of the Scale (η^2) | |
|----------------------------------|--|---------|-------------|---------|---|---------|
| | (r) | | (r) | | Mathematics | Science |
| | Mathematics | Science | Mathematics | Science | | |
| Australia | 0.12 | 0.12 | 0.02 | 0.02 | 0.02 | 0.02 |
| Bahrain | 0.13 | 0.16 | 0.02 | 0.03 | 0.03 | 0.05 |
| Botswana (9) | 0.14 | 0.17 | 0.02 | 0.03 | 0.03 | 0.05 |
| Canada | 0.08 | 0.07 | 0.01 | 0.01 | 0.01 | 0.01 |
| Chile | 0.02 | 0.04 | 0.00 | 0.00 | 0.01 | 0.01 |
| Chinese Taipei | 0.02 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Egypt | 0.27 | 0.28 | 0.07 | 0.08 | 0.10 | 0.10 |
| England | 0.07 | 0.02 | 0.00 | 0.00 | 0.01 | 0.01 |
| Georgia | 0.11 | 0.12 | 0.01 | 0.01 | 0.01 | 0.03 |
| Hong Kong SAR | -0.08 | -0.09 | 0.01 | 0.01 | 0.00 | 0.01 |
| Hungary | 0.11 | 0.08 | 0.01 | 0.01 | 0.02 | 0.01 |
| Iran, Islamic Rep. of | 0.11 | 0.11 | 0.01 | 0.01 | 0.03 | 0.03 |
| Ireland | 0.03 | 0.04 | 0.00 | 0.00 | 0.01 | 0.01 |
| Israel | - | - | - | - | - | - |
| Italy | 0.05 | 0.04 | 0.00 | 0.00 | 0.00 | 0.01 |
| Japan | -0.06 | -0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Jordan | 0.17 | 0.26 | 0.03 | 0.07 | 0.04 | 0.09 |
| Kazakhstan | 0.06 | 0.03 | 0.00 | 0.00 | 0.01 | 0.00 |
| Korea, Rep. of | -0.04 | -0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| Kuwait | 0.04 | 0.07 | 0.00 | 0.01 | 0.01 | 0.02 |
| Lebanon | 0.17 | 0.23 | 0.03 | 0.05 | 0.05 | 0.09 |
| Lithuania | 0.05 | 0.05 | 0.00 | 0.00 | 0.01 | 0.01 |
| Malaysia | 0.15 | 0.21 | 0.02 | 0.04 | 0.03 | 0.06 |
| Malta | 0.08 | 0.06 | 0.01 | 0.00 | 0.03 | 0.03 |
| Morocco | 0.06 | 0.08 | 0.00 | 0.01 | 0.01 | 0.01 |
| New Zealand | 0.09 | 0.09 | 0.01 | 0.01 | 0.01 | 0.01 |
| Norway (9) | 0.05 | 0.07 | 0.00 | 0.00 | 0.01 | 0.01 |
| Oman | 0.12 | 0.15 | 0.01 | 0.02 | 0.02 | 0.03 |
| Qatar | 0.12 | 0.15 | 0.01 | 0.02 | 0.04 | 0.06 |
| Russian Federation | 0.05 | 0.05 | 0.00 | 0.00 | 0.01 | 0.00 |
| Saudi Arabia | 0.08 | 0.18 | 0.01 | 0.03 | 0.02 | 0.06 |
| Singapore | 0.10 | 0.09 | 0.01 | 0.01 | 0.01 | 0.01 |
| Slovenia | 0.03 | 0.03 | 0.00 | 0.00 | 0.01 | 0.01 |
| South Africa (9) | 0.23 | 0.28 | 0.05 | 0.08 | 0.07 | 0.10 |
| Sweden | 0.08 | 0.08 | 0.01 | 0.01 | 0.01 | 0.02 |
| Thailand | 0.04 | 0.04 | 0.00 | 0.00 | 0.01 | 0.01 |
| Turkey | 0.14 | 0.14 | 0.02 | 0.02 | 0.03 | 0.03 |
| United Arab Emirates | 0.14 | 0.16 | 0.02 | 0.03 | 0.04 | 0.05 |
| United States | 0.05 | 0.06 | 0.00 | 0.00 | 0.01 | 0.01 |
| International Median | 0.08 | 0.08 | 0.01 | 0.01 | 0.01 | 0.01 |
| Benchmarking Participants | | | | | | |
| Buenos Aires, Argentina | 0.03 | 0.04 | 0.00 | 0.00 | 0.00 | 0.01 |
| Ontario, Canada | 0.06 | 0.08 | 0.00 | 0.01 | 0.01 | 0.01 |
| Quebec, Canada | 0.03 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Norway (8) | 0.10 | 0.11 | 0.01 | 0.01 | 0.02 | 0.02 |
| Abu Dhabi, UAE | 0.16 | 0.19 | 0.02 | 0.04 | 0.05 | 0.07 |
| Dubai, UAE | 0.09 | 0.10 | 0.01 | 0.01 | 0.02 | 0.02 |
| Florida, US | 0.05 | 0.05 | 0.00 | 0.00 | 0.01 | 0.01 |

A dash (-) indicates comparable data not available.

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Students Confident in Biology Scale, Eighth Grade

The Students Confident in Biology (SCB) scale was created based on students’ degree of agreement with the eight statements described below.

Items in the TIMSS 2015 Students Confident in Biology Scale, Eighth Grade

| | | How much do you agree with these statements about biology? | | | |
|---|----------|---|----------------|-------------------|----------------|
| | | Agree a lot | Agree a little | Disagree a little | Disagree a lot |
| T | BSBB24A | 1) I usually do well in biology ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| T | BSBB24B* | 2) Biology is more difficult for me than for many of my classmates* ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| T | BSBB24C* | 3) Biology is not one of my strengths* ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| T | BSBB24D | 4) I learn things quickly in biology ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| T | BSBB24E | 5) I am good at working out difficult biology problems ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| T | BSBB24F | 6) My teacher tells me I am good at biology ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| T | BSBB24G* | 7) Biology is harder for me than any other subject* ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| T | BSBB24H* | 8) Biology makes me confused* ----- ○ ——— ○ ——— ○ ——— ○ | | | |

* Reverse coded

T Trend item—item was included in the same scale in TIMSS 2011 and was used for linking the TIMSS 2011 and TIMSS 2015 scales.

Item Parameters for the TIMSS 2015 Students Confident in Biology Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|----------|----------|----------|----------|---------|-------|
| BSBB24A | -0.53880 | -1.22367 | -0.47664 | 1.70031 | 0.92 |
| BSBB24B* | 0.02820 | -1.04634 | -0.25298 | 1.29932 | 1.00 |
| BSBB24C* | 0.26502 | -1.08484 | -0.13799 | 1.22283 | 0.96 |
| BSBB24D | -0.22053 | -1.39570 | -0.22015 | 1.61585 | 0.91 |
| BSBB24E | 0.30089 | -1.62811 | 0.00932 | 1.61879 | 1.02 |
| BSBB24F | 0.21858 | -1.53529 | -0.08286 | 1.61815 | 1.09 |
| BSBB24G* | 0.03479 | -0.82612 | -0.35591 | 1.18203 | 1.01 |
| BSBB24H* | -0.08815 | -0.59141 | -0.39757 | 0.98898 | 1.07 |

*Reverse coded

Scale Transformation Constants for the TIMSS 2015 Students Confident in Biology Scale, Eighth Grade

Scale Transformation Constants

A = 8.684972

B = 1.447375

Transformed Scale Score = 8.684972 + 1.447375 • Logit Scale Score

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Students Confident in Biology Scale, Eighth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 2.85186 | |
| 1 | 4.49062 | |
| 2 | 5.28824 | |
| 3 | 5.84050 | |
| 4 | 6.27693 | |
| 5 | 6.64380 | |
| 6 | 6.97197 | |
| 7 | 7.27080 | |
| 8 | 7.54690 | |
| 9 | 7.81493 | |
| 10 | 8.07299 | |
| 11 | 8.32835 | |
| 12 | 8.58506 | 8.6 |
| 13 | 8.84688 | |
| 14 | 9.11736 | |
| 15 | 9.40008 | |
| 16 | 9.69874 | |
| 17 | 10.01647 | |
| 18 | 10.36086 | |
| 19 | 10.73954 | |
| 20 | 11.16602 | 11.1 |
| 21 | 11.66296 | |
| 22 | 12.28106 | |
| 23 | 13.14959 | |
| 24 | 14.86445 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Students Confident in Biology Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | |
|--------------------|--|-------------------------------|----------------------------------|----------|----------|---------|---------|---------|----------|----------|
| | | | BSBB24A | BSBB24B* | BSBB24C* | BSBB24D | BSBB24E | BSBB24F | BSBB24G* | BSBB24H* |
| Georgia | 0.80 | 42 | 0.67 | 0.63 | 0.69 | 0.70 | 0.65 | 0.62 | 0.60 | 0.62 |
| Hungary | 0.88 | 55 | 0.80 | 0.72 | 0.78 | 0.80 | 0.71 | 0.72 | 0.73 | 0.67 |
| Kazakhstan | 0.87 | 52 | 0.74 | 0.68 | 0.73 | 0.78 | 0.74 | 0.72 | 0.69 | 0.68 |
| Lebanon | 0.75 | 37 | 0.66 | 0.62 | 0.51 | 0.71 | 0.63 | 0.66 | 0.62 | 0.44 |
| Lithuania | 0.85 | 50 | 0.77 | 0.68 | 0.75 | 0.77 | 0.74 | 0.63 | 0.69 | 0.60 |
| Malta | 0.91 | 61 | 0.81 | 0.76 | 0.76 | 0.83 | 0.79 | 0.76 | 0.77 | 0.76 |
| Morocco | 0.67 | 31 | 0.66 | 0.36 | 0.26 | 0.74 | 0.70 | 0.71 | 0.38 | 0.40 |
| Russian Federation | 0.87 | 53 | 0.74 | 0.71 | 0.80 | 0.80 | 0.74 | 0.69 | 0.69 | 0.67 |
| Slovenia | 0.90 | 58 | 0.79 | 0.73 | 0.79 | 0.82 | 0.76 | 0.69 | 0.76 | 0.73 |
| Sweden | 0.87 | 53 | 0.77 | 0.69 | 0.77 | 0.79 | 0.74 | 0.65 | 0.70 | 0.70 |

*Reverse coded

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Students Confident in Biology Scale, Eighth Grade, and TIMSS 2015 Science Achievement

| Country | Pearson's Correlation with Science Achievement | | Variance in Science Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|----------------------|--|-------------------|---|
| | (r) | (r ²) | |
| Georgia | 0.36 | 0.13 | 0.14 |
| Hungary | 0.26 | 0.07 | 0.08 |
| Kazakhstan | 0.20 | 0.04 | 0.04 |
| Lebanon | 0.38 | 0.15 | 0.14 |
| Lithuania | 0.24 | 0.06 | 0.06 |
| Malta | 0.44 | 0.20 | 0.21 |
| Morocco | 0.32 | 0.10 | 0.09 |
| Russian Federation | 0.16 | 0.02 | 0.02 |
| Slovenia | 0.26 | 0.07 | 0.07 |
| Sweden | 0.30 | 0.09 | 0.09 |
| International Median | 0.28 | 0.08 | 0.08 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Students Confident in Chemistry Scale, Eighth Grade

The Students Confident in Chemistry (SCC) scale was created based on students' degree of agreement with the eight statements described below.

Items in the TIMSS 2015 Students Confident in Chemistry Scale, Eighth Grade

| | | How much do you agree with these statements about chemistry? | | | |
|---|----------|--|-------------------|----------------------|-------------------|
| | | Agree a lot | Agree a little | Disagree a little | Disagree a lot |
| T | BSBC32A | 1) I usually do well in chemistry ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| T | BSBC32B* | 2) Chemistry is more difficult for me than for many of my classmates* ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| T | BSBC32C* | 3) Chemistry is not one of my strengths* ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| T | BSBC32D | 4) I learn things quickly in chemistry ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| T | BSBC32E | 5) I am good at working out difficult chemistry problems -- ○ ——— ○ ——— ○ ——— ○ | | | |
| T | BSBC32F | 6) My teacher tells me I am good at chemistry ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| T | BSBC32G* | 7) Chemistry is harder for me than any other subject* ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| T | BSBC32H* | 8) Chemistry makes me confused* ----- ○ ——— ○ ——— ○ ——— ○ | | | |

* Reverse coded

Very Confident ← 11.6 Confident 9.5 Not Confident →

T Trend item—item was included in the same scale in TIMSS 2011 and was used for linking the TIMSS 2011 and TIMSS 2015 scales.

Item Parameters for the TIMSS 2015 Students Confident in Chemistry Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|----------|----------|----------|----------|---------|-------|
| BSBC32A | -0.43252 | -1.24702 | -0.21914 | 1.46616 | 0.88 |
| BSBC32B* | -0.07136 | -1.07970 | -0.06435 | 1.14405 | 1.02 |
| BSBC32C* | 0.20772 | -1.09748 | 0.01172 | 1.08576 | 0.98 |
| BSBC32D | -0.09316 | -1.42123 | 0.01572 | 1.40551 | 0.87 |
| BSBC32E | 0.29153 | -1.42513 | 0.11128 | 1.31385 | 1.00 |
| BSBC32F | 0.08171 | -1.42824 | 0.02111 | 1.40713 | 1.01 |
| BSBC32G* | 0.11166 | -0.94209 | -0.08266 | 1.02475 | 1.07 |
| BSBC32H* | -0.09558 | -0.71550 | -0.16147 | 0.87697 | 1.20 |

*Reverse coded

Scale Transformation Constants for the TIMSS 2015 Students Confident in Chemistry Scale, Eighth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 9.428069 | Transformed Scale Score = 9.428069 + 1.394223 • Logit Scale Score |
| B = 1.394223 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Students Confident in Chemistry Scale, Eighth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 3.83109 | |
| 1 | 5.43486 | |
| 2 | 6.22207 | |
| 3 | 6.76721 | |
| 4 | 7.19805 | |
| 5 | 7.56067 | |
| 6 | 7.87953 | |
| 7 | 8.16824 | |
| 8 | 8.43786 | |
| 9 | 8.69269 | |
| 10 | 8.93765 | |
| 11 | 9.17680 | |
| 12 | 9.41304 | 9.5 |
| 13 | 9.65127 | |
| 14 | 9.89290 | |
| 15 | 10.14184 | |
| 16 | 10.40188 | |
| 17 | 10.67761 | |
| 18 | 10.97271 | |
| 19 | 11.29909 | |
| 20 | 11.66958 | 11.6 |
| 21 | 12.10853 | |
| 22 | 12.66162 | |
| 23 | 13.45723 | |
| 24 | 15.06951 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Students Confident in Chemistry Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | |
|--------------------|--|-------------------------------|----------------------------------|----------|----------|---------|---------|---------|----------|----------|
| | | | BS8C32A | BS8C32B* | BS8C32C* | BS8C32D | BS8C32E | BS8C32F | BS8C32G* | BS8C32H* |
| Georgia | 0.81 | 43 | 0.70 | 0.61 | 0.69 | 0.75 | 0.69 | 0.65 | 0.57 | 0.54 |
| Hungary | 0.89 | 57 | 0.82 | 0.68 | 0.79 | 0.81 | 0.76 | 0.78 | 0.71 | 0.67 |
| Kazakhstan | 0.87 | 54 | 0.78 | 0.72 | 0.73 | 0.79 | 0.77 | 0.76 | 0.65 | 0.64 |
| Lebanon | 0.74 | 37 | 0.72 | 0.53 | 0.44 | 0.76 | 0.69 | 0.76 | 0.46 | 0.31 |
| Lithuania | 0.87 | 53 | 0.82 | 0.69 | 0.74 | 0.80 | 0.77 | 0.73 | 0.67 | 0.58 |
| Malta | 0.92 | 65 | 0.82 | 0.80 | 0.83 | 0.82 | 0.81 | 0.78 | 0.79 | 0.78 |
| Morocco | 0.63 | 35 | 0.69 | -0.38 | -0.42 | 0.72 | 0.77 | 0.77 | -0.43 | -0.35 |
| Russian Federation | 0.91 | 60 | 0.80 | 0.76 | 0.82 | 0.84 | 0.80 | 0.79 | 0.71 | 0.67 |
| Slovenia | 0.92 | 63 | 0.82 | 0.78 | 0.80 | 0.85 | 0.79 | 0.76 | 0.78 | 0.75 |
| Sweden | 0.89 | 56 | 0.79 | 0.71 | 0.78 | 0.81 | 0.77 | 0.67 | 0.71 | 0.71 |

*Reverse coded

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Students Confident in Chemistry Scale, Eighth Grade, and TIMSS 2015 Science Achievement

| Country | Pearson's Correlation with Science Achievement | | Variance in Science Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|----------------------|--|-------------------|---|
| | (r) | (r ²) | |
| Georgia | 0.34 | 0.11 | 0.14 |
| Hungary | 0.23 | 0.05 | 0.08 |
| Kazakhstan | 0.19 | 0.04 | 0.04 |
| Lebanon | 0.31 | 0.10 | 0.10 |
| Lithuania | 0.24 | 0.06 | 0.08 |
| Malta | 0.34 | 0.12 | 0.15 |
| Morocco | 0.31 | 0.10 | 0.09 |
| Russian Federation | 0.20 | 0.04 | 0.05 |
| Slovenia | 0.39 | 0.15 | 0.16 |
| Sweden | 0.31 | 0.10 | 0.11 |
| International Median | 0.31 | 0.10 | 0.10 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Students Confident in Earth Science Scale, Eighth Grade

The Students Confident in Earth Science (SCE) scale was created based on students' degree of agreement with the eight statements described below.

Items in the TIMSS 2015 Students Confident in Earth Science Scale, Eighth Grade

| | | How much do you agree with these statements about earth science? | | | |
|---|----------|---|----------------|-------------------|----------------|
| | | Agree a lot | Agree a little | Disagree a little | Disagree a lot |
| T | BSBE28A | 1) I usually do well in earth science ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| T | BSBE28B* | 2) Earth science is more difficult for me than for many of my classmates* ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| T | BSBE28C* | 3) Earth science is not one of my strengths* ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| T | BSBE28D | 4) I learn things quickly in earth science ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| T | BSBE28E | 5) I am good at working out difficult earth science problems ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| T | BSBE28F | 6) My teacher tells me I am good at earth science ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| T | BSBE28G* | 7) Earth science is harder for me than any other subject* --- ○ ——— ○ ——— ○ ——— ○ | | | |
| | BSBE28H* | 8) Earth science makes me confused* ----- ○ ——— ○ ——— ○ ——— ○ | | | |

* Reverse coded

T Trend item—item was included in the same scale in TIMSS 2011 and was used for linking the TIMSS 2011 and TIMSS 2015 scales.

Item Parameters for the TIMSS 2015 Students Confident in Earth Science Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|----------|----------|----------|----------|---------|-------|
| BSBE28A | -0.42005 | -1.17384 | -0.44817 | 1.62201 | 0.90 |
| BSBE28B* | -0.06756 | -1.01438 | -0.28584 | 1.30022 | 0.97 |
| BSBE28C* | 0.19190 | -1.06848 | -0.14054 | 1.20902 | 0.93 |
| BSBE28D | -0.15726 | -1.36012 | -0.24217 | 1.60229 | 0.89 |
| BSBE28E | 0.31769 | -1.54826 | 0.00872 | 1.53954 | 1.01 |
| BSBE28F | 0.24063 | -1.49092 | -0.07339 | 1.56431 | 1.04 |
| BSBE28G* | 0.04915 | -0.92539 | -0.33018 | 1.25557 | 1.02 |
| BSBE28H* | -0.15450 | -0.55000 | -0.43709 | 0.98709 | 1.07 |

*Reverse coded

Scale Transformation Constants for the TIMSS 2015 Students Confident in Earth Science Scale, Eighth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 8.804148 | Transformed Scale Score = 8.804148 + 1.447084 • Logit Scale Score |
| B = 1.447084 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Students Confident in Earth Science Scale, Eighth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 3.05255 | |
| 1 | 4.68088 | |
| 2 | 5.46730 | |
| 3 | 6.00837 | |
| 4 | 6.43368 | |
| 5 | 6.79112 | |
| 6 | 7.11037 | |
| 7 | 7.39780 | |
| 8 | 7.66917 | |
| 9 | 7.92933 | |
| 10 | 8.18503 | |
| 11 | 8.43655 | |
| 12 | 8.69029 | 8.7 |
| 13 | 8.94985 | |
| 14 | 9.21859 | |
| 15 | 9.49991 | |
| 16 | 9.79733 | |
| 17 | 10.11386 | |
| 18 | 10.45693 | |
| 19 | 10.83407 | |
| 20 | 11.25874 | 11.2 |
| 21 | 11.75346 | |
| 22 | 12.36898 | |
| 23 | 13.23453 | |
| 24 | 14.94588 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Students Confident in Earth Science Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | |
|--------------------|--|-------------------------------|----------------------------------|----------|----------|---------|---------|---------|----------|----------|
| | | | BSBE28A | BSBE28B* | BSBE28C* | BSBE28D | BSBE28E | BSBE28F | BSBE28G* | BSBE28H* |
| Georgia | 0.76 | 37 | 0.64 | 0.58 | 0.64 | 0.68 | 0.63 | 0.60 | 0.55 | 0.57 |
| Hungary | 0.89 | 56 | 0.81 | 0.72 | 0.80 | 0.80 | 0.73 | 0.76 | 0.74 | 0.65 |
| Kazakhstan | 0.87 | 52 | 0.76 | 0.70 | 0.75 | 0.78 | 0.74 | 0.74 | 0.65 | 0.64 |
| Lebanon | - | - | - | - | - | - | - | - | - | - |
| Lithuania | 0.84 | 48 | 0.76 | 0.70 | 0.74 | 0.75 | 0.72 | 0.64 | 0.65 | 0.55 |
| Malta | 0.87 | 52 | 0.78 | 0.66 | 0.69 | 0.80 | 0.76 | 0.73 | 0.67 | 0.69 |
| Morocco | 0.65 | 32 | 0.72 | -0.24 | -0.29 | 0.74 | 0.78 | 0.79 | -0.24 | -0.21 |
| Russian Federation | 0.87 | 52 | 0.75 | 0.71 | 0.79 | 0.79 | 0.74 | 0.71 | 0.64 | 0.63 |
| Slovenia | 0.90 | 58 | 0.81 | 0.76 | 0.79 | 0.80 | 0.75 | 0.70 | 0.76 | 0.72 |
| Sweden | - | - | - | - | - | - | - | - | - | - |

*Reverse coded

A dash (-) indicates comparable data not available.

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Students Confident in Earth Science Scale, Eighth Grade, and TIMSS 2015 Science Achievement

| Country | Pearson's Correlation with Science Achievement | | Variance in Science Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|----------------------|--|-----------|---|
| | (r) | (r^2) | |
| Georgia | 0.38 | 0.14 | 0.15 |
| Hungary | 0.22 | 0.05 | 0.07 |
| Kazakhstan | 0.18 | 0.03 | 0.04 |
| Lebanon | - | - | - |
| Lithuania | 0.30 | 0.09 | 0.09 |
| Malta | 0.32 | 0.10 | 0.12 |
| Morocco | 0.30 | 0.09 | 0.08 |
| Russian Federation | 0.18 | 0.03 | 0.04 |
| Slovenia | 0.27 | 0.07 | 0.09 |
| Sweden | - | - | - |
| International Median | 0.28 | 0.08 | 0.08 |

A dash (-) indicates comparable data not available.

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Students Confident in Mathematics Scale, Eighth Grade

The Students Confident in Mathematics (SCM) scale was created based on students' degree of agreement with the nine statements described below.

Items in the TIMSS 2015 Students Confident in Mathematics Scale, Eighth Grade

| | | How much do you agree with these statements about mathematics? | | | |
|---|----------|--|----------------|-------------------|----------------|
| | | Agree a lot | Agree a little | Disagree a little | Disagree a lot |
| T | BSBM19A | 1) I usually do well in mathematics ----- ○ ———— ○ ———— ○ ———— ○ | | | |
| T | BSBM19B* | 2) Mathematics is more difficult for me than for many of my classmates* ----- ○ ———— ○ ———— ○ ———— ○ | | | |
| T | BSBM19C* | 3) Mathematics is not one of my strengths* ----- ○ ———— ○ ———— ○ ———— ○ | | | |
| T | BSBM19D | 4) I learn things quickly in mathematics ----- ○ ———— ○ ———— ○ ———— ○ | | | |
| | BSBM19E* | 5) Mathematics makes me nervous* ----- ○ ———— ○ ———— ○ ———— ○ | | | |
| T | BSBM19F | 6) I am good at working out difficult mathematics problems ----- ○ ———— ○ ———— ○ ———— ○ | | | |
| T | BSBM19G | 7) My teacher tells me I am good at mathematics ----- ○ ———— ○ ———— ○ ———— ○ | | | |
| T | BSBM19H* | 8) Mathematics is harder for me than any other subject* -- ○ ———— ○ ———— ○ ———— ○ | | | |
| | BSBM19I* | 9) Mathematics makes me confused* ----- ○ ———— ○ ———— ○ ———— ○ | | | |

* Reverse coded

T Trend item—item was included in the same scale in TIMSS 2011 and was used for linking the TIMSS 2011 and TIMSS 2015 scales.

Item Parameters for the TIMSS 2015 Students Confident in Mathematics Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|----------|----------|----------|----------|---------|-------|
| BSBM19A | -0.50782 | -1.09617 | -0.31356 | 1.40973 | 0.93 |
| BSBM19B* | 0.02025 | -1.16866 | 0.14633 | 1.02233 | 1.04 |
| BSBM19C* | 0.24765 | -0.85950 | 0.16100 | 0.69850 | 0.94 |
| BSBM19D | -0.23484 | -1.26266 | -0.08260 | 1.34526 | 0.94 |
| BSBM19E* | -0.05673 | -0.97126 | 0.06128 | 0.90998 | 1.21 |
| BSBM19F | 0.28492 | -1.25325 | -0.17310 | 1.42635 | 0.99 |
| BSBM19G | 0.02811 | -1.08338 | -0.13552 | 1.21890 | 1.11 |
| BSBM19H* | 0.11634 | -0.69162 | 0.02593 | 0.66569 | 0.92 |
| BSBM19I* | 0.10212 | -0.89145 | 0.10503 | 0.78642 | 0.99 |

*Reverse coded

Scale Transformation Constants for the TIMSS 2015 Students Confident in Mathematics Scale, Eighth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 9.553292 | Transformed Scale Score = 9.553292 + 1.590838 • Logit Scale Score |
| B = 1.590838 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Students Confident in Mathematics Scale, Eighth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 3.19619 | |
| 1 | 4.99370 | |
| 2 | 5.86478 | |
| 3 | 6.46291 | |
| 4 | 6.92948 | |
| 5 | 7.32079 | |
| 6 | 7.66196 | |
| 7 | 7.96832 | |
| 8 | 8.24834 | |
| 9 | 8.51163 | |
| 10 | 8.76064 | |
| 11 | 8.99900 | |
| 12 | 9.22981 | |
| 13 | 9.45579 | 9.5 |
| 14 | 9.67949 | |
| 15 | 9.90347 | |
| 16 | 10.13034 | |
| 17 | 10.36309 | |
| 18 | 10.60515 | |
| 19 | 10.86066 | |
| 20 | 11.13293 | |
| 21 | 11.43104 | |
| 22 | 11.76507 | |
| 23 | 12.15148 | 12.1 |
| 24 | 12.61729 | |
| 25 | 13.22021 | |
| 26 | 14.10390 | |
| 27 | 15.92523 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Students Confident in Mathematics Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|----------|----------|---------|----------|---------|---------|----------|----------|
| | | | BSBM19A | BSBM19B* | BSBM19C* | BSBM19D | BSBM19E* | BSBM19F | BSBM19G | BSBM19H* | BSBM19I* |
| Australia | 0.90 | 56 | 0.80 | 0.75 | 0.83 | 0.79 | 0.58 | 0.77 | 0.58 | 0.80 | 0.77 |
| Bahrain | 0.80 | 38 | 0.49 | 0.58 | 0.61 | 0.65 | 0.58 | 0.64 | 0.59 | 0.72 | 0.65 |
| Botswana (9) | 0.71 | 32 | 0.71 | 0.38 | 0.49 | 0.68 | 0.10 | 0.71 | 0.66 | 0.49 | 0.53 |
| Canada | 0.92 | 62 | 0.83 | 0.82 | 0.86 | 0.82 | 0.66 | 0.80 | 0.58 | 0.84 | 0.81 |
| Chile | 0.85 | 46 | 0.76 | 0.53 | 0.66 | 0.78 | 0.48 | 0.75 | 0.67 | 0.70 | 0.73 |
| Chinese Taipei | 0.93 | 65 | 0.85 | 0.81 | 0.88 | 0.85 | 0.54 | 0.82 | 0.80 | 0.84 | 0.81 |
| Egypt | 0.70 | 30 | 0.19 | 0.67 | 0.59 | 0.38 | 0.68 | 0.34 | 0.29 | 0.74 | 0.71 |
| England | 0.89 | 53 | 0.76 | 0.72 | 0.79 | 0.78 | 0.60 | 0.77 | 0.48 | 0.82 | 0.77 |
| Georgia | 0.80 | 39 | 0.63 | 0.62 | 0.70 | 0.66 | 0.43 | 0.62 | 0.59 | 0.66 | 0.64 |
| Hong Kong SAR | 0.91 | 58 | 0.78 | 0.76 | 0.85 | 0.76 | 0.62 | 0.77 | 0.68 | 0.83 | 0.77 |
| Hungary | 0.91 | 59 | 0.83 | 0.73 | 0.83 | 0.83 | 0.57 | 0.79 | 0.78 | 0.76 | 0.74 |
| Iran, Islamic Rep. of | 0.85 | 46 | 0.75 | 0.53 | 0.63 | 0.73 | 0.65 | 0.69 | 0.69 | 0.71 | 0.72 |
| Ireland | 0.89 | 55 | 0.80 | 0.74 | 0.81 | 0.81 | 0.60 | 0.77 | 0.52 | 0.80 | 0.76 |
| Israel | 0.87 | 49 | 0.75 | 0.68 | 0.70 | 0.73 | 0.63 | 0.70 | 0.60 | 0.75 | 0.72 |
| Italy | 0.92 | 63 | 0.84 | 0.76 | 0.85 | 0.85 | 0.67 | 0.78 | 0.76 | 0.81 | 0.79 |
| Japan | 0.90 | 56 | 0.77 | 0.70 | 0.84 | 0.74 | 0.63 | 0.78 | 0.66 | 0.78 | 0.78 |
| Jordan | 0.76 | 34 | 0.33 | 0.63 | 0.62 | 0.54 | 0.65 | 0.52 | 0.51 | 0.70 | 0.68 |
| Kazakhstan | 0.89 | 54 | 0.77 | 0.72 | 0.76 | 0.79 | 0.59 | 0.76 | 0.76 | 0.74 | 0.72 |
| Korea, Rep. of | 0.91 | 60 | 0.86 | 0.79 | 0.86 | 0.76 | 0.36 | 0.84 | 0.78 | 0.82 | 0.76 |
| Kuwait | 0.82 | 40 | 0.54 | 0.59 | 0.54 | 0.70 | 0.63 | 0.67 | 0.61 | 0.73 | 0.68 |
| Lebanon | 0.77 | 36 | 0.62 | 0.62 | 0.60 | 0.59 | 0.63 | 0.50 | 0.57 | 0.71 | 0.55 |
| Lithuania | 0.88 | 52 | 0.81 | 0.72 | 0.80 | 0.75 | 0.60 | 0.75 | 0.66 | 0.74 | 0.65 |
| Malaysia | 0.81 | 39 | 0.58 | 0.58 | 0.73 | 0.56 | 0.68 | 0.57 | 0.46 | 0.70 | 0.74 |
| Malta | 0.89 | 53 | 0.78 | 0.66 | 0.76 | 0.77 | 0.63 | 0.73 | 0.63 | 0.78 | 0.77 |
| Morocco | 0.68 | 29 | 0.62 | 0.31 | 0.26 | 0.69 | 0.51 | 0.60 | 0.68 | 0.47 | 0.52 |
| New Zealand | 0.88 | 51 | 0.75 | 0.71 | 0.80 | 0.75 | 0.56 | 0.75 | 0.54 | 0.79 | 0.72 |
| Norway (9) | 0.93 | 63 | 0.83 | 0.77 | 0.86 | 0.83 | 0.73 | 0.83 | 0.71 | 0.81 | 0.74 |
| Oman | 0.78 | 36 | 0.41 | 0.71 | 0.60 | 0.52 | 0.69 | 0.41 | 0.38 | 0.76 | 0.73 |
| Qatar | 0.82 | 40 | 0.58 | 0.65 | 0.65 | 0.63 | 0.63 | 0.59 | 0.56 | 0.72 | 0.69 |
| Russian Federation | 0.91 | 58 | 0.78 | 0.74 | 0.83 | 0.82 | 0.67 | 0.77 | 0.71 | 0.77 | 0.75 |
| Saudi Arabia | 0.75 | 34 | 0.29 | 0.65 | 0.56 | 0.55 | 0.66 | 0.44 | 0.44 | 0.74 | 0.72 |
| Singapore | 0.91 | 59 | 0.84 | 0.76 | 0.85 | 0.78 | 0.65 | 0.78 | 0.64 | 0.82 | 0.77 |
| Slovenia | 0.91 | 59 | 0.81 | 0.73 | 0.82 | 0.81 | 0.67 | 0.79 | 0.73 | 0.78 | 0.77 |
| South Africa (9) | 0.80 | 38 | 0.66 | 0.51 | 0.63 | 0.65 | 0.51 | 0.65 | 0.62 | 0.65 | 0.67 |
| Sweden | 0.92 | 60 | 0.82 | 0.77 | 0.84 | 0.82 | 0.61 | 0.82 | 0.66 | 0.84 | 0.80 |
| Thailand | 0.80 | 39 | 0.59 | 0.62 | 0.75 | 0.58 | 0.52 | 0.51 | 0.55 | 0.71 | 0.70 |
| Turkey | 0.87 | 50 | 0.76 | 0.67 | 0.78 | 0.72 | 0.50 | 0.72 | 0.71 | 0.73 | 0.75 |
| United Arab Emirates | 0.85 | 45 | 0.64 | 0.65 | 0.74 | 0.66 | 0.66 | 0.64 | 0.59 | 0.73 | 0.71 |
| United States | 0.90 | 56 | 0.77 | 0.76 | 0.82 | 0.79 | 0.63 | 0.76 | 0.58 | 0.82 | 0.78 |
| Benchmarking Participants | | | | | | | | | | | |
| Buenos Aires, Argentina | 0.85 | 46 | 0.73 | 0.66 | 0.73 | 0.69 | 0.54 | 0.63 | 0.63 | 0.75 | 0.72 |
| Ontario, Canada | 0.92 | 61 | 0.81 | 0.82 | 0.85 | 0.81 | 0.65 | 0.80 | 0.56 | 0.84 | 0.81 |
| Quebec, Canada | 0.92 | 63 | 0.84 | 0.81 | 0.87 | 0.84 | 0.67 | 0.79 | 0.61 | 0.83 | 0.81 |
| Norway (8) | 0.91 | 60 | 0.81 | 0.77 | 0.84 | 0.82 | 0.71 | 0.81 | 0.64 | 0.79 | 0.74 |
| Abu Dhabi, UAE | 0.83 | 42 | 0.58 | 0.64 | 0.73 | 0.61 | 0.66 | 0.60 | 0.53 | 0.70 | 0.71 |
| Dubai, UAE | 0.88 | 51 | 0.74 | 0.70 | 0.77 | 0.72 | 0.67 | 0.70 | 0.64 | 0.77 | 0.74 |
| Florida, US | 0.89 | 53 | 0.75 | 0.71 | 0.80 | 0.77 | 0.60 | 0.72 | 0.61 | 0.80 | 0.77 |

*Reverse coded

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Students Confident in Mathematics Scale, Eighth Grade, and TIMSS 2015 Mathematics Achievement

| Country | Pearson's Correlation with Mathematics Achievement | | Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|----------------------------------|--|-------------------|---|
| | (r) | (r ²) | |
| Australia | 0.51 | 0.26 | 0.25 |
| Bahrain | 0.40 | 0.16 | 0.15 |
| Botswana (9) | 0.26 | 0.07 | 0.09 |
| Canada | 0.55 | 0.30 | 0.29 |
| Chile | 0.43 | 0.18 | 0.18 |
| Chinese Taipei | 0.52 | 0.27 | 0.24 |
| Egypt | 0.35 | 0.12 | 0.11 |
| England | 0.46 | 0.21 | 0.18 |
| Georgia | 0.45 | 0.20 | 0.19 |
| Hong Kong SAR | 0.37 | 0.14 | 0.14 |
| Hungary | 0.53 | 0.28 | 0.28 |
| Iran, Islamic Rep. of | 0.42 | 0.18 | 0.17 |
| Ireland | 0.44 | 0.19 | 0.19 |
| Israel | 0.36 | 0.13 | 0.13 |
| Italy | 0.50 | 0.25 | 0.23 |
| Japan | 0.44 | 0.19 | 0.16 |
| Jordan | 0.37 | 0.14 | 0.14 |
| Kazakhstan | 0.25 | 0.06 | 0.07 |
| Korea, Rep. of | 0.52 | 0.27 | 0.24 |
| Kuwait | 0.30 | 0.09 | 0.09 |
| Lebanon | 0.33 | 0.11 | 0.11 |
| Lithuania | 0.54 | 0.29 | 0.29 |
| Malaysia | 0.33 | 0.11 | 0.11 |
| Malta | 0.39 | 0.15 | 0.16 |
| Morocco | 0.39 | 0.15 | 0.14 |
| New Zealand | 0.47 | 0.22 | 0.20 |
| Norway (9) | 0.61 | 0.37 | 0.34 |
| Oman | 0.35 | 0.12 | 0.11 |
| Qatar | 0.42 | 0.17 | 0.16 |
| Russian Federation | 0.44 | 0.19 | 0.18 |
| Saudi Arabia | 0.35 | 0.12 | 0.11 |
| Singapore | 0.40 | 0.16 | 0.16 |
| Slovenia | 0.54 | 0.29 | 0.28 |
| South Africa (9) | 0.24 | 0.06 | 0.08 |
| Sweden | 0.59 | 0.35 | 0.32 |
| Thailand | 0.23 | 0.05 | 0.10 |
| Turkey | 0.48 | 0.23 | 0.24 |
| United Arab Emirates | 0.37 | 0.14 | 0.14 |
| United States | 0.43 | 0.18 | 0.18 |
| International Median | 0.42 | 0.18 | 0.16 |
| Benchmarking Participants | | | |
| Buenos Aires, Argentina | 0.37 | 0.13 | 0.12 |
| Ontario, Canada | 0.59 | 0.35 | 0.35 |
| Quebec, Canada | 0.54 | 0.29 | 0.27 |
| Norway (8) | 0.57 | 0.33 | 0.30 |
| Abu Dhabi, UAE | 0.39 | 0.15 | 0.14 |
| Dubai, UAE | 0.42 | 0.18 | 0.17 |
| Florida, US | 0.33 | 0.11 | 0.10 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Students Confident in Physics Scale, Eighth Grade

The Students Confident in Physics (SCP) scale was created based on students’ degree of agreement with the eight statements described below.

Items in the TIMSS 2015 Students Confident in Physics Scale, Eighth Grade

| | | How much do you agree with these statements about physics? | | | |
|---|----------|---|----------------|-------------------|----------------|
| | | Agree a lot | Agree a little | Disagree a little | Disagree a lot |
| T | BSBP36A | 1) I usually do well in physics ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| T | BSBP36B* | 2) Physics is more difficult for me than for many of my classmates* ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| T | BSBP36C* | 3) Physics is not one of my strengths* ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| T | BSBP36D | 4) I learn things quickly in physics ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| T | BSBP36E | 5) I am good at working out difficult physics problems ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| T | BSBP36F | 6) My teacher tells me I am good at physics ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| T | BSBP36G* | 7) Physics is harder for me than any other subject* ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| T | BSBP36H* | 8) Physics makes me confused* ----- ○ ——— ○ ——— ○ ——— ○ | | | |

* Reverse coded

Very Confident ←————→ Not Confident

11.6 9.4

T Trend item—item was included in the same scale in TIMSS 2011 and was used for linking the TIMSS 2011 and TIMSS 2015 scales.

Item Parameters for the TIMSS 2015 Students Confident in Physics Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|----------|----------|----------|----------|---------|-------|
| BSBP36A | -0.38641 | -1.18505 | -0.21963 | 1.40468 | 0.89 |
| BSBP36B* | -0.06965 | -1.03618 | -0.08308 | 1.11926 | 1.03 |
| BSBP36C* | 0.18964 | -1.07039 | 0.01690 | 1.05349 | 0.97 |
| BSBP36D | -0.11066 | -1.41785 | 0.00024 | 1.41761 | 0.89 |
| BSBP36E | 0.26746 | -1.41522 | 0.14013 | 1.27509 | 1.00 |
| BSBP36F | 0.06832 | -1.36952 | 0.01208 | 1.35744 | 1.00 |
| BSBP36G* | 0.11199 | -0.95260 | -0.05350 | 1.00610 | 1.07 |
| BSBP36H* | -0.07069 | -0.70594 | -0.15808 | 0.86402 | 1.17 |

*Reverse coded

Scale Transformation Constants for the TIMSS 2015 Students Confident in Physics Scale, Eighth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 9.354065 | Transformed Scale Score = 9.354065 + 1.474407 • Logit Scale Score |
| B = 1.474407 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Students Confident in Physics Scale, Eighth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 3.48271 | |
| 1 | 5.17467 | |
| 2 | 6.00291 | |
| 3 | 6.57512 | |
| 4 | 7.02652 | |
| 5 | 7.40595 | |
| 6 | 7.73926 | |
| 7 | 8.04083 | |
| 8 | 8.32236 | |
| 9 | 8.58833 | |
| 10 | 8.84388 | |
| 11 | 9.09326 | |
| 12 | 9.33953 | 9.4 |
| 13 | 9.58774 | |
| 14 | 9.83945 | |
| 15 | 10.09876 | |
| 16 | 10.36970 | |
| 17 | 10.65709 | |
| 18 | 10.96483 | |
| 19 | 11.30549 | |
| 20 | 11.69268 | 11.6 |
| 21 | 12.15215 | |
| 22 | 12.73226 | |
| 23 | 13.56872 | |
| 24 | 15.26874 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Students Confident in Physics Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | |
|--------------------|--|-------------------------------|----------------------------------|----------|----------|---------|---------|---------|----------|----------|
| | | | BSBP36A | BSBP36B* | BSBP36C* | BSBP36D | BSBP36E | BSBP36F | BSBP36G* | BSBP36H* |
| Georgia | 0.80 | 42 | 0.73 | 0.58 | 0.63 | 0.75 | 0.72 | 0.69 | 0.52 | 0.51 |
| Hungary | 0.90 | 58 | 0.83 | 0.72 | 0.78 | 0.83 | 0.74 | 0.77 | 0.72 | 0.67 |
| Kazakhstan | 0.86 | 51 | 0.76 | 0.69 | 0.73 | 0.76 | 0.75 | 0.76 | 0.63 | 0.62 |
| Lebanon | 0.72 | 35 | 0.78 | 0.35 | 0.27 | 0.81 | 0.78 | 0.81 | 0.26 | 0.18 |
| Lithuania | 0.86 | 52 | 0.82 | 0.70 | 0.71 | 0.80 | 0.76 | 0.74 | 0.65 | 0.53 |
| Malta | 0.89 | 57 | 0.78 | 0.73 | 0.76 | 0.79 | 0.78 | 0.74 | 0.72 | 0.73 |
| Morocco | 0.63 | 35 | 0.67 | -0.43 | -0.46 | 0.66 | 0.73 | 0.74 | -0.49 | -0.40 |
| Russian Federation | 0.89 | 56 | 0.79 | 0.73 | 0.82 | 0.82 | 0.77 | 0.76 | 0.67 | 0.62 |
| Slovenia | 0.91 | 60 | 0.82 | 0.74 | 0.81 | 0.83 | 0.80 | 0.74 | 0.74 | 0.72 |
| Sweden | 0.89 | 56 | 0.80 | 0.71 | 0.77 | 0.82 | 0.76 | 0.69 | 0.69 | 0.72 |

*Reverse coded

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Students Confident in Physics Scale, Eighth Grade, and TIMSS 2015 Science Achievement

| Country | Pearson's Correlation with Science Achievement | | Variance in Science Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|----------------------|--|-----------|---|
| | (r) | (r^2) | |
| Georgia | 0.26 | 0.07 | 0.09 |
| Hungary | 0.33 | 0.11 | 0.14 |
| Kazakhstan | 0.17 | 0.03 | 0.03 |
| Lebanon | 0.33 | 0.11 | 0.12 |
| Lithuania | 0.27 | 0.07 | 0.10 |
| Malta | 0.44 | 0.20 | 0.21 |
| Morocco | 0.31 | 0.10 | 0.09 |
| Russian Federation | 0.25 | 0.06 | 0.06 |
| Slovenia | 0.35 | 0.12 | 0.14 |
| Sweden | 0.34 | 0.11 | 0.13 |
| International Median | 0.32 | 0.10 | 0.11 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Students Confident in Science Scale, Eighth Grade

The Students Confident in Science (SCS) scale was created based on students’ degree of agreement with the eight statements described below.

Items in the TIMSS 2015 Students Confident in Science Scale, Eighth Grade

| | | How much do you agree with these statements about science? | | | |
|---|----------|---|-------------------|----------------------|-------------------|
| | | Agree a lot | Agree a little | Disagree a little | Disagree a lot |
| T | BSBS23A | 1) I usually do well in science ----- ○ ———— ○ ———— ○ ———— ○ | | | |
| T | BSBS23B* | 2) Science is more difficult for me than for many of my classmates* ----- ○ ———— ○ ———— ○ ———— ○ | | | |
| T | BSBS23C* | 3) Science is not one of my strengths* ----- ○ ———— ○ ———— ○ ———— ○ | | | |
| T | BSBS23D | 4) I learn things quickly in science ----- ○ ———— ○ ———— ○ ———— ○ | | | |
| T | BSBS23E | 5) I am good at working out difficult science problems ----- ○ ———— ○ ———— ○ ———— ○ | | | |
| T | BSBS23F | 6) My teacher tells me I am good at science ----- ○ ———— ○ ———— ○ ———— ○ | | | |
| T | BSBS23G* | 7) Science is harder for me than any other subject* ----- ○ ———— ○ ———— ○ ———— ○ | | | |
| T | BSBS23H* | 8) Science makes me confused* ----- ○ ———— ○ ———— ○ ———— ○ | | | |

* Reverse coded

T Trend item—item was included in the same scale in TIMSS 2011 and was used for linking the TIMSS 2011 and TIMSS 2015 scales.

Item Parameters for the TIMSS 2015 Students Confident in Science Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|----------|----------|----------|----------|---------|-------|
| BSBS23A | -0.40602 | -0.90090 | -0.39226 | 1.29316 | 0.92 |
| BSBS23B* | 0.02223 | -1.15732 | 0.20137 | 0.95595 | 1.05 |
| BSBS23C* | 0.27706 | -1.01187 | 0.22919 | 0.78268 | 1.05 |
| BSBS23D | -0.24566 | -1.21791 | -0.02344 | 1.24135 | 0.90 |
| BSBS23E | 0.17088 | -1.28471 | 0.00993 | 1.27478 | 1.02 |
| BSBS23F | 0.09152 | -1.12464 | 0.01922 | 1.10542 | 1.10 |
| BSBS23G* | 0.03010 | -0.88164 | 0.03964 | 0.84200 | 1.02 |
| BSBS23H* | 0.05989 | -0.92434 | 0.16959 | 0.75475 | 1.06 |

*Reverse coded

Scale Transformation Constants for the TIMSS 2015 Students Confident in Science Scale, Eighth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 9.091884 | Transformed Scale Score = 9.091884 + 1.615239 • Logit Scale Score |
| B = 1.615239 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Students Confident in Science Scale, Eighth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 2.82098 | |
| 1 | 4.65523 | |
| 2 | 5.54634 | |
| 3 | 6.15963 | |
| 4 | 6.64373 | |
| 5 | 7.05126 | |
| 6 | 7.40989 | |
| 7 | 7.73394 | |
| 8 | 8.03689 | |
| 9 | 8.32242 | |
| 10 | 8.59538 | |
| 11 | 8.85979 | |
| 12 | 9.12033 | 9.2 |
| 13 | 9.37683 | |
| 14 | 9.63617 | |
| 15 | 9.90101 | |
| 16 | 10.17585 | |
| 17 | 10.46634 | |
| 18 | 10.77961 | |
| 19 | 11.12175 | |
| 20 | 11.51463 | 11.5 |
| 21 | 11.98495 | |
| 22 | 12.58681 | |
| 23 | 13.46826 | |
| 24 | 15.29598 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Students Confident in Science Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|----------|----------|---------|---------|---------|----------|----------|--|
| | | | BS8S23A | BS8S23B* | BS8S23C* | BS8S23D | BS8S23E | BS8S23F | BS8S23G* | BS8S23H* | |
| Australia | 0.90 | 58 | 0.79 | 0.73 | 0.79 | 0.80 | 0.78 | 0.67 | 0.75 | 0.75 | |
| Bahrain | 0.76 | 37 | 0.49 | 0.64 | 0.59 | 0.65 | 0.57 | 0.60 | 0.68 | 0.63 | |
| Botswana (9) | 0.72 | 34 | 0.69 | 0.43 | 0.46 | 0.68 | 0.68 | 0.66 | 0.46 | 0.51 | |
| Canada | 0.89 | 58 | 0.79 | 0.75 | 0.81 | 0.81 | 0.78 | 0.63 | 0.75 | 0.75 | |
| Chile | 0.81 | 43 | 0.76 | 0.51 | 0.56 | 0.78 | 0.74 | 0.65 | 0.58 | 0.63 | |
| Chinese Taipei | 0.93 | 67 | 0.85 | 0.79 | 0.84 | 0.85 | 0.82 | 0.79 | 0.81 | 0.78 | |
| Egypt | 0.68 | 31 | 0.09 | 0.78 | 0.68 | 0.37 | 0.26 | 0.31 | 0.78 | 0.72 | |
| England | 0.90 | 59 | 0.80 | 0.75 | 0.81 | 0.82 | 0.78 | 0.64 | 0.77 | 0.76 | |
| Georgia | - | - | - | - | - | - | - | - | - | - | |
| Hong Kong SAR | 0.88 | 55 | 0.79 | 0.73 | 0.78 | 0.77 | 0.76 | 0.65 | 0.77 | 0.69 | |
| Hungary | - | - | - | - | - | - | - | - | - | - | |
| Iran, Islamic Rep. of | 0.82 | 45 | 0.73 | 0.57 | 0.60 | 0.75 | 0.71 | 0.70 | 0.65 | 0.66 | |
| Ireland | 0.91 | 61 | 0.83 | 0.78 | 0.80 | 0.83 | 0.78 | 0.67 | 0.78 | 0.76 | |
| Israel | 0.86 | 51 | 0.78 | 0.68 | 0.69 | 0.78 | 0.75 | 0.69 | 0.68 | 0.68 | |
| Italy | 0.88 | 55 | 0.79 | 0.71 | 0.78 | 0.81 | 0.69 | 0.69 | 0.73 | 0.71 | |
| Japan | 0.89 | 58 | 0.79 | 0.73 | 0.82 | 0.76 | 0.78 | 0.68 | 0.76 | 0.74 | |
| Jordan | 0.72 | 34 | 0.30 | 0.71 | 0.65 | 0.54 | 0.48 | 0.51 | 0.69 | 0.65 | |
| Kazakhstan | - | - | - | - | - | - | - | - | - | - | |
| Korea, Rep. of | 0.93 | 66 | 0.86 | 0.79 | 0.84 | 0.81 | 0.84 | 0.81 | 0.80 | 0.76 | |
| Kuwait | 0.79 | 41 | 0.55 | 0.66 | 0.57 | 0.71 | 0.67 | 0.64 | 0.65 | 0.63 | |
| Lebanon | - | - | - | - | - | - | - | - | - | - | |
| Lithuania | - | - | - | - | - | - | - | - | - | - | |
| Malaysia | 0.67 | 30 | 0.60 | 0.48 | 0.57 | 0.56 | 0.57 | 0.40 | 0.59 | 0.59 | |
| Malta | - | - | - | - | - | - | - | - | - | - | |
| Morocco | - | - | - | - | - | - | - | - | - | - | |
| New Zealand | 0.88 | 54 | 0.78 | 0.72 | 0.77 | 0.78 | 0.75 | 0.64 | 0.74 | 0.69 | |
| Norway (9) | 0.90 | 60 | 0.81 | 0.76 | 0.82 | 0.82 | 0.79 | 0.69 | 0.75 | 0.72 | |
| Oman | 0.74 | 36 | 0.37 | 0.76 | 0.66 | 0.52 | 0.39 | 0.44 | 0.76 | 0.72 | |
| Qatar | 0.78 | 39 | 0.65 | 0.60 | 0.54 | 0.73 | 0.67 | 0.67 | 0.59 | 0.55 | |
| Russian Federation | - | - | - | - | - | - | - | - | - | - | |
| Saudi Arabia | 0.71 | 34 | 0.20 | 0.77 | 0.66 | 0.43 | 0.30 | 0.37 | 0.79 | 0.76 | |
| Singapore | 0.91 | 62 | 0.83 | 0.79 | 0.83 | 0.80 | 0.79 | 0.69 | 0.79 | 0.76 | |
| Slovenia | - | - | - | - | - | - | - | - | - | - | |
| South Africa (9) | 0.78 | 40 | 0.68 | 0.54 | 0.60 | 0.71 | 0.69 | 0.61 | 0.57 | 0.61 | |
| Sweden | - | - | - | - | - | - | - | - | - | - | |
| Thailand | 0.73 | 35 | 0.78 | 0.14 | 0.27 | 0.85 | 0.83 | 0.77 | 0.13 | 0.20 | |
| Turkey | 0.84 | 48 | 0.75 | 0.69 | 0.70 | 0.72 | 0.67 | 0.65 | 0.67 | 0.68 | |
| United Arab Emirates | 0.82 | 44 | 0.64 | 0.65 | 0.66 | 0.72 | 0.67 | 0.63 | 0.67 | 0.65 | |
| United States | 0.88 | 54 | 0.75 | 0.75 | 0.76 | 0.79 | 0.73 | 0.60 | 0.76 | 0.74 | |
| Benchmarking Participants | | | | | | | | | | | |
| Buenos Aires, Argentina | 0.78 | 40 | 0.71 | 0.56 | 0.43 | 0.77 | 0.69 | 0.62 | 0.63 | 0.61 | |
| Ontario, Canada | 0.90 | 58 | 0.79 | 0.75 | 0.81 | 0.81 | 0.78 | 0.62 | 0.76 | 0.76 | |
| Quebec, Canada | 0.90 | 59 | 0.79 | 0.76 | 0.83 | 0.82 | 0.77 | 0.65 | 0.74 | 0.76 | |
| Norway (8) | 0.89 | 57 | 0.81 | 0.75 | 0.80 | 0.81 | 0.78 | 0.65 | 0.71 | 0.71 | |
| Abu Dhabi, UAE | 0.79 | 40 | 0.61 | 0.60 | 0.63 | 0.70 | 0.65 | 0.64 | 0.61 | 0.62 | |
| Dubai, UAE | 0.86 | 51 | 0.72 | 0.71 | 0.71 | 0.77 | 0.72 | 0.65 | 0.73 | 0.69 | |
| Florida, US | 0.85 | 50 | 0.73 | 0.71 | 0.73 | 0.77 | 0.70 | 0.58 | 0.72 | 0.71 | |

*Reverse coded

A dash (-) indicates comparable data not available.

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Students Confident in Science Scale, Eighth Grade, and TIMSS 2015 Science Achievement

| Country | Pearson's Correlation with Science Achievement | | Variance in Science Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|----------------------------------|--|-------------|---|
| | (r) | (r^2) | |
| Australia | 0.39 | 0.15 | 0.16 |
| Bahrain | 0.38 | 0.15 | 0.16 |
| Botswana (9) | 0.26 | 0.07 | 0.08 |
| Canada | 0.35 | 0.12 | 0.12 |
| Chile | 0.24 | 0.06 | 0.08 |
| Chinese Taipei | 0.38 | 0.15 | 0.18 |
| Egypt | 0.41 | 0.16 | 0.16 |
| England | 0.39 | 0.15 | 0.15 |
| Georgia | - | - | - |
| Hong Kong SAR | 0.31 | 0.09 | 0.12 |
| Hungary | - | - | - |
| Iran, Islamic Rep. of | 0.31 | 0.10 | 0.10 |
| Ireland | 0.49 | 0.24 | 0.23 |
| Israel | 0.38 | 0.15 | 0.18 |
| Italy | 0.31 | 0.10 | 0.10 |
| Japan | 0.37 | 0.14 | 0.14 |
| Jordan | 0.39 | 0.15 | 0.15 |
| Kazakhstan | - | - | - |
| Korea, Rep. of | 0.45 | 0.20 | 0.23 |
| Kuwait | 0.36 | 0.13 | 0.12 |
| Lebanon | - | - | - |
| Lithuania | - | - | - |
| Malaysia | -0.16 | 0.03 | 0.02 |
| Malta | - | - | - |
| Morocco | - | - | - |
| New Zealand | 0.33 | 0.11 | 0.13 |
| Norway (9) | 0.44 | 0.19 | 0.20 |
| Oman | 0.30 | 0.09 | 0.09 |
| Qatar | 0.39 | 0.15 | 0.17 |
| Russian Federation | - | - | - |
| Saudi Arabia | 0.34 | 0.11 | 0.14 |
| Singapore | 0.24 | 0.06 | 0.07 |
| Slovenia | - | - | - |
| South Africa (9) | 0.19 | 0.03 | 0.05 |
| Sweden | - | - | - |
| Thailand | 0.17 | 0.03 | 0.06 |
| Turkey | 0.39 | 0.15 | 0.16 |
| United Arab Emirates | 0.35 | 0.12 | 0.15 |
| United States | 0.34 | 0.11 | 0.13 |
| International Median | 0.35 | 0.12 | 0.14 |
| Benchmarking Participants | | | |
| Buenos Aires, Argentina | 0.20 | 0.04 | 0.06 |
| Ontario, Canada | 0.36 | 0.13 | 0.12 |
| Quebec, Canada | 0.32 | 0.10 | 0.10 |
| Norway (8) | 0.35 | 0.13 | 0.13 |
| Abu Dhabi, UAE | 0.34 | 0.12 | 0.14 |
| Dubai, UAE | 0.34 | 0.11 | 0.12 |
| Florida, US | 0.33 | 0.11 | 0.13 |

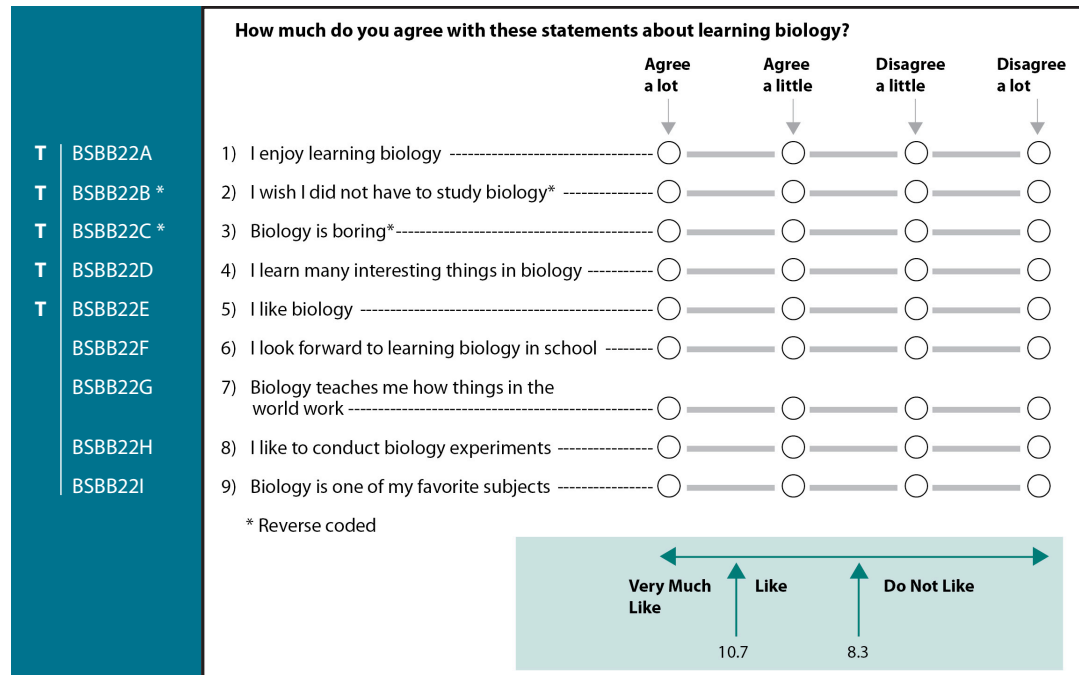
SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

A dash (-) indicates comparable data not available.

Students Like Learning Biology Scale, Eighth Grade

The Students Like Learning Biology (SLB) scale was created based on students' degree of agreement with the nine statements described below.

Items in the TIMSS 2015 Students Like Learning Biology Scale, Eighth Grade



T Trend item—item was included in the same scale in TIMSS 2011 and was used for linking the TIMSS 2011 and TIMSS 2015 scales.

Item Parameters for the TIMSS 2015 Students Like Learning Biology Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|----------|----------|----------|----------|---------|-------|
| BSBB22A | -0.21561 | -1.36738 | -0.38682 | 1.75420 | 0.78 |
| BSBB22B* | 0.48941 | -0.97790 | -0.35507 | 1.33297 | 1.53 |
| BSBB22C* | 0.32744 | -1.12315 | -0.37329 | 1.49644 | 1.36 |
| BSBB22D | -0.70652 | -1.04264 | -0.60801 | 1.65065 | 0.86 |
| BSBB22E | -0.08498 | -1.26709 | -0.29413 | 1.56122 | 0.63 |
| BSBB22F | 0.47630 | -1.62094 | -0.00453 | 1.62547 | 0.85 |
| BSBB22G | -0.71956 | -1.08900 | -0.74172 | 1.83072 | 1.15 |
| BSBB22H | -0.28187 | -1.07022 | -0.43544 | 1.50566 | 1.27 |
| BSBB22I | 0.71539 | -1.35579 | 0.06572 | 1.29007 | 0.87 |

*Reverse coded

Scale Transformation Constants for the TIMSS 2015 Students Like Learning Biology Scale, Eighth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 8.424458 | Transformed Scale Score = 8.424458 + 1.150254 • Logit Scale Score |
| B = 1.150254 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Students Like Learning Biology Scale, Eighth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 3.58422 | |
| 1 | 4.83770 | |
| 2 | 5.43659 | |
| 3 | 5.85367 | |
| 4 | 6.18434 | |
| 5 | 6.46579 | |
| 6 | 6.72147 | |
| 7 | 6.95733 | |
| 8 | 7.17826 | |
| 9 | 7.39267 | |
| 10 | 7.60305 | |
| 11 | 7.80935 | |
| 12 | 8.01503 | |
| 13 | 8.22181 | 8.3 |
| 14 | 8.43143 | |
| 15 | 8.64503 | |
| 16 | 8.86456 | |
| 17 | 9.09141 | |
| 18 | 9.32733 | |
| 19 | 9.57355 | |
| 20 | 9.83403 | |
| 21 | 10.11239 | |
| 22 | 10.41516 | |
| 23 | 10.75327 | 10.7 |
| 24 | 11.14479 | |
| 25 | 11.63080 | |
| 26 | 12.31447 | |
| 27 | 13.66963 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Students Like Learning Biology Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | |
|--------------------|--|-------------------------------|----------------------------------|----------|----------|---------|---------|---------|---------|---------|---------|
| | | | BS8B22A | BS8B22B* | BS8B22C* | BS8B22D | BS8B22E | BS8B22F | BS8B22G | BS8B22H | BS8B22I |
| Georgia | 0.85 | 47 | 0.81 | 0.43 | 0.45 | 0.67 | 0.87 | 0.77 | 0.60 | 0.62 | 0.79 |
| Hungary | 0.91 | 60 | 0.87 | 0.66 | 0.75 | 0.79 | 0.91 | 0.84 | 0.63 | 0.63 | 0.84 |
| Kazakhstan | 0.87 | 52 | 0.80 | 0.36 | 0.49 | 0.80 | 0.87 | 0.81 | 0.66 | 0.73 | 0.83 |
| Lebanon | 0.84 | 49 | 0.75 | 0.29 | 0.33 | 0.74 | 0.87 | 0.78 | 0.68 | 0.74 | 0.83 |
| Lithuania | 0.92 | 61 | 0.86 | 0.66 | 0.71 | 0.80 | 0.91 | 0.84 | 0.71 | 0.65 | 0.83 |
| Malta | 0.92 | 63 | 0.87 | 0.75 | 0.76 | 0.78 | 0.91 | 0.89 | 0.67 | 0.58 | 0.89 |
| Morocco | 0.85 | 50 | 0.75 | 0.35 | 0.46 | 0.77 | 0.85 | 0.83 | 0.68 | 0.71 | 0.79 |
| Russian Federation | 0.89 | 55 | 0.83 | 0.49 | 0.69 | 0.77 | 0.88 | 0.81 | 0.67 | 0.64 | 0.84 |
| Slovenia | 0.93 | 63 | 0.87 | 0.68 | 0.76 | 0.84 | 0.91 | 0.89 | 0.65 | 0.65 | 0.85 |
| Sweden | 0.92 | 62 | 0.87 | 0.70 | 0.77 | 0.83 | 0.91 | 0.89 | 0.66 | 0.58 | 0.80 |

*Reverse coded

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Students Like Learning Biology Scale, Eighth Grade, and TIMSS 2015 Science Achievement

| Country | Pearson's Correlation with Science Achievement | | Variance in Science Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|----------------------|--|-----------|---|
| | (r) | (r^2) | |
| Georgia | 0.16 | 0.03 | 0.03 |
| Hungary | 0.09 | 0.01 | 0.01 |
| Kazakhstan | 0.13 | 0.02 | 0.01 |
| Lebanon | 0.30 | 0.09 | 0.09 |
| Lithuania | 0.06 | 0.00 | 0.00 |
| Malta | 0.31 | 0.10 | 0.10 |
| Morocco | 0.22 | 0.05 | 0.04 |
| Russian Federation | 0.05 | 0.00 | 0.00 |
| Slovenia | 0.05 | 0.00 | 0.00 |
| Sweden | 0.12 | 0.01 | 0.01 |
| International Median | 0.13 | 0.02 | 0.01 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Students Like Learning Chemistry Scale, Eighth Grade

The Students Like Learning Chemistry (SLC) scale was created based on students' degree of agreement with the nine statements described below.

Items in the TIMSS 2015 Students Like Learning Chemistry Scale, Eighth Grade

| | | How much do you agree with these statements about learning chemistry? | | | | |
|---|-----------|---|----------------|-------------------|----------------|---|
| | | Agree a lot | Agree a little | Disagree a little | Disagree a lot | |
| T | BSBC30A | 1) I enjoy learning chemistry -----○ | ○ | ○ | ○ | ○ |
| T | BSBC30B * | 2) I wish I did not have to study chemistry* -----○ | ○ | ○ | ○ | ○ |
| T | BSBC30C * | 3) Chemistry is boring* -----○ | ○ | ○ | ○ | ○ |
| T | BSBC30D | 4) I learn many interesting things in chemistry -----○ | ○ | ○ | ○ | ○ |
| T | BSBC30E | 5) I like chemistry -----○ | ○ | ○ | ○ | ○ |
| | BSBC30F | 6) I look forward to learning chemistry in school -----○ | ○ | ○ | ○ | ○ |
| | BSBC30G | 7) Chemistry teaches me how things in the world work -----○ | ○ | ○ | ○ | ○ |
| | BSBC30H | 8) I like to conduct chemistry experiments -----○ | ○ | ○ | ○ | ○ |
| | BSBC30I | 9) Chemistry is one of my favorite subjects -----○ | ○ | ○ | ○ | ○ |

* Reverse coded

T Trend item—item was included in the same scale in TIMSS 2011 and was used for linking the TIMSS 2011 and TIMSS 2015 scales.

Item Parameters for the TIMSS 2015 Students Like Learning Chemistry Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|----------|----------|----------|----------|---------|-------|
| BSBC30A | -0.02523 | -1.23109 | -0.19180 | 1.42289 | 0.78 |
| BSBC30B* | 0.48146 | -0.92656 | -0.23159 | 1.15815 | 1.68 |
| BSBC30C* | 0.25060 | -1.07638 | -0.32509 | 1.40147 | 1.54 |
| BSBC30D | -0.53330 | -1.12674 | -0.47727 | 1.60401 | 0.82 |
| BSBC30E | 0.04614 | -1.23609 | -0.14551 | 1.38160 | 0.62 |
| BSBC30F | 0.44759 | -1.46092 | 0.09506 | 1.36586 | 0.79 |
| BSBC30G | -0.33281 | -1.19842 | -0.43524 | 1.63366 | 1.09 |
| BSBC30H | -0.88655 | -0.62539 | -0.71378 | 1.33917 | 1.28 |
| BSBC30I | 0.55210 | -1.26474 | 0.09353 | 1.17121 | 0.80 |

*Reverse coded

Scale Transformation Constants for the TIMSS 2015 Students Like Learning Chemistry Scale, Eighth Grade

Scale Transformation Constants

A = 9.10346

B = 1.077212

Transformed Scale Score = 9.10346 + 1.077212 • Logit Scale Score

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Students Like Learning Chemistry Scale, Eighth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 4.69247 | |
| 1 | 5.86077 | |
| 2 | 6.41657 | |
| 3 | 6.79900 | |
| 4 | 7.10281 | |
| 5 | 7.36210 | |
| 6 | 7.59312 | |
| 7 | 7.80909 | |
| 8 | 8.01275 | |
| 9 | 8.20800 | |
| 10 | 8.39762 | |
| 11 | 8.58367 | |
| 12 | 8.76781 | |
| 13 | 8.95150 | 9.0 |
| 14 | 9.13676 | |
| 15 | 9.32284 | |
| 16 | 9.51333 | |
| 17 | 9.70911 | |
| 18 | 9.91208 | |
| 19 | 10.12367 | |
| 20 | 10.34801 | |
| 21 | 10.58902 | |
| 22 | 10.85319 | |
| 23 | 11.15104 | 11.1 |
| 24 | 11.49986 | |
| 25 | 11.93805 | |
| 26 | 12.56219 | |
| 27 | 13.81623 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Students Like Learning Chemistry Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | |
|--------------------|--|-------------------------------|----------------------------------|----------|----------|---------|---------|---------|---------|---------|---------|
| | | | B5BC30A | B5BC30B* | B5BC30C* | B5BC30D | B5BC30E | B5BC30F | B5BC30G | B5BC30H | B5BC30I |
| Georgia | 0.87 | 52 | 0.83 | 0.39 | 0.42 | 0.78 | 0.89 | 0.81 | 0.69 | 0.64 | 0.83 |
| Hungary | 0.91 | 60 | 0.87 | 0.63 | 0.67 | 0.80 | 0.91 | 0.87 | 0.70 | 0.58 | 0.85 |
| Kazakhstan | 0.90 | 58 | 0.83 | 0.43 | 0.51 | 0.83 | 0.89 | 0.83 | 0.75 | 0.77 | 0.85 |
| Lebanon | 0.84 | 51 | 0.78 | 0.23 | 0.24 | 0.79 | 0.87 | 0.80 | 0.77 | 0.75 | 0.83 |
| Lithuania | 0.92 | 63 | 0.89 | 0.65 | 0.67 | 0.81 | 0.92 | 0.86 | 0.73 | 0.68 | 0.88 |
| Malta | 0.94 | 69 | 0.88 | 0.77 | 0.79 | 0.85 | 0.92 | 0.90 | 0.76 | 0.64 | 0.89 |
| Morocco | 0.85 | 51 | 0.74 | 0.22 | 0.31 | 0.79 | 0.86 | 0.85 | 0.75 | 0.77 | 0.80 |
| Russian Federation | 0.91 | 59 | 0.87 | 0.45 | 0.63 | 0.83 | 0.91 | 0.86 | 0.73 | 0.68 | 0.87 |
| Slovenia | 0.93 | 64 | 0.87 | 0.66 | 0.73 | 0.86 | 0.92 | 0.91 | 0.74 | 0.58 | 0.88 |
| Sweden | 0.93 | 64 | 0.89 | 0.67 | 0.74 | 0.86 | 0.91 | 0.88 | 0.70 | 0.64 | 0.83 |

*Reverse coded

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Students Like Learning Chemistry Scale, Eighth Grade, and TIMSS 2015 Science Achievement

| Country | Pearson's Correlation with Science Achievement | | Variance in Science Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|----------------------|--|-----------|---|
| | (r) | (r^2) | |
| Georgia | 0.20 | 0.04 | 0.04 |
| Hungary | 0.11 | 0.01 | 0.02 |
| Kazakhstan | 0.17 | 0.03 | 0.03 |
| Lebanon | 0.20 | 0.04 | 0.05 |
| Lithuania | 0.16 | 0.02 | 0.02 |
| Malta | 0.31 | 0.10 | 0.09 |
| Morocco | 0.24 | 0.06 | 0.06 |
| Russian Federation | 0.16 | 0.03 | 0.02 |
| Slovenia | 0.24 | 0.06 | 0.05 |
| Sweden | 0.19 | 0.04 | 0.03 |
| International Median | 0.19 | 0.04 | 0.03 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Students Like Learning Earth Science Scale, Eighth Grade

The Students Like Learning Earth Science (SLE) scale was created based on students' degree of agreement with the nine statements described below.

Items in the TIMSS 2015 Students Like Learning Earth Science Scale, Eighth Grade

| | | How much do you agree with these statements about learning earth science? | | | | |
|---|-----------|---|----------------|-------------------|----------------|---|
| | | Agree a lot | Agree a little | Disagree a little | Disagree a lot | |
| T | BSBE26A | 1) I enjoy learning earth science -----○ | ○ | ○ | ○ | ○ |
| T | BSBE26B * | 2) I wish I did not have to study earth science* -----○ | ○ | ○ | ○ | ○ |
| T | BSBE26C * | 3) Earth science is boring* -----○ | ○ | ○ | ○ | ○ |
| T | BSBE26D | 4) I learn many interesting things in earth science ---○ | ○ | ○ | ○ | ○ |
| T | BSBE26E | 5) I like earth science -----○ | ○ | ○ | ○ | ○ |
| | BSBE26F | 6) I look forward to learning earth science in school -----○ | ○ | ○ | ○ | ○ |
| | BSBE26G | 7) Earth science teaches me how things in the world work -----○ | ○ | ○ | ○ | ○ |
| | BSBE26H | 8) I like to conduct earth science experiments -----○ | ○ | ○ | ○ | ○ |
| | BSBE26I | 9) Earth science is one of my favorite subjects -----○ | ○ | ○ | ○ | ○ |

* Reverse coded

Very Much Like Like Do Not Like

10.9 8.6

T Trend item—item was included in the same scale in TIMSS 2011 and was used for linking the TIMSS 2011 and TIMSS 2015 scales.

Item Parameters for the TIMSS 2015 Students Like Learning Earth Science Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|----------|----------|----------|----------|---------|-------|
| BSBE26A | -0.23011 | -1.44006 | -0.28759 | 1.72765 | 0.77 |
| BSBE26B* | 0.38072 | -1.07357 | -0.31732 | 1.39089 | 1.61 |
| BSBE26C* | 0.15618 | -1.23747 | -0.35190 | 1.58937 | 1.40 |
| BSBE26D | -0.70905 | -1.24739 | -0.55289 | 1.80028 | 0.86 |
| BSBE26E | -0.12440 | -1.34236 | -0.29463 | 1.63699 | 0.65 |
| BSBE26F | 0.43991 | -1.68433 | 0.08108 | 1.60325 | 0.83 |
| BSBE26G | -0.82465 | -1.18029 | -0.67026 | 1.85055 | 1.09 |
| BSBE26H | 0.25967 | -1.34111 | -0.13343 | 1.47454 | 1.15 |
| BSBE26I | 0.65173 | -1.39181 | 0.01682 | 1.37499 | 0.85 |

*Reverse coded

Scale Transformation Constants for the TIMSS 2015 Students Like Learning Earth Science Scale, Eighth Grade

Scale Transformation Constants

A = 8.692574

B = 1.090836

Transformed Scale Score = 8.692574 + 1.090836 • Logit Scale Score

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Students Like Learning Earth Science Scale, Eighth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 3.96247 | |
| 1 | 5.17563 | |
| 2 | 5.76426 | |
| 3 | 6.17484 | |
| 4 | 6.50371 | |
| 5 | 6.78595 | |
| 6 | 7.03864 | |
| 7 | 7.27438 | |
| 8 | 7.49669 | |
| 9 | 7.70979 | |
| 10 | 7.91683 | |
| 11 | 8.12025 | |
| 12 | 8.32207 | |
| 13 | 8.52407 | 8.6 |
| 14 | 8.72785 | |
| 15 | 8.93490 | |
| 16 | 9.14666 | |
| 17 | 9.36457 | |
| 18 | 9.59024 | |
| 19 | 9.82482 | |
| 20 | 10.07207 | |
| 21 | 10.33557 | |
| 22 | 10.62160 | |
| 23 | 10.94063 | 10.9 |
| 24 | 11.31149 | |
| 25 | 11.76867 | |
| 26 | 12.41427 | |
| 27 | 13.69652 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Students Like Learning Earth Science Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | | |
|--------------------|--|-------------------------------|----------------------------------|----------|----------|---------|---------|---------|---------|---------|---------|--|
| | | | BSBE26A | BSBE26B* | BSBE26C* | BSBE26D | BSBE26E | BSBE26F | BSBE26G | BSBE26H | BSBE26I | |
| Georgia | 0.83 | 46 | 0.77 | 0.26 | 0.27 | 0.73 | 0.85 | 0.76 | 0.70 | 0.71 | 0.76 | |
| Hungary | 0.92 | 61 | 0.87 | 0.63 | 0.71 | 0.81 | 0.90 | 0.86 | 0.67 | 0.71 | 0.84 | |
| Kazakhstan | 0.88 | 54 | 0.80 | 0.37 | 0.47 | 0.81 | 0.88 | 0.81 | 0.75 | 0.73 | 0.83 | |
| Lebanon | - | - | - | - | - | - | - | - | - | - | - | |
| Lithuania | 0.91 | 60 | 0.87 | 0.64 | 0.68 | 0.77 | 0.90 | 0.82 | 0.70 | 0.70 | 0.84 | |
| Malta | 0.93 | 65 | 0.88 | 0.64 | 0.71 | 0.82 | 0.92 | 0.90 | 0.71 | 0.75 | 0.85 | |
| Morocco | 0.85 | 51 | 0.76 | 0.27 | 0.37 | 0.78 | 0.86 | 0.84 | 0.72 | 0.76 | 0.79 | |
| Russian Federation | 0.89 | 56 | 0.84 | 0.38 | 0.62 | 0.80 | 0.89 | 0.83 | 0.70 | 0.70 | 0.83 | |
| Slovenia | 0.93 | 64 | 0.86 | 0.66 | 0.73 | 0.84 | 0.92 | 0.90 | 0.68 | 0.71 | 0.86 | |
| Sweden | - | - | - | - | - | - | - | - | - | - | - | |

*Reverse coded

A dash (-) indicates comparable data not available.

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Students Like Learning Earth Science Scale, Eighth Grade, and TIMSS 2015 Science Achievement

| Country | Pearson's Correlation with Science Achievement | | Variance in Science Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|----------------------|--|-------------------|---|
| | (r) | (r ²) | |
| Georgia | 0.18 | 0.03 | 0.03 |
| Hungary | 0.02 | 0.00 | 0.00 |
| Kazakhstan | 0.09 | 0.01 | 0.01 |
| Lebanon | - | - | - |
| Lithuania | 0.13 | 0.02 | 0.02 |
| Malta | 0.16 | 0.03 | 0.02 |
| Morocco | 0.20 | 0.04 | 0.04 |
| Russian Federation | 0.04 | 0.00 | 0.00 |
| Slovenia | 0.07 | 0.01 | 0.00 |
| Sweden | - | - | - |
| International Median | 0.11 | 0.01 | 0.01 |

A dash (-) indicates comparable data not available.

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Students Like Learning Mathematics Scale, Eighth Grade

The Students Like Learning Mathematics (SLM) scale was created based on students' degree of agreement with the nine statements described below.

Items in the TIMSS 2015 Students Like Learning Mathematics Scale, Eighth Grade

| | | How much do you agree with these statements about learning mathematics? | | | |
|---|-----------|---|----------------|-------------------|----------------|
| | | Agree a lot | Agree a little | Disagree a little | Disagree a lot |
| T | BSBM17A | 1) I enjoy learning mathematics -----○ | ○ | ○ | ○ |
| T | BSBM17B * | 2) I wish I did not have to study mathematics* -----○ | ○ | ○ | ○ |
| T | BSBM17C * | 3) Mathematics is boring* -----○ | ○ | ○ | ○ |
| T | BSBM17D | 4) I learn many interesting things in mathematics ---○ | ○ | ○ | ○ |
| T | BSBM17E | 5) I like mathematics -----○ | ○ | ○ | ○ |
| | BSBM17F | 6) I like any schoolwork that involves numbers -----○ | ○ | ○ | ○ |
| | BSBM17G | 7) I like to solve mathematics problems-----○ | ○ | ○ | ○ |
| | BSBM17H | 8) I look forward to mathematics class -----○ | ○ | ○ | ○ |
| | BSBM17I | 9) Mathematics is one of my favorite subjects -----○ | ○ | ○ | ○ |

* Reverse coded

T Trend item—item was included in the same scale in TIMSS 2011 and was used for linking the TIMSS 2011 and TIMSS 2015 scales.

Item Parameters for the TIMSS 2015 Students Like Learning Mathematics Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|----------|----------|----------|----------|---------|-------|
| BSBM17A | -0.48929 | -1.41673 | -0.43072 | 1.84745 | 0.81 |
| BSBM17B* | -0.07466 | -1.22401 | 0.09794 | 1.12607 | 1.72 |
| BSBM17C* | 0.11238 | -1.62447 | 0.14173 | 1.48274 | 1.39 |
| BSBM17D | -0.71855 | -1.68593 | -0.23274 | 1.91867 | 1.10 |
| BSBM17E | -0.22025 | -1.25167 | -0.34163 | 1.59330 | 0.67 |
| BSBM17F | 0.20385 | -1.83417 | 0.00020 | 1.83397 | 1.01 |
| BSBM17G | 0.13127 | -1.51555 | -0.16902 | 1.68457 | 0.90 |
| BSBM17H | 0.56595 | -1.67774 | -0.09470 | 1.77244 | 0.92 |
| BSBM17I | 0.48930 | -1.06313 | -0.07995 | 1.14308 | 0.81 |

*Reverse coded

Scale Transformation Constants for the TIMSS 2015 Students Like Learning Mathematics Scale, Eighth Grade

| Scale Transformation Constants | |
|--------------------------------|--|
| A = 9.42706 | Transformed Scale Score = 9.42706 + 0.987588 • Logit Scale Score |
| B = 0.987588 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Students Like Learning Mathematics Scale, Eighth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 4.96789 | |
| 1 | 6.12033 | |
| 2 | 6.69346 | |
| 3 | 7.09477 | |
| 4 | 7.41571 | |
| 5 | 7.68894 | |
| 6 | 7.93203 | |
| 7 | 8.15498 | |
| 8 | 8.36376 | |
| 9 | 8.56346 | |
| 10 | 8.75617 | |
| 11 | 8.94416 | |
| 12 | 9.12922 | |
| 13 | 9.31285 | 9.4 |
| 14 | 9.49639 | |
| 15 | 9.68118 | |
| 16 | 9.86866 | |
| 17 | 10.06049 | |
| 18 | 10.25863 | |
| 19 | 10.46547 | |
| 20 | 10.68282 | |
| 21 | 10.91671 | |
| 22 | 11.17269 | |
| 23 | 11.46067 | 11.4 |
| 24 | 11.79792 | |
| 25 | 12.21629 | |
| 26 | 12.80770 | |
| 27 | 13.97818 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Students Like Learning Mathematics Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|----------|----------|---------|---------|---------|---------|---------|---------|--|
| | | | BSBM17A | BSBM17B* | BSBM17C* | BSBM17D | BSBM17E | BSBM17F | BSBM17G | BSBM17H | BSBM17I | |
| Australia | 0.94 | 67 | 0.88 | 0.71 | 0.74 | 0.74 | 0.91 | 0.81 | 0.85 | 0.86 | 0.85 | |
| Bahrain | 0.92 | 63 | 0.84 | 0.56 | 0.61 | 0.81 | 0.90 | 0.77 | 0.85 | 0.84 | 0.87 | |
| Botswana (9) | 0.87 | 50 | 0.76 | 0.52 | 0.60 | 0.64 | 0.83 | 0.68 | 0.77 | 0.70 | 0.78 | |
| Canada | 0.94 | 68 | 0.89 | 0.70 | 0.78 | 0.74 | 0.91 | 0.81 | 0.85 | 0.86 | 0.87 | |
| Chile | 0.93 | 66 | 0.85 | 0.61 | 0.72 | 0.74 | 0.90 | 0.83 | 0.87 | 0.86 | 0.87 | |
| Chinese Taipei | 0.95 | 70 | 0.89 | 0.74 | 0.78 | 0.83 | 0.92 | 0.85 | 0.88 | 0.78 | 0.88 | |
| Egypt | 0.88 | 54 | 0.78 | 0.33 | 0.48 | 0.75 | 0.86 | 0.75 | 0.83 | 0.82 | 0.82 | |
| England | 0.94 | 67 | 0.87 | 0.75 | 0.78 | 0.74 | 0.90 | 0.82 | 0.83 | 0.83 | 0.85 | |
| Georgia | 0.90 | 56 | 0.81 | 0.49 | 0.58 | 0.68 | 0.87 | 0.76 | 0.81 | 0.80 | 0.83 | |
| Hong Kong SAR | 0.94 | 69 | 0.89 | 0.67 | 0.73 | 0.82 | 0.92 | 0.84 | 0.88 | 0.81 | 0.89 | |
| Hungary | 0.93 | 65 | 0.87 | 0.67 | 0.72 | 0.76 | 0.91 | 0.82 | 0.83 | 0.82 | 0.84 | |
| Iran, Islamic Rep. of | 0.92 | 62 | 0.83 | 0.70 | 0.64 | 0.75 | 0.89 | 0.73 | 0.83 | 0.80 | 0.88 | |
| Ireland | 0.94 | 66 | 0.88 | 0.74 | 0.75 | 0.75 | 0.90 | 0.79 | 0.82 | 0.83 | 0.85 | |
| Israel | 0.93 | 65 | 0.85 | 0.64 | 0.73 | 0.80 | 0.90 | 0.78 | 0.85 | 0.80 | 0.87 | |
| Italy | 0.95 | 71 | 0.90 | 0.79 | 0.82 | 0.71 | 0.92 | 0.84 | 0.80 | 0.86 | 0.88 | |
| Japan | 0.94 | 68 | 0.88 | 0.61 | 0.72 | 0.82 | 0.92 | 0.85 | 0.88 | 0.82 | 0.88 | |
| Jordan | 0.91 | 60 | 0.82 | 0.45 | 0.55 | 0.78 | 0.90 | 0.79 | 0.84 | 0.87 | 0.86 | |
| Kazakhstan | 0.91 | 60 | 0.78 | 0.51 | 0.65 | 0.74 | 0.87 | 0.78 | 0.86 | 0.83 | 0.85 | |
| Korea, Rep. of | 0.94 | 70 | 0.89 | 0.66 | 0.78 | 0.83 | 0.92 | 0.86 | 0.87 | 0.77 | 0.89 | |
| Kuwait | 0.92 | 62 | 0.86 | 0.49 | 0.68 | 0.80 | 0.90 | 0.79 | 0.85 | 0.79 | 0.88 | |
| Lebanon | 0.87 | 52 | 0.77 | 0.45 | 0.42 | 0.66 | 0.87 | 0.74 | 0.81 | 0.75 | 0.85 | |
| Lithuania | 0.93 | 65 | 0.86 | 0.67 | 0.71 | 0.71 | 0.90 | 0.82 | 0.88 | 0.82 | 0.84 | |
| Malaysia | 0.89 | 54 | 0.82 | 0.58 | 0.67 | 0.74 | 0.86 | 0.75 | 0.60 | 0.73 | 0.82 | |
| Malta | 0.94 | 67 | 0.88 | 0.71 | 0.77 | 0.76 | 0.91 | 0.78 | 0.78 | 0.85 | 0.88 | |
| Morocco | 0.88 | 52 | 0.80 | 0.44 | 0.56 | 0.73 | 0.86 | 0.69 | 0.70 | 0.84 | 0.80 | |
| New Zealand | 0.93 | 64 | 0.87 | 0.67 | 0.70 | 0.71 | 0.90 | 0.81 | 0.83 | 0.84 | 0.85 | |
| Norway (9) | 0.94 | 70 | 0.88 | 0.71 | 0.78 | 0.80 | 0.92 | 0.84 | 0.89 | 0.86 | 0.85 | |
| Oman | 0.87 | 52 | 0.78 | 0.39 | 0.60 | 0.73 | 0.86 | 0.65 | 0.81 | 0.71 | 0.83 | |
| Qatar | 0.92 | 62 | 0.85 | 0.51 | 0.55 | 0.80 | 0.90 | 0.81 | 0.86 | 0.85 | 0.88 | |
| Russian Federation | 0.92 | 62 | 0.86 | 0.54 | 0.71 | 0.74 | 0.89 | 0.78 | 0.81 | 0.83 | 0.85 | |
| Saudi Arabia | 0.92 | 63 | 0.85 | 0.46 | 0.61 | 0.83 | 0.90 | 0.79 | 0.85 | 0.87 | 0.88 | |
| Singapore | 0.94 | 69 | 0.88 | 0.77 | 0.78 | 0.75 | 0.91 | 0.79 | 0.87 | 0.82 | 0.89 | |
| Slovenia | 0.93 | 66 | 0.85 | 0.64 | 0.80 | 0.78 | 0.91 | 0.78 | 0.84 | 0.86 | 0.84 | |
| South Africa (9) | 0.89 | 54 | 0.82 | 0.55 | 0.61 | 0.62 | 0.86 | 0.73 | 0.80 | 0.76 | 0.82 | |
| Sweden | 0.95 | 71 | 0.88 | 0.71 | 0.83 | 0.80 | 0.92 | 0.87 | 0.86 | 0.86 | 0.87 | |
| Thailand | 0.89 | 56 | 0.80 | 0.44 | 0.56 | 0.67 | 0.87 | 0.81 | 0.77 | 0.83 | 0.85 | |
| Turkey | 0.92 | 61 | 0.82 | 0.63 | 0.74 | 0.59 | 0.89 | 0.76 | 0.83 | 0.83 | 0.87 | |
| United Arab Emirates | 0.93 | 64 | 0.85 | 0.61 | 0.70 | 0.78 | 0.89 | 0.77 | 0.84 | 0.82 | 0.87 | |
| United States | 0.94 | 69 | 0.88 | 0.70 | 0.75 | 0.76 | 0.91 | 0.82 | 0.88 | 0.87 | 0.87 | |
| Benchmarking Participants | | | | | | | | | | | | |
| Buenos Aires, Argentina | 0.92 | 62 | 0.83 | 0.57 | 0.64 | 0.73 | 0.89 | 0.84 | 0.84 | 0.83 | 0.86 | |
| Ontario, Canada | 0.95 | 70 | 0.90 | 0.73 | 0.78 | 0.74 | 0.91 | 0.82 | 0.87 | 0.88 | 0.87 | |
| Quebec, Canada | 0.93 | 64 | 0.87 | 0.63 | 0.79 | 0.73 | 0.90 | 0.80 | 0.81 | 0.82 | 0.84 | |
| Norway (8) | 0.95 | 71 | 0.88 | 0.73 | 0.81 | 0.79 | 0.92 | 0.84 | 0.88 | 0.86 | 0.85 | |
| Abu Dhabi, UAE | 0.93 | 64 | 0.85 | 0.56 | 0.68 | 0.79 | 0.89 | 0.80 | 0.85 | 0.84 | 0.88 | |
| Dubai, UAE | 0.93 | 65 | 0.86 | 0.71 | 0.75 | 0.76 | 0.89 | 0.76 | 0.83 | 0.82 | 0.87 | |
| Florida, US | 0.94 | 68 | 0.88 | 0.68 | 0.71 | 0.77 | 0.91 | 0.81 | 0.89 | 0.86 | 0.86 | |

*Reverse coded

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Students Like Learning Mathematics Scale, Eighth Grade, and TIMSS 2015 Mathematics Achievement

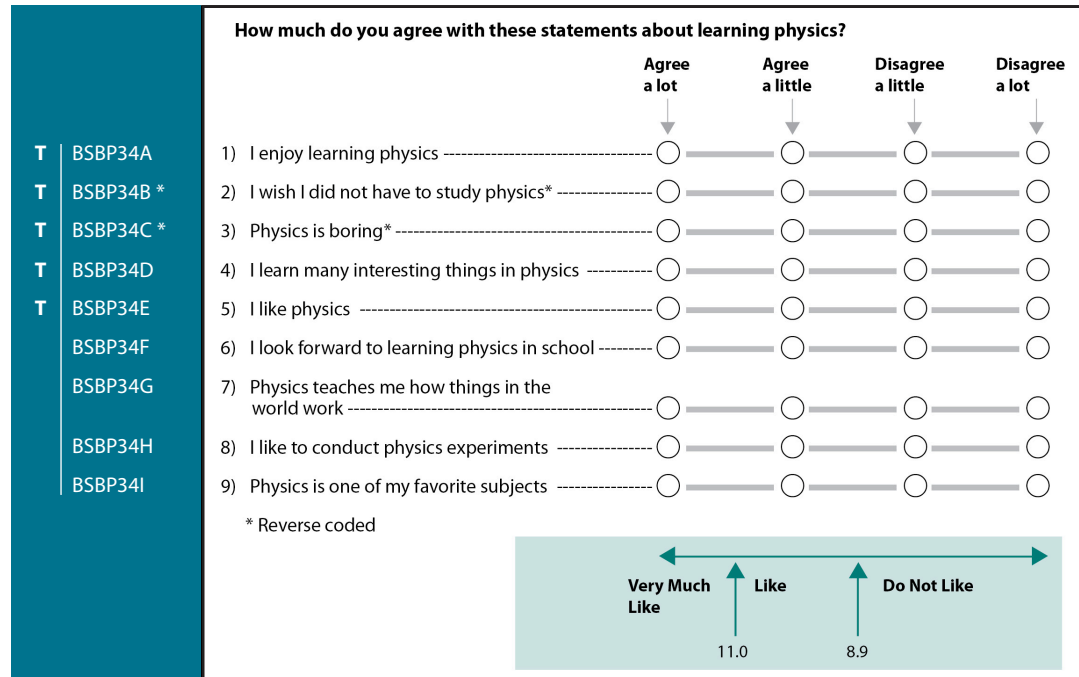
| Country | Pearson's Correlation with Mathematics Achievement | | Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|----------------------------------|--|-------------------|---|
| | (r) | (r ²) | |
| Australia | 0.34 | 0.11 | 0.09 |
| Bahrain | 0.27 | 0.07 | 0.07 |
| Botswana (9) | 0.27 | 0.07 | 0.07 |
| Canada | 0.36 | 0.13 | 0.10 |
| Chile | 0.25 | 0.06 | 0.07 |
| Chinese Taipei | 0.43 | 0.18 | 0.15 |
| Egypt | 0.24 | 0.06 | 0.08 |
| England | 0.30 | 0.09 | 0.08 |
| Georgia | 0.23 | 0.05 | 0.05 |
| Hong Kong SAR | 0.33 | 0.11 | 0.09 |
| Hungary | 0.29 | 0.09 | 0.08 |
| Iran, Islamic Rep. of | 0.27 | 0.07 | 0.07 |
| Ireland | 0.32 | 0.10 | 0.08 |
| Israel | 0.11 | 0.01 | 0.01 |
| Italy | 0.34 | 0.11 | 0.11 |
| Japan | 0.35 | 0.13 | 0.11 |
| Jordan | 0.16 | 0.03 | 0.04 |
| Kazakhstan | 0.18 | 0.03 | 0.03 |
| Korea, Rep. of | 0.40 | 0.16 | 0.13 |
| Kuwait | 0.16 | 0.02 | 0.02 |
| Lebanon | 0.18 | 0.03 | 0.04 |
| Lithuania | 0.28 | 0.08 | 0.07 |
| Malaysia | 0.27 | 0.07 | 0.06 |
| Malta | 0.26 | 0.07 | 0.06 |
| Morocco | 0.30 | 0.09 | 0.08 |
| New Zealand | 0.25 | 0.06 | 0.05 |
| Norway (9) | 0.40 | 0.16 | 0.13 |
| Oman | 0.26 | 0.07 | 0.07 |
| Qatar | 0.29 | 0.08 | 0.08 |
| Russian Federation | 0.25 | 0.06 | 0.06 |
| Saudi Arabia | 0.19 | 0.04 | 0.03 |
| Singapore | 0.32 | 0.10 | 0.08 |
| Slovenia | 0.30 | 0.09 | 0.08 |
| South Africa (9) | 0.08 | 0.01 | 0.02 |
| Sweden | 0.40 | 0.16 | 0.15 |
| Thailand | 0.19 | 0.04 | 0.04 |
| Turkey | 0.19 | 0.04 | 0.05 |
| United Arab Emirates | 0.23 | 0.05 | 0.05 |
| United States | 0.27 | 0.07 | 0.06 |
| International Median | 0.27 | 0.07 | 0.07 |
| Benchmarking Participants | | | |
| Buenos Aires, Argentina | 0.16 | 0.03 | 0.02 |
| Ontario, Canada | 0.41 | 0.17 | 0.15 |
| Quebec, Canada | 0.33 | 0.11 | 0.07 |
| Norway (8) | 0.35 | 0.12 | 0.10 |
| Abu Dhabi, UAE | 0.22 | 0.05 | 0.05 |
| Dubai, UAE | 0.27 | 0.07 | 0.07 |
| Florida, US | 0.16 | 0.03 | 0.03 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Students Like Learning Physics Scale, Eighth Grade

The Students Like Learning Physics (SLP) scale was created based on students' degree of agreement with the nine statements described below.

Items in the TIMSS 2015 Students Like Learning Physics Scale, Eighth Grade



T Trend item—item was included in the same scale in TIMSS 2011 and was used for linking the TIMSS 2011 and TIMSS 2015 scales.

Item Parameters for the TIMSS 2015 Students Like Learning Physics Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|----------|----------|----------|----------|---------|-------|
| BSBP34A | -0.07404 | -1.30547 | -0.15488 | 1.46035 | 0.78 |
| BSBP34B* | 0.45993 | -1.00740 | -0.17183 | 1.17923 | 1.73 |
| BSBP34C* | 0.26168 | -1.15919 | -0.28413 | 1.44332 | 1.54 |
| BSBP34D | -0.54501 | -1.21552 | -0.43870 | 1.65422 | 0.83 |
| BSBP34E | 0.07244 | -1.28315 | -0.11316 | 1.39631 | 0.62 |
| BSBP34F | 0.42153 | -1.49755 | 0.11984 | 1.37771 | 0.82 |
| BSBP34G | -0.62535 | -1.08281 | -0.62965 | 1.71246 | 1.12 |
| BSBP34H | -0.57460 | -0.91537 | -0.50031 | 1.41568 | 1.10 |
| BSBP34I | 0.60342 | -1.27446 | 0.09125 | 1.18321 | 0.80 |

*Reverse coded

Scale Transformation Constants for the TIMSS 2015 Students Like Learning Physics Scale, Eighth Grade

Scale Transformation Constants

$$A = 9.037567$$

$$B = 1.051045$$

$$\text{Transformed Scale Score} = 9.037567 + 1.051045 \cdot \text{Logit Scale Score}$$

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Students Like Learning Physics Scale, Eighth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 4.64895 | |
| 1 | 5.80878 | |
| 2 | 6.36558 | |
| 3 | 6.74953 | |
| 4 | 7.05428 | |
| 5 | 7.31372 | |
| 6 | 7.54411 | |
| 7 | 7.75905 | |
| 8 | 7.96155 | |
| 9 | 8.15567 | |
| 10 | 8.34431 | |
| 11 | 8.52962 | |
| 12 | 8.71320 | |
| 13 | 8.89640 | 8.9 |
| 14 | 9.08040 | |
| 15 | 9.26639 | |
| 16 | 9.45564 | |
| 17 | 9.64960 | |
| 18 | 9.85004 | |
| 19 | 10.05832 | |
| 20 | 10.27840 | |
| 21 | 10.51415 | |
| 22 | 10.77194 | |
| 23 | 11.06214 | 11.0 |
| 24 | 11.40300 | |
| 25 | 11.82828 | |
| 26 | 12.43593 | |
| 27 | 13.65813 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Students Like Learning Physics Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | | |
|--------------------|--|-------------------------------|----------------------------------|----------|----------|---------|---------|---------|---------|---------|---------|--|
| | | | BSBP34A | BSBP34B* | BSBP34C* | BSBP34D | BSBP34E | BSBP34F | BSBP34G | BSBP34H | BSBP34I | |
| Georgia | 0.87 | 52 | 0.83 | 0.35 | 0.38 | 0.76 | 0.88 | 0.82 | 0.68 | 0.71 | 0.83 | |
| Hungary | 0.92 | 62 | 0.88 | 0.62 | 0.68 | 0.82 | 0.91 | 0.85 | 0.69 | 0.72 | 0.85 | |
| Kazakhstan | 0.89 | 58 | 0.82 | 0.40 | 0.50 | 0.83 | 0.89 | 0.83 | 0.80 | 0.79 | 0.84 | |
| Lebanon | 0.86 | 54 | 0.81 | 0.19 | 0.19 | 0.82 | 0.90 | 0.82 | 0.78 | 0.80 | 0.85 | |
| Lithuania | 0.92 | 61 | 0.88 | 0.60 | 0.64 | 0.81 | 0.91 | 0.84 | 0.73 | 0.73 | 0.85 | |
| Malta | 0.93 | 65 | 0.89 | 0.66 | 0.70 | 0.83 | 0.92 | 0.90 | 0.75 | 0.70 | 0.88 | |
| Morocco | 0.85 | 52 | 0.77 | 0.22 | 0.31 | 0.82 | 0.87 | 0.86 | 0.76 | 0.79 | 0.80 | |
| Russian Federation | 0.90 | 57 | 0.85 | 0.41 | 0.59 | 0.81 | 0.89 | 0.83 | 0.73 | 0.72 | 0.85 | |
| Slovenia | 0.93 | 64 | 0.86 | 0.64 | 0.72 | 0.86 | 0.92 | 0.90 | 0.66 | 0.71 | 0.86 | |
| Sweden | 0.93 | 65 | 0.88 | 0.68 | 0.77 | 0.87 | 0.92 | 0.89 | 0.71 | 0.70 | 0.83 | |

*Reverse coded

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Students Like Learning Physics Scale, Eighth Grade, and TIMSS 2015 Science Achievement

| Country | Pearson's Correlation with Science Achievement | | Variance in Science Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|----------------------|--|-----------|---|
| | (r) | (r^2) | |
| Georgia | 0.14 | 0.02 | 0.03 |
| Hungary | 0.14 | 0.02 | 0.03 |
| Kazakhstan | 0.16 | 0.03 | 0.03 |
| Lebanon | 0.23 | 0.05 | 0.07 |
| Lithuania | 0.22 | 0.05 | 0.05 |
| Malta | 0.36 | 0.13 | 0.11 |
| Morocco | 0.23 | 0.05 | 0.05 |
| Russian Federation | 0.19 | 0.04 | 0.03 |
| Slovenia | 0.18 | 0.03 | 0.03 |
| Sweden | 0.22 | 0.05 | 0.04 |
| International Median | 0.21 | 0.04 | 0.03 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Students Like Learning Science Scale, Eighth Grade

The Students Like Learning Science (SLS) scale was created based on students' degree of agreement with the nine statements described below.

Items in the TIMSS 2015 Students Like Learning Science Scale, Eighth Grade

| | | How much do you agree with these statements about learning science? | | | |
|---|-----------|---|----------------|-------------------|----------------|
| | | Agree a lot | Agree a little | Disagree a little | Disagree a lot |
| T | BSBS21A | 1) I enjoy learning science -----○ | ○ | ○ | ○ |
| T | BSBS21B * | 2) I wish I did not have to study science* -----○ | ○ | ○ | ○ |
| T | BSBS21C * | 3) Science is boring*-----○ | ○ | ○ | ○ |
| T | BSBS21D | 4) I learn many interesting things in science -----○ | ○ | ○ | ○ |
| T | BSBS21E | 5) I like science -----○ | ○ | ○ | ○ |
| | BSBS21F | 6) I look forward to learning science in school -----○ | ○ | ○ | ○ |
| | BSBS21G | 7) Science teaches me how things in the world work -----○ | ○ | ○ | ○ |
| | BSBS21H | 8) I like to conduct science experiments -----○ | ○ | ○ | ○ |
| | BSBS21I | 9) Science is one of my favorite subjects -----○ | ○ | ○ | ○ |

* Reverse coded

Very Much Like Like Do Not Like

10.7 8.3

T Trend item—item was included in the same scale in TIMSS 2011 and was used for linking the TIMSS 2011 and TIMSS 2015 scales.

Item Parameters for the TIMSS 2015 Students Like Learning Science Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|----------|----------|----------|----------|---------|-------|
| BSBS21A | -0.13142 | -1.01695 | -0.52680 | 1.54375 | 0.76 |
| BSBS21B* | 0.56759 | -1.19007 | -0.00233 | 1.19240 | 1.65 |
| BSBS21C* | 0.47515 | -1.36232 | 0.00944 | 1.35288 | 1.42 |
| BSBS21D | -0.52383 | -0.93744 | -0.51695 | 1.45439 | 0.90 |
| BSBS21E | 0.01158 | -1.06294 | -0.35802 | 1.42096 | 0.65 |
| BSBS21F | 0.41917 | -1.45338 | -0.07468 | 1.52806 | 0.83 |
| BSBS21G | -0.64772 | -0.96459 | -0.57542 | 1.54001 | 1.10 |
| BSBS21H | -0.67455 | -0.78921 | -0.43697 | 1.22618 | 1.33 |
| BSBS21I | 0.50403 | -1.16503 | -0.06851 | 1.23354 | 0.81 |

*Reverse coded

Scale Transformation Constants for the TIMSS 2015 Students Like Learning Science Scale, Eighth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 8.489044 | Transformed Scale Score = 8.489044 + 1.163944 • Logit Scale Score |
| B = 1.163944 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Students Like Learning Science Scale, Eighth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 3.77142 | |
| 1 | 5.02704 | |
| 2 | 5.62048 | |
| 3 | 6.02909 | |
| 4 | 6.34989 | |
| 5 | 6.62088 | |
| 6 | 6.86531 | |
| 7 | 7.08748 | |
| 8 | 7.29855 | |
| 9 | 7.50187 | |
| 10 | 7.70183 | |
| 11 | 7.89809 | |
| 12 | 8.09428 | |
| 13 | 8.29197 | 8.3 |
| 14 | 8.49247 | |
| 15 | 8.69676 | |
| 16 | 8.90626 | |
| 17 | 9.12229 | |
| 18 | 9.34659 | |
| 19 | 9.58043 | |
| 20 | 9.82838 | |
| 21 | 10.09453 | |
| 22 | 10.38590 | |
| 23 | 10.71393 | 10.7 |
| 24 | 11.09720 | |
| 25 | 11.57741 | |
| 26 | 12.25898 | |
| 27 | 13.62135 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Students Like Learning Science Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|----------|----------|---------|---------|---------|---------|---------|---------|
| | | | BS8S21A | BS8S21B* | BS8S21C* | BS8S21D | BS8S21E | BS8S21F | BS8S21G | BS8S21H | BS8S21I |
| Australia | 0.93 | 65 | 0.89 | 0.71 | 0.75 | 0.81 | 0.92 | 0.91 | 0.73 | 0.61 | 0.87 |
| Bahrain | 0.89 | 56 | 0.83 | 0.37 | 0.45 | 0.83 | 0.89 | 0.86 | 0.78 | 0.68 | 0.87 |
| Botswana (9) | 0.83 | 44 | 0.72 | 0.50 | 0.61 | 0.65 | 0.79 | 0.71 | 0.59 | 0.58 | 0.75 |
| Canada | 0.92 | 61 | 0.88 | 0.65 | 0.74 | 0.79 | 0.91 | 0.88 | 0.68 | 0.59 | 0.87 |
| Chile | 0.89 | 56 | 0.86 | 0.45 | 0.61 | 0.80 | 0.89 | 0.82 | 0.71 | 0.66 | 0.84 |
| Chinese Taipei | 0.93 | 64 | 0.89 | 0.71 | 0.73 | 0.83 | 0.91 | 0.85 | 0.73 | 0.64 | 0.88 |
| Egypt | 0.81 | 45 | 0.69 | 0.25 | 0.35 | 0.73 | 0.82 | 0.80 | 0.71 | 0.70 | 0.77 |
| England | 0.93 | 65 | 0.89 | 0.77 | 0.78 | 0.80 | 0.92 | 0.90 | 0.71 | 0.57 | 0.87 |
| Georgia | - | - | - | - | - | - | - | - | - | - | - |
| Hong Kong SAR | 0.92 | 64 | 0.87 | 0.61 | 0.64 | 0.85 | 0.91 | 0.87 | 0.78 | 0.72 | 0.88 |
| Hungary | - | - | - | - | - | - | - | - | - | - | - |
| Iran, Islamic Rep. of | 0.89 | 54 | 0.83 | 0.59 | 0.59 | 0.74 | 0.87 | 0.80 | 0.67 | 0.63 | 0.85 |
| Ireland | 0.93 | 64 | 0.90 | 0.69 | 0.74 | 0.81 | 0.92 | 0.90 | 0.72 | 0.61 | 0.87 |
| Israel | 0.92 | 62 | 0.88 | 0.62 | 0.67 | 0.84 | 0.91 | 0.82 | 0.73 | 0.65 | 0.88 |
| Italy | 0.92 | 60 | 0.87 | 0.78 | 0.76 | 0.78 | 0.90 | 0.83 | 0.57 | 0.54 | 0.85 |
| Japan | 0.92 | 62 | 0.89 | 0.66 | 0.72 | 0.82 | 0.90 | 0.87 | 0.65 | 0.63 | 0.88 |
| Jordan | 0.86 | 54 | 0.78 | 0.33 | 0.42 | 0.81 | 0.88 | 0.86 | 0.74 | 0.71 | 0.85 |
| Kazakhstan | - | - | - | - | - | - | - | - | - | - | - |
| Korea, Rep. of | 0.93 | 65 | 0.89 | 0.71 | 0.76 | 0.82 | 0.91 | 0.83 | 0.72 | 0.66 | 0.89 |
| Kuwait | 0.89 | 56 | 0.83 | 0.49 | 0.62 | 0.79 | 0.89 | 0.85 | 0.66 | 0.62 | 0.86 |
| Lebanon | - | - | - | - | - | - | - | - | - | - | - |
| Lithuania | - | - | - | - | - | - | - | - | - | - | - |
| Malaysia | 0.90 | 56 | 0.83 | 0.55 | 0.61 | 0.80 | 0.87 | 0.74 | 0.77 | 0.69 | 0.82 |
| Malta | - | - | - | - | - | - | - | - | - | - | - |
| Morocco | - | - | - | - | - | - | - | - | - | - | - |
| New Zealand | 0.92 | 62 | 0.88 | 0.71 | 0.70 | 0.77 | 0.91 | 0.89 | 0.73 | 0.59 | 0.87 |
| Norway (9) | 0.92 | 63 | 0.88 | 0.76 | 0.79 | 0.81 | 0.91 | 0.88 | 0.66 | 0.50 | 0.84 |
| Oman | 0.84 | 49 | 0.75 | 0.31 | 0.46 | 0.76 | 0.85 | 0.78 | 0.74 | 0.68 | 0.81 |
| Qatar | 0.90 | 59 | 0.85 | 0.41 | 0.44 | 0.85 | 0.91 | 0.88 | 0.79 | 0.71 | 0.87 |
| Russian Federation | - | - | - | - | - | - | - | - | - | - | - |
| Saudi Arabia | 0.89 | 58 | 0.84 | 0.32 | 0.44 | 0.84 | 0.91 | 0.89 | 0.73 | 0.75 | 0.88 |
| Singapore | 0.92 | 63 | 0.87 | 0.78 | 0.78 | 0.77 | 0.91 | 0.87 | 0.70 | 0.54 | 0.87 |
| Slovenia | - | - | - | - | - | - | - | - | - | - | - |
| South Africa (9) | 0.87 | 51 | 0.79 | 0.49 | 0.58 | 0.67 | 0.86 | 0.80 | 0.64 | 0.68 | 0.81 |
| Sweden | - | - | - | - | - | - | - | - | - | - | - |
| Thailand | 0.86 | 50 | 0.75 | 0.45 | 0.52 | 0.71 | 0.83 | 0.76 | 0.72 | 0.68 | 0.83 |
| Turkey | 0.88 | 52 | 0.81 | 0.54 | 0.66 | 0.63 | 0.86 | 0.80 | 0.68 | 0.62 | 0.85 |
| United Arab Emirates | 0.91 | 60 | 0.84 | 0.55 | 0.63 | 0.82 | 0.89 | 0.86 | 0.76 | 0.65 | 0.86 |
| United States | 0.92 | 63 | 0.88 | 0.62 | 0.69 | 0.80 | 0.91 | 0.89 | 0.73 | 0.66 | 0.87 |
| Benchmarking Participants | | | | | | | | | | | |
| Buenos Aires, Argentina | 0.88 | 52 | 0.82 | 0.44 | 0.50 | 0.80 | 0.89 | 0.82 | 0.67 | 0.61 | 0.82 |
| Ontario, Canada | 0.92 | 63 | 0.88 | 0.67 | 0.75 | 0.79 | 0.91 | 0.89 | 0.70 | 0.61 | 0.88 |
| Quebec, Canada | 0.91 | 60 | 0.87 | 0.60 | 0.78 | 0.79 | 0.91 | 0.87 | 0.62 | 0.57 | 0.85 |
| Norway (8) | 0.93 | 63 | 0.88 | 0.75 | 0.80 | 0.83 | 0.92 | 0.89 | 0.67 | 0.48 | 0.85 |
| Abu Dhabi, UAE | 0.91 | 59 | 0.83 | 0.47 | 0.55 | 0.83 | 0.90 | 0.87 | 0.77 | 0.68 | 0.86 |
| Dubai, UAE | 0.92 | 61 | 0.86 | 0.67 | 0.74 | 0.79 | 0.89 | 0.85 | 0.72 | 0.56 | 0.87 |
| Florida, US | 0.92 | 61 | 0.88 | 0.56 | 0.64 | 0.82 | 0.91 | 0.88 | 0.76 | 0.65 | 0.86 |

*Reverse coded

A dash (-) indicates comparable data not available.

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Students Like Learning Science Scale, Eighth Grade, and TIMSS 2015 Science Achievement

| Country | Pearson's Correlation with Science Achievement | | Variance in Science Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|----------------------------------|--|-------------|---|
| | (r) | (r^2) | |
| Australia | 0.34 | 0.12 | 0.10 |
| Bahrain | 0.28 | 0.08 | 0.07 |
| Botswana (9) | 0.41 | 0.17 | 0.15 |
| Canada | 0.23 | 0.05 | 0.05 |
| Chile | 0.16 | 0.03 | 0.03 |
| Chinese Taipei | 0.38 | 0.14 | 0.12 |
| Egypt | 0.37 | 0.14 | 0.13 |
| England | 0.31 | 0.10 | 0.09 |
| Georgia | - | - | - |
| Hong Kong SAR | 0.32 | 0.10 | 0.09 |
| Hungary | - | - | - |
| Iran, Islamic Rep. of | 0.18 | 0.03 | 0.04 |
| Ireland | 0.39 | 0.15 | 0.13 |
| Israel | 0.20 | 0.04 | 0.03 |
| Italy | 0.19 | 0.03 | 0.03 |
| Japan | 0.30 | 0.09 | 0.08 |
| Jordan | 0.26 | 0.07 | 0.06 |
| Kazakhstan | - | - | - |
| Korea, Rep. of | 0.40 | 0.16 | 0.15 |
| Kuwait | 0.23 | 0.06 | 0.04 |
| Lebanon | - | - | - |
| Lithuania | - | - | - |
| Malaysia | 0.35 | 0.12 | 0.11 |
| Malta | - | - | - |
| Morocco | - | - | - |
| New Zealand | 0.27 | 0.07 | 0.06 |
| Norway (9) | 0.28 | 0.08 | 0.07 |
| Oman | 0.27 | 0.07 | 0.06 |
| Qatar | 0.36 | 0.13 | 0.12 |
| Russian Federation | - | - | - |
| Saudi Arabia | 0.27 | 0.07 | 0.07 |
| Singapore | 0.27 | 0.07 | 0.07 |
| Slovenia | - | - | - |
| South Africa (9) | 0.19 | 0.04 | 0.03 |
| Sweden | - | - | - |
| Thailand | 0.22 | 0.05 | 0.04 |
| Turkey | 0.22 | 0.05 | 0.05 |
| United Arab Emirates | 0.30 | 0.09 | 0.09 |
| United States | 0.26 | 0.07 | 0.06 |
| International Median | 0.27 | 0.07 | 0.07 |
| Benchmarking Participants | | | |
| Buenos Aires, Argentina | 0.10 | 0.01 | 0.01 |
| Ontario, Canada | 0.23 | 0.06 | 0.05 |
| Quebec, Canada | 0.25 | 0.06 | 0.05 |
| Norway (8) | 0.21 | 0.04 | 0.03 |
| Abu Dhabi, UAE | 0.29 | 0.08 | 0.08 |
| Dubai, UAE | 0.28 | 0.08 | 0.08 |
| Florida, US | 0.23 | 0.05 | 0.05 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

A dash (-) indicates comparable data not available.

Students' Sense of School Belonging Scale, Eighth Grade

The Students' Sense of School Belonging (SSB) scale was created based on students' degree of agreement with the seven statements described below.

Items in the TIMSS 2015 Students' Sense of School Belonging, Eighth Grade

What do you think about your school? Tell how much you agree with these statements.

| | Agree a lot | Agree a little | Disagree a little | Disagree a lot |
|--|-----------------------|-----------------------|-----------------------|-----------------------|
| BSBG15A 1) I like being in school ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| BSBG15B 2) I feel safe when I am at school ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| BSBG15C 3) I feel like I belong at this school ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| BSBG15D 4) I like to see my classmates at school ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| BSBG15E 5) Teachers at my school are fair to me ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| BSBG15F 6) I am proud to go to this school ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| BSBG15G 7) I learn a lot in school ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

High Sense of School Belonging 10.3 Sense of School Belonging 7.5 Little Sense of School Belonging

Item Parameters for the TIMSS 2015 Students' Sense of School Belonging Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|---------|----------|----------|----------|---------|-------|
| BSBG15A | 0.38218 | -0.95870 | -0.74432 | 1.70302 | 1.01 |
| BSBG15B | 0.07288 | -0.94599 | -0.58632 | 1.53231 | 0.99 |
| BSBG15C | 0.21160 | -0.83609 | -0.55012 | 1.38621 | 0.94 |
| BSBG15D | -0.73119 | -0.52286 | -0.46686 | 0.98972 | 1.17 |
| BSBG15E | 0.20067 | -0.98123 | -0.56256 | 1.54379 | 1.12 |
| BSBG15F | 0.26647 | -0.76246 | -0.50391 | 1.26637 | 0.91 |
| BSBG15G | -0.40261 | -0.89880 | -0.61886 | 1.51766 | 0.98 |

Scale Transformation Constants for the TIMSS 2015 Students' Sense of School Belonging Scale, Eighth Grade

Scale Transformation Constants

A = 7.847376

B = 1.363355

Transformed Scale Score = 7.847376 + 1.363355 • Logit Scale Score

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Students' Sense of School Belonging Scale, Eighth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 3.04846 | |
| 1 | 4.43161 | |
| 2 | 5.08351 | |
| 3 | 5.53680 | |
| 4 | 5.89159 | |
| 5 | 6.19976 | |
| 6 | 6.47840 | |
| 7 | 6.73927 | |
| 8 | 6.99036 | |
| 9 | 7.23785 | |
| 10 | 7.48892 | 7.5 |
| 11 | 7.74446 | |
| 12 | 8.01437 | |
| 13 | 8.30564 | |
| 14 | 8.62531 | |
| 15 | 8.98361 | |
| 16 | 9.39043 | |
| 17 | 9.85678 | |
| 18 | 10.39858 | 10.3 |
| 19 | 11.05536 | |
| 20 | 11.94384 | |
| 21 | 13.62245 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Students' Sense of School Belonging Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Factor Loadings for Each Item | | | | | | |
|----------------------------------|--|-------------------------------|-------------------------------|---------|---------|---------|---------|---------|---------|
| | | | BS8G15A | BS8G15B | BS8G15C | BS8G15D | BS8G15E | BS8G15F | BS8G15G |
| Australia | 0.86 | 55 | 0.75 | 0.75 | 0.81 | 0.55 | 0.70 | 0.84 | 0.75 |
| Bahrain | 0.83 | 50 | 0.73 | 0.73 | 0.77 | 0.51 | 0.65 | 0.80 | 0.70 |
| Botswana (9) | 0.68 | 36 | 0.66 | 0.65 | 0.64 | 0.53 | 0.42 | 0.66 | 0.59 |
| Canada | 0.83 | 49 | 0.70 | 0.72 | 0.76 | 0.59 | 0.64 | 0.81 | 0.70 |
| Chile | 0.85 | 53 | 0.71 | 0.77 | 0.77 | 0.60 | 0.66 | 0.82 | 0.72 |
| Chinese Taipei | 0.82 | 49 | 0.71 | 0.72 | 0.77 | 0.62 | 0.59 | 0.75 | 0.69 |
| Egypt | 0.81 | 47 | 0.69 | 0.71 | 0.77 | 0.47 | 0.63 | 0.76 | 0.71 |
| England | 0.84 | 51 | 0.74 | 0.72 | 0.80 | 0.48 | 0.67 | 0.82 | 0.72 |
| Georgia | 0.76 | 41 | 0.54 | 0.66 | 0.66 | 0.53 | 0.65 | 0.76 | 0.67 |
| Hong Kong SAR | 0.87 | 57 | 0.77 | 0.80 | 0.84 | 0.63 | 0.66 | 0.78 | 0.75 |
| Hungary | 0.80 | 46 | 0.73 | 0.69 | 0.78 | 0.50 | 0.62 | 0.79 | 0.58 |
| Iran, Islamic Rep. of | 0.72 | 40 | 0.69 | 0.73 | 0.70 | 0.52 | 0.65 | 0.40 | 0.67 |
| Ireland | 0.84 | 51 | 0.71 | 0.72 | 0.79 | 0.55 | 0.67 | 0.80 | 0.73 |
| Israel | 0.85 | 53 | 0.75 | 0.72 | 0.79 | 0.55 | 0.69 | 0.82 | 0.72 |
| Italy | 0.81 | 46 | 0.71 | 0.71 | 0.74 | 0.48 | 0.63 | 0.80 | 0.65 |
| Japan | 0.87 | 57 | 0.81 | 0.79 | 0.81 | 0.73 | 0.63 | 0.80 | 0.69 |
| Jordan | 0.82 | 48 | 0.70 | 0.70 | 0.79 | 0.54 | 0.59 | 0.79 | 0.71 |
| Kazakhstan | 0.80 | 46 | 0.67 | 0.62 | 0.72 | 0.61 | 0.69 | 0.76 | 0.67 |
| Korea, Rep. of | 0.86 | 54 | 0.77 | 0.76 | 0.76 | 0.71 | 0.62 | 0.78 | 0.73 |
| Kuwait | 0.80 | 45 | 0.69 | 0.71 | 0.75 | 0.47 | 0.61 | 0.79 | 0.64 |
| Lebanon | 0.78 | 44 | 0.64 | 0.72 | 0.75 | 0.55 | 0.55 | 0.72 | 0.66 |
| Lithuania | 0.79 | 45 | 0.71 | 0.73 | 0.68 | 0.56 | 0.63 | 0.75 | 0.60 |
| Malaysia | 0.80 | 45 | 0.72 | 0.69 | 0.61 | 0.55 | 0.65 | 0.78 | 0.69 |
| Malta | 0.84 | 51 | 0.74 | 0.74 | 0.79 | 0.51 | 0.64 | 0.82 | 0.74 |
| Morocco | 0.75 | 41 | 0.63 | 0.65 | 0.70 | 0.45 | 0.57 | 0.75 | 0.68 |
| New Zealand | 0.84 | 51 | 0.75 | 0.69 | 0.80 | 0.58 | 0.66 | 0.81 | 0.71 |
| Norway (9) | 0.84 | 52 | 0.74 | 0.75 | 0.81 | 0.60 | 0.66 | 0.75 | 0.70 |
| Oman | 0.80 | 45 | 0.66 | 0.69 | 0.74 | 0.53 | 0.64 | 0.76 | 0.67 |
| Qatar | 0.87 | 56 | 0.76 | 0.76 | 0.81 | 0.57 | 0.70 | 0.84 | 0.75 |
| Russian Federation | 0.81 | 48 | 0.72 | 0.71 | 0.74 | 0.58 | 0.63 | 0.77 | 0.65 |
| Saudi Arabia | 0.82 | 48 | 0.71 | 0.72 | 0.79 | 0.50 | 0.61 | 0.79 | 0.69 |
| Singapore | 0.86 | 54 | 0.77 | 0.75 | 0.83 | 0.62 | 0.63 | 0.82 | 0.71 |
| Slovenia | 0.84 | 52 | 0.70 | 0.75 | 0.76 | 0.51 | 0.69 | 0.83 | 0.74 |
| South Africa (9) | 0.72 | 38 | 0.63 | 0.63 | 0.72 | 0.50 | 0.45 | 0.73 | 0.61 |
| Sweden | 0.83 | 49 | 0.72 | 0.68 | 0.78 | 0.57 | 0.66 | 0.78 | 0.68 |
| Thailand | 0.76 | 42 | 0.62 | 0.65 | 0.65 | 0.47 | 0.68 | 0.72 | 0.69 |
| Turkey | 0.78 | 44 | 0.70 | 0.73 | 0.69 | 0.55 | 0.52 | 0.74 | 0.68 |
| United Arab Emirates | 0.88 | 58 | 0.72 | 0.78 | 0.78 | 0.72 | 0.70 | 0.82 | 0.81 |
| United States | 0.84 | 52 | 0.70 | 0.71 | 0.79 | 0.59 | 0.69 | 0.82 | 0.71 |
| Benchmarking Participants | | | | | | | | | |
| Buenos Aires, Argentina | 0.80 | 46 | 0.68 | 0.68 | 0.71 | 0.59 | 0.59 | 0.78 | 0.70 |
| Ontario, Canada | 0.84 | 51 | 0.71 | 0.72 | 0.77 | 0.60 | 0.64 | 0.82 | 0.70 |
| Quebec, Canada | 0.80 | 45 | 0.68 | 0.72 | 0.71 | 0.57 | 0.59 | 0.76 | 0.67 |
| Norway (8) | 0.84 | 52 | 0.71 | 0.74 | 0.81 | 0.63 | 0.64 | 0.78 | 0.70 |
| Abu Dhabi, UAE | 0.88 | 57 | 0.73 | 0.78 | 0.77 | 0.71 | 0.69 | 0.81 | 0.79 |
| Dubai, UAE | 0.86 | 55 | 0.69 | 0.75 | 0.76 | 0.68 | 0.67 | 0.82 | 0.79 |
| Florida, US | 0.85 | 52 | 0.72 | 0.72 | 0.78 | 0.59 | 0.67 | 0.84 | 0.73 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Students' Sense of School Belonging Scale, Eighth Grade, and TIMSS 2015 Achievement

| Country | Pearson's Correlation with Achievement | | | | Variance in Achievement Accounted for by Difference Between Regions of the Scale (η^2) | |
|----------------------------------|--|-------------|-------------|-------------|---|-------------|
| | (r) | | (r) | | Mathematics | Science |
| | Mathematics | Science | Mathematics | Science | | |
| Australia | 0.29 | 0.29 | 0.08 | 0.09 | 0.07 | 0.07 |
| Bahrain | 0.15 | 0.15 | 0.02 | 0.02 | 0.02 | 0.02 |
| Botswana (9) | 0.16 | 0.19 | 0.02 | 0.04 | 0.02 | 0.03 |
| Canada | 0.16 | 0.16 | 0.03 | 0.03 | 0.03 | 0.02 |
| Chile | 0.12 | 0.11 | 0.01 | 0.01 | 0.01 | 0.01 |
| Chinese Taipei | 0.15 | 0.15 | 0.02 | 0.02 | 0.02 | 0.02 |
| Egypt | 0.07 | 0.07 | 0.00 | 0.01 | 0.00 | 0.01 |
| England | 0.27 | 0.27 | 0.08 | 0.07 | 0.06 | 0.06 |
| Georgia | 0.08 | 0.09 | 0.01 | 0.01 | 0.01 | 0.01 |
| Hong Kong SAR | 0.23 | 0.19 | 0.05 | 0.04 | 0.05 | 0.03 |
| Hungary | 0.17 | 0.15 | 0.03 | 0.02 | 0.02 | 0.01 |
| Iran, Islamic Rep. of | 0.02 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Ireland | 0.20 | 0.21 | 0.04 | 0.04 | 0.04 | 0.04 |
| Israel | 0.03 | 0.06 | 0.00 | 0.00 | 0.01 | 0.01 |
| Italy | 0.09 | 0.06 | 0.01 | 0.00 | 0.01 | 0.00 |
| Japan | 0.12 | 0.10 | 0.02 | 0.01 | 0.01 | 0.01 |
| Jordan | 0.01 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| Kazakhstan | 0.07 | 0.05 | 0.01 | 0.00 | 0.00 | 0.00 |
| Korea, Rep. of | 0.13 | 0.11 | 0.02 | 0.01 | 0.02 | 0.01 |
| Kuwait | 0.10 | 0.06 | 0.01 | 0.00 | 0.01 | 0.01 |
| Lebanon | 0.02 | 0.06 | 0.00 | 0.00 | 0.00 | 0.01 |
| Lithuania | 0.02 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Malaysia | 0.03 | 0.15 | 0.00 | 0.02 | 0.01 | 0.04 |
| Malta | 0.26 | 0.24 | 0.07 | 0.06 | 0.07 | 0.05 |
| Morocco | -0.01 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| New Zealand | 0.20 | 0.18 | 0.04 | 0.03 | 0.03 | 0.03 |
| Norway (9) | 0.16 | 0.16 | 0.03 | 0.02 | 0.03 | 0.03 |
| Oman | 0.10 | 0.11 | 0.01 | 0.01 | 0.01 | 0.01 |
| Qatar | 0.20 | 0.22 | 0.04 | 0.05 | 0.04 | 0.05 |
| Russian Federation | 0.07 | 0.03 | 0.01 | 0.00 | 0.00 | 0.00 |
| Saudi Arabia | 0.04 | 0.08 | 0.00 | 0.01 | 0.01 | 0.01 |
| Singapore | 0.19 | 0.18 | 0.04 | 0.03 | 0.03 | 0.03 |
| Slovenia | 0.12 | 0.14 | 0.02 | 0.02 | 0.01 | 0.02 |
| South Africa (9) | 0.03 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Sweden | 0.18 | 0.17 | 0.03 | 0.03 | 0.03 | 0.03 |
| Thailand | 0.04 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Turkey | -0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| United Arab Emirates | 0.29 | 0.30 | 0.09 | 0.09 | 0.08 | 0.08 |
| United States | 0.23 | 0.21 | 0.05 | 0.05 | 0.05 | 0.04 |
| International Median | 0.12 | 0.11 | 0.02 | 0.01 | 0.01 | 0.01 |
| Benchmarking Participants | | | | | | |
| Buenos Aires, Argentina | 0.12 | 0.11 | 0.02 | 0.01 | 0.01 | 0.01 |
| Ontario, Canada | 0.17 | 0.16 | 0.03 | 0.03 | 0.03 | 0.03 |
| Quebec, Canada | 0.20 | 0.17 | 0.04 | 0.03 | 0.03 | 0.03 |
| Norway (8) | 0.17 | 0.15 | 0.03 | 0.02 | 0.03 | 0.03 |
| Abu Dhabi, UAE | 0.24 | 0.22 | 0.06 | 0.05 | 0.06 | 0.05 |
| Dubai, UAE | 0.28 | 0.29 | 0.08 | 0.09 | 0.08 | 0.08 |
| Florida, US | 0.17 | 0.17 | 0.03 | 0.03 | 0.03 | 0.03 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Students Value Mathematics Scale, Eighth Grade

The Students Value Mathematics (SVM) scale was created based on students' degree of agreement with the nine statements described below.

Items in the TIMSS 2015 Students Value Mathematics Scale, Eighth Grade

| | | How much do you agree with these statements about mathematics? | | | |
|---|---------|--|----------------|-------------------|----------------|
| | | Agree a lot | Agree a little | Disagree a little | Disagree a lot |
| T | BSBM20A | 1) I think learning mathematics will help me in my daily life ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| T | BSBM20B | 2) I need mathematics to learn other school subjects ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| T | BSBM20C | 3) I need to do well in mathematics to get into the university of my choice ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| T | BSBM20D | 4) I need to do well in mathematics to get the job I want ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| T | BSBM20E | 5) I would like a job that involves using mathematics ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| | BSBM20F | 6) It is important to learn about mathematics to get ahead in the world ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| | BSBM20G | 7) Learning mathematics will give me more job opportunities when I am an adult ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| | BSBM20H | 8) My parents think that it is important that I do well in mathematics ----- ○ ——— ○ ——— ○ ——— ○ | | | |
| | BSBM20I | 9) It is important to do well in mathematics ----- ○ ——— ○ ——— ○ ——— ○ | | | |

←
↑
↑
↑
→

Strongly Value Mathematics
Value Mathematics
Do Not Value Mathematics

10.3
7.7

T Trend item—item was included in the same scale in TIMSS 2011 and was used for linking the TIMSS 2011 and TIMSS 2015 scales.

Item Parameters for the TIMSS 2015 Students Value Mathematics Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|---------|----------|----------|----------|---------|-------|
| BSBM20A | -0.09861 | -0.83768 | -0.54142 | 1.37910 | 1.06 |
| BSBM20B | 0.18629 | -1.33201 | -0.44135 | 1.77336 | 1.09 |
| BSBM20C | -0.25501 | -0.94177 | -0.29071 | 1.23248 | 0.97 |
| BSBM20D | -0.04767 | -1.09264 | -0.15715 | 1.24979 | 0.90 |
| BSBM20E | 1.50538 | -1.33717 | -0.05987 | 1.39704 | 1.32 |
| BSBM20F | 0.03583 | -1.16694 | -0.36329 | 1.53023 | 0.86 |
| BSBM20G | -0.24374 | -1.00834 | -0.47571 | 1.48405 | 0.85 |
| BSBM20H | -0.52892 | -0.96883 | -0.41750 | 1.38633 | 1.17 |
| BSBM20I | -0.55355 | -0.78232 | -0.54990 | 1.33222 | 0.91 |

Scale Transformation Constants for the TIMSS 2015 Students Value Mathematics Scale, Eighth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 7.964227 | Transformed Scale Score = 7.964227 + 1.234642 • Logit Scale Score |
| B = 1.234642 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Students Value Mathematics Scale, Eighth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 2.99893 | |
| 1 | 4.33377 | |
| 2 | 4.96171 | |
| 3 | 5.38958 | |
| 4 | 5.72259 | |
| 5 | 6.00170 | |
| 6 | 6.24837 | |
| 7 | 6.47387 | |
| 8 | 6.68550 | |
| 9 | 6.88836 | |
| 10 | 7.08629 | |
| 11 | 7.28237 | |
| 12 | 7.48033 | |
| 13 | 7.67979 | 7.7 |
| 14 | 7.88500 | |
| 15 | 8.09804 | |
| 16 | 8.32084 | |
| 17 | 8.55527 | |
| 18 | 8.80299 | |
| 19 | 9.06690 | |
| 20 | 9.34984 | |
| 21 | 9.65639 | |
| 22 | 9.99387 | |
| 23 | 10.37453 | 10.3 |
| 24 | 10.81825 | |
| 25 | 11.37143 | |
| 26 | 12.14660 | |
| 27 | 13.65262 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Students Value Mathematics Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|--|
| | | | BSBM20A | BSBM20B | BSBM20C | BSBM20D | BSBM20E | BSBM20F | BSBM20G | BSBM20H | BSBM20I | |
| Australia | 0.90 | 58 | 0.77 | 0.73 | 0.79 | 0.80 | 0.65 | 0.82 | 0.81 | 0.64 | 0.80 | |
| Bahrain | 0.90 | 57 | 0.72 | 0.73 | 0.80 | 0.78 | 0.62 | 0.82 | 0.82 | 0.67 | 0.78 | |
| Botswana (9) | 0.81 | 42 | 0.64 | 0.61 | 0.70 | 0.73 | 0.48 | 0.72 | 0.70 | 0.56 | 0.68 | |
| Canada | 0.88 | 52 | 0.71 | 0.68 | 0.75 | 0.76 | 0.63 | 0.77 | 0.79 | 0.62 | 0.78 | |
| Chile | 0.89 | 55 | 0.74 | 0.70 | 0.77 | 0.79 | 0.59 | 0.82 | 0.82 | 0.67 | 0.76 | |
| Chinese Taipei | 0.90 | 56 | 0.68 | 0.67 | 0.78 | 0.82 | 0.70 | 0.80 | 0.84 | 0.61 | 0.79 | |
| Egypt | 0.87 | 49 | 0.64 | 0.71 | 0.75 | 0.74 | 0.61 | 0.73 | 0.73 | 0.64 | 0.71 | |
| England | 0.87 | 51 | 0.71 | 0.69 | 0.71 | 0.75 | 0.60 | 0.79 | 0.78 | 0.61 | 0.76 | |
| Georgia | 0.88 | 54 | 0.72 | 0.68 | 0.73 | 0.77 | 0.57 | 0.80 | 0.78 | 0.69 | 0.81 | |
| Hong Kong SAR | 0.91 | 57 | 0.69 | 0.73 | 0.77 | 0.83 | 0.68 | 0.82 | 0.85 | 0.62 | 0.79 | |
| Hungary | 0.87 | 51 | 0.72 | 0.67 | 0.66 | 0.75 | 0.65 | 0.78 | 0.75 | 0.66 | 0.75 | |
| Iran, Islamic Rep. of | 0.88 | 51 | 0.66 | 0.64 | 0.77 | 0.78 | 0.67 | 0.78 | 0.75 | 0.60 | 0.74 | |
| Ireland | 0.87 | 51 | 0.68 | 0.66 | 0.74 | 0.77 | 0.63 | 0.79 | 0.77 | 0.59 | 0.75 | |
| Israel | 0.88 | 54 | 0.70 | 0.69 | 0.75 | 0.77 | 0.58 | 0.83 | 0.81 | 0.64 | 0.79 | |
| Italy | 0.86 | 47 | 0.71 | 0.63 | 0.68 | 0.74 | 0.65 | 0.79 | 0.78 | 0.56 | 0.61 | |
| Japan | 0.86 | 47 | 0.63 | 0.66 | 0.72 | 0.76 | 0.57 | 0.81 | 0.78 | 0.58 | 0.66 | |
| Jordan | 0.89 | 54 | 0.68 | 0.71 | 0.78 | 0.78 | 0.57 | 0.79 | 0.79 | 0.70 | 0.77 | |
| Kazakhstan | 0.91 | 58 | 0.73 | 0.67 | 0.82 | 0.83 | 0.70 | 0.78 | 0.83 | 0.70 | 0.77 | |
| Korea, Rep. of | 0.88 | 52 | 0.60 | 0.68 | 0.77 | 0.80 | 0.60 | 0.77 | 0.81 | 0.63 | 0.80 | |
| Kuwait | 0.86 | 49 | 0.68 | 0.66 | 0.74 | 0.73 | 0.64 | 0.76 | 0.76 | 0.58 | 0.73 | |
| Lebanon | 0.88 | 51 | 0.68 | 0.69 | 0.74 | 0.76 | 0.63 | 0.80 | 0.75 | 0.60 | 0.73 | |
| Lithuania | 0.88 | 52 | 0.71 | 0.69 | 0.73 | 0.79 | 0.60 | 0.73 | 0.78 | 0.63 | 0.78 | |
| Malaysia | 0.89 | 53 | 0.69 | 0.64 | 0.79 | 0.77 | 0.59 | 0.78 | 0.77 | 0.72 | 0.79 | |
| Malta | 0.88 | 52 | 0.70 | 0.70 | 0.73 | 0.76 | 0.59 | 0.80 | 0.79 | 0.61 | 0.75 | |
| Morocco | 0.85 | 47 | 0.64 | 0.67 | 0.74 | 0.75 | 0.60 | 0.71 | 0.72 | 0.60 | 0.72 | |
| New Zealand | 0.89 | 56 | 0.74 | 0.72 | 0.77 | 0.78 | 0.59 | 0.81 | 0.81 | 0.68 | 0.79 | |
| Norway (9) | 0.89 | 55 | 0.73 | 0.70 | 0.78 | 0.79 | 0.66 | 0.81 | 0.80 | 0.62 | 0.77 | |
| Oman | 0.85 | 46 | 0.65 | 0.63 | 0.72 | 0.70 | 0.57 | 0.74 | 0.73 | 0.65 | 0.70 | |
| Qatar | 0.91 | 60 | 0.73 | 0.75 | 0.81 | 0.80 | 0.64 | 0.84 | 0.83 | 0.73 | 0.81 | |
| Russian Federation | 0.89 | 55 | 0.72 | 0.69 | 0.78 | 0.80 | 0.67 | 0.79 | 0.80 | 0.61 | 0.75 | |
| Saudi Arabia | 0.89 | 55 | 0.72 | 0.74 | 0.78 | 0.77 | 0.61 | 0.81 | 0.80 | 0.64 | 0.75 | |
| Singapore | 0.87 | 50 | 0.68 | 0.64 | 0.74 | 0.76 | 0.60 | 0.79 | 0.78 | 0.59 | 0.75 | |
| Slovenia | 0.88 | 52 | 0.69 | 0.66 | 0.72 | 0.77 | 0.60 | 0.80 | 0.81 | 0.64 | 0.74 | |
| South Africa (9) | 0.82 | 44 | 0.65 | 0.57 | 0.73 | 0.75 | 0.50 | 0.71 | 0.72 | 0.57 | 0.70 | |
| Sweden | 0.88 | 51 | 0.64 | 0.65 | 0.80 | 0.80 | 0.64 | 0.75 | 0.77 | 0.64 | 0.72 | |
| Thailand | 0.88 | 53 | 0.61 | 0.66 | 0.75 | 0.79 | 0.60 | 0.80 | 0.79 | 0.74 | 0.77 | |
| Turkey | 0.87 | 50 | 0.63 | 0.68 | 0.74 | 0.77 | 0.65 | 0.81 | 0.77 | 0.55 | 0.73 | |
| United Arab Emirates | 0.90 | 56 | 0.72 | 0.70 | 0.79 | 0.79 | 0.62 | 0.81 | 0.81 | 0.68 | 0.77 | |
| United States | 0.89 | 54 | 0.72 | 0.70 | 0.73 | 0.77 | 0.60 | 0.83 | 0.82 | 0.65 | 0.78 | |
| Benchmarking Participants | | | | | | | | | | | | |
| Buenos Aires, Argentina | 0.86 | 48 | 0.72 | 0.66 | 0.66 | 0.73 | 0.56 | 0.78 | 0.78 | 0.58 | 0.71 | |
| Ontario, Canada | 0.88 | 53 | 0.70 | 0.67 | 0.75 | 0.75 | 0.64 | 0.80 | 0.78 | 0.63 | 0.78 | |
| Quebec, Canada | 0.86 | 50 | 0.67 | 0.64 | 0.74 | 0.77 | 0.61 | 0.71 | 0.80 | 0.64 | 0.75 | |
| Norway (8) | 0.88 | 54 | 0.73 | 0.69 | 0.79 | 0.77 | 0.62 | 0.80 | 0.80 | 0.60 | 0.77 | |
| Abu Dhabi, UAE | 0.90 | 57 | 0.73 | 0.72 | 0.80 | 0.80 | 0.62 | 0.81 | 0.82 | 0.70 | 0.78 | |
| Dubai, UAE | 0.89 | 54 | 0.71 | 0.65 | 0.78 | 0.78 | 0.65 | 0.81 | 0.81 | 0.65 | 0.75 | |
| Florida, US | 0.89 | 56 | 0.74 | 0.70 | 0.73 | 0.79 | 0.59 | 0.84 | 0.83 | 0.67 | 0.80 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Students Value Mathematics Scale, Eighth Grade, and TIMSS 2015 Mathematics Achievement

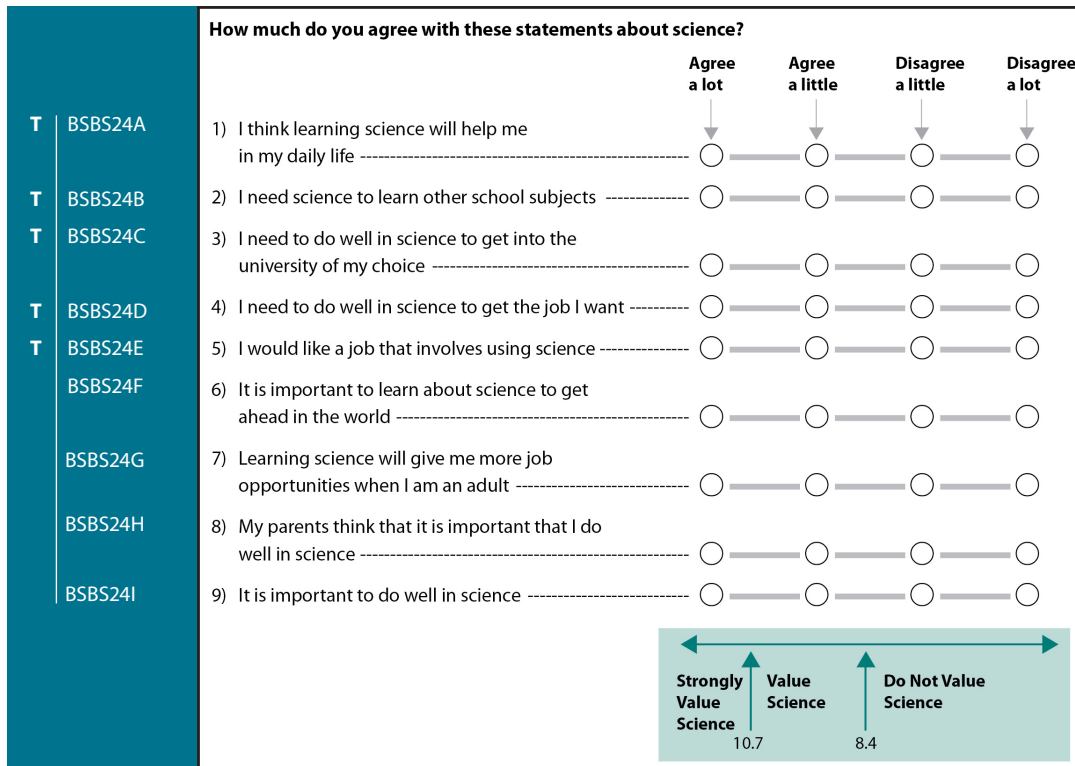
| Country | Pearson's Correlation with Mathematics Achievement | | Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|----------------------------------|--|-------------|---|
| | (r) | (r^2) | |
| Australia | 0.23 | 0.05 | 0.05 |
| Bahrain | 0.23 | 0.05 | 0.05 |
| Botswana (9) | 0.34 | 0.12 | 0.11 |
| Canada | 0.22 | 0.05 | 0.05 |
| Chile | 0.12 | 0.01 | 0.01 |
| Chinese Taipei | 0.36 | 0.13 | 0.12 |
| Egypt | 0.18 | 0.03 | 0.03 |
| England | 0.12 | 0.01 | 0.01 |
| Georgia | 0.11 | 0.01 | 0.02 |
| Hong Kong SAR | 0.24 | 0.06 | 0.06 |
| Hungary | 0.18 | 0.03 | 0.03 |
| Iran, Islamic Rep. of | 0.12 | 0.01 | 0.02 |
| Ireland | 0.15 | 0.02 | 0.02 |
| Israel | 0.16 | 0.02 | 0.03 |
| Italy | 0.19 | 0.04 | 0.03 |
| Japan | 0.24 | 0.06 | 0.04 |
| Jordan | 0.14 | 0.02 | 0.03 |
| Kazakhstan | 0.09 | 0.01 | 0.01 |
| Korea, Rep. of | 0.38 | 0.14 | 0.13 |
| Kuwait | 0.15 | 0.02 | 0.02 |
| Lebanon | 0.14 | 0.02 | 0.02 |
| Lithuania | 0.15 | 0.02 | 0.02 |
| Malaysia | 0.22 | 0.05 | 0.05 |
| Malta | 0.17 | 0.03 | 0.03 |
| Morocco | 0.19 | 0.03 | 0.03 |
| New Zealand | 0.16 | 0.02 | 0.02 |
| Norway (9) | 0.23 | 0.06 | 0.05 |
| Oman | 0.21 | 0.04 | 0.05 |
| Qatar | 0.27 | 0.07 | 0.07 |
| Russian Federation | 0.10 | 0.01 | 0.01 |
| Saudi Arabia | 0.12 | 0.02 | 0.02 |
| Singapore | 0.11 | 0.01 | 0.02 |
| Slovenia | 0.18 | 0.03 | 0.02 |
| South Africa (9) | 0.15 | 0.02 | 0.02 |
| Sweden | 0.20 | 0.04 | 0.04 |
| Thailand | 0.19 | 0.03 | 0.03 |
| Turkey | 0.14 | 0.02 | 0.02 |
| United Arab Emirates | 0.22 | 0.05 | 0.05 |
| United States | 0.17 | 0.03 | 0.02 |
| International Median | 0.18 | 0.03 | 0.03 |
| Benchmarking Participants | | | |
| Buenos Aires, Argentina | 0.02 | 0.00 | 0.00 |
| Ontario, Canada | 0.25 | 0.06 | 0.05 |
| Quebec, Canada | 0.24 | 0.06 | 0.05 |
| Norway (8) | 0.17 | 0.03 | 0.03 |
| Abu Dhabi, UAE | 0.19 | 0.04 | 0.05 |
| Dubai, UAE | 0.25 | 0.06 | 0.05 |
| Florida, US | 0.07 | 0.01 | 0.00 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Students Value Science Scale, Eighth Grade

The Students Value Science (SVS) scale was created based on students' degree of agreement with the nine statements described below.

Items in the TIMSS 2015 Students Value Science Scale, Eighth Grade



T Trend item—item was included in the same scale in TIMSS 2011 and was used for linking the TIMSS 2011 and TIMSS 2015 scales.

Item Parameters for the TIMSS 2015 Students Value Science Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|---------|----------|----------|----------|---------|-------|
| BSBS24A | -0.49782 | -1.43829 | -0.52891 | 1.96720 | 1.12 |
| BSBS24B | 0.23455 | -1.99011 | -0.10911 | 2.09922 | 1.17 |
| BSBS24C | -0.05110 | -1.63211 | -0.09250 | 1.72461 | 0.92 |
| BSBS24D | 0.24137 | -1.62498 | 0.02997 | 1.59501 | 0.91 |
| BSBS24E | 0.99622 | -1.64483 | 0.11575 | 1.52908 | 1.21 |
| BSBS24F | -0.02119 | -1.69905 | -0.26791 | 1.96696 | 0.92 |
| BSBS24G | -0.07333 | -1.66588 | -0.23263 | 1.89851 | 0.90 |
| BSBS24H | -0.25840 | -1.75651 | -0.24059 | 1.99710 | 1.28 |
| BSBS24I | -0.57030 | -1.49224 | -0.39374 | 1.88598 | 1.07 |

Scale Transformation Constants for the TIMSS 2015 Students Value Science Scale, Eighth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 8.556049 | Transformed Scale Score = 8.556049 + 0.9487 • Logit Scale Score |
| B = 0.9487 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Students Value Science Scale, Eighth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 4.14796 | |
| 1 | 5.24468 | |
| 2 | 5.78617 | |
| 3 | 6.16816 | |
| 4 | 6.47284 | |
| 5 | 6.73402 | |
| 6 | 6.97032 | |
| 7 | 7.18668 | |
| 8 | 7.39377 | |
| 9 | 7.59437 | |
| 10 | 7.79236 | |
| 11 | 7.98819 | |
| 12 | 8.18496 | |
| 13 | 8.38409 | 8.4 |
| 14 | 8.58656 | |
| 15 | 8.79310 | |
| 16 | 9.00422 | |
| 17 | 9.22038 | |
| 18 | 9.44187 | |
| 19 | 9.67007 | |
| 20 | 9.90677 | |
| 21 | 10.15530 | |
| 22 | 10.42118 | |
| 23 | 10.71378 | 10.7 |
| 24 | 11.04984 | |
| 25 | 11.45997 | |
| 26 | 12.03246 | |
| 27 | 13.15815 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Students Value Science Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|
| | | | BS8S24A | BS8S24B | BS8S24C | BS8S24D | BS8S24E | BS8S24F | BS8S24G | BS8S24H | BS8S24I |
| Australia | 0.94 | 67 | 0.82 | 0.79 | 0.86 | 0.85 | 0.79 | 0.85 | 0.86 | 0.72 | 0.83 |
| Bahrain | 0.93 | 63 | 0.77 | 0.78 | 0.83 | 0.83 | 0.76 | 0.83 | 0.83 | 0.72 | 0.79 |
| Botswana (9) | 0.86 | 48 | 0.65 | 0.65 | 0.76 | 0.75 | 0.64 | 0.72 | 0.74 | 0.60 | 0.70 |
| Canada | 0.92 | 63 | 0.79 | 0.76 | 0.84 | 0.83 | 0.76 | 0.82 | 0.83 | 0.70 | 0.78 |
| Chile | 0.93 | 65 | 0.79 | 0.76 | 0.86 | 0.86 | 0.80 | 0.85 | 0.87 | 0.71 | 0.72 |
| Chinese Taipei | 0.92 | 63 | 0.71 | 0.75 | 0.83 | 0.86 | 0.79 | 0.83 | 0.86 | 0.68 | 0.79 |
| Egypt | 0.89 | 53 | 0.64 | 0.71 | 0.78 | 0.77 | 0.71 | 0.76 | 0.76 | 0.70 | 0.73 |
| England | 0.92 | 63 | 0.79 | 0.75 | 0.82 | 0.83 | 0.75 | 0.85 | 0.84 | 0.70 | 0.81 |
| Georgia | 0.91 | 60 | 0.71 | 0.75 | 0.79 | 0.81 | 0.69 | 0.82 | 0.83 | 0.75 | 0.80 |
| Hong Kong SAR | 0.94 | 67 | 0.70 | 0.78 | 0.87 | 0.88 | 0.81 | 0.84 | 0.88 | 0.74 | 0.82 |
| Hungary | 0.91 | 57 | 0.73 | 0.74 | 0.78 | 0.82 | 0.75 | 0.79 | 0.79 | 0.73 | 0.65 |
| Iran, Islamic Rep. of | 0.91 | 59 | 0.72 | 0.72 | 0.82 | 0.82 | 0.78 | 0.82 | 0.81 | 0.68 | 0.75 |
| Ireland | 0.92 | 62 | 0.78 | 0.73 | 0.84 | 0.82 | 0.77 | 0.82 | 0.82 | 0.71 | 0.81 |
| Israel | 0.94 | 67 | 0.82 | 0.84 | 0.86 | 0.86 | 0.78 | 0.89 | 0.86 | 0.65 | 0.81 |
| Italy | 0.89 | 55 | 0.73 | 0.68 | 0.77 | 0.79 | 0.78 | 0.80 | 0.81 | 0.62 | 0.62 |
| Japan | 0.90 | 55 | 0.68 | 0.71 | 0.80 | 0.83 | 0.67 | 0.84 | 0.81 | 0.64 | 0.63 |
| Jordan | 0.92 | 60 | 0.71 | 0.76 | 0.83 | 0.83 | 0.70 | 0.83 | 0.81 | 0.74 | 0.77 |
| Kazakhstan | 0.94 | 66 | 0.75 | 0.79 | 0.86 | 0.86 | 0.78 | 0.84 | 0.86 | 0.82 | 0.77 |
| Korea, Rep. of | 0.92 | 61 | 0.73 | 0.77 | 0.84 | 0.83 | 0.67 | 0.78 | 0.84 | 0.71 | 0.84 |
| Kuwait | 0.89 | 54 | 0.69 | 0.67 | 0.79 | 0.78 | 0.71 | 0.79 | 0.79 | 0.64 | 0.71 |
| Lebanon | 0.91 | 58 | 0.67 | 0.72 | 0.80 | 0.81 | 0.76 | 0.80 | 0.81 | 0.73 | 0.74 |
| Lithuania | 0.91 | 59 | 0.71 | 0.74 | 0.81 | 0.82 | 0.71 | 0.76 | 0.82 | 0.73 | 0.80 |
| Malaysia | 0.90 | 56 | 0.71 | 0.68 | 0.81 | 0.80 | 0.66 | 0.78 | 0.79 | 0.75 | 0.77 |
| Malta | 0.94 | 67 | 0.78 | 0.77 | 0.84 | 0.84 | 0.77 | 0.84 | 0.86 | 0.79 | 0.84 |
| Morocco | 0.89 | 54 | 0.65 | 0.72 | 0.79 | 0.78 | 0.73 | 0.76 | 0.76 | 0.69 | 0.75 |
| New Zealand | 0.93 | 65 | 0.81 | 0.78 | 0.84 | 0.83 | 0.76 | 0.84 | 0.84 | 0.75 | 0.82 |
| Norway (9) | 0.92 | 60 | 0.78 | 0.75 | 0.83 | 0.82 | 0.77 | 0.80 | 0.81 | 0.62 | 0.77 |
| Oman | 0.88 | 52 | 0.67 | 0.68 | 0.76 | 0.77 | 0.69 | 0.76 | 0.78 | 0.69 | 0.68 |
| Qatar | 0.94 | 67 | 0.79 | 0.78 | 0.86 | 0.85 | 0.79 | 0.86 | 0.87 | 0.78 | 0.81 |
| Russian Federation | 0.91 | 59 | 0.71 | 0.73 | 0.82 | 0.83 | 0.74 | 0.79 | 0.81 | 0.70 | 0.78 |
| Saudi Arabia | 0.93 | 62 | 0.75 | 0.77 | 0.82 | 0.82 | 0.74 | 0.83 | 0.84 | 0.74 | 0.79 |
| Singapore | 0.90 | 57 | 0.72 | 0.65 | 0.82 | 0.82 | 0.71 | 0.80 | 0.84 | 0.66 | 0.77 |
| Slovenia | 0.93 | 64 | 0.73 | 0.72 | 0.83 | 0.85 | 0.77 | 0.84 | 0.86 | 0.75 | 0.82 |
| South Africa (9) | 0.92 | 60 | 0.73 | 0.71 | 0.84 | 0.84 | 0.78 | 0.78 | 0.81 | 0.69 | 0.76 |
| Sweden | 0.92 | 60 | 0.70 | 0.72 | 0.85 | 0.85 | 0.77 | 0.82 | 0.81 | 0.70 | 0.75 |
| Thailand | 0.91 | 59 | 0.70 | 0.74 | 0.80 | 0.81 | 0.69 | 0.82 | 0.81 | 0.76 | 0.78 |
| Turkey | 0.90 | 55 | 0.64 | 0.72 | 0.79 | 0.81 | 0.75 | 0.82 | 0.79 | 0.62 | 0.71 |
| United Arab Emirates | 0.93 | 64 | 0.79 | 0.74 | 0.85 | 0.84 | 0.77 | 0.84 | 0.84 | 0.74 | 0.79 |
| United States | 0.92 | 62 | 0.79 | 0.75 | 0.82 | 0.83 | 0.76 | 0.85 | 0.85 | 0.68 | 0.77 |
| Benchmarking Participants | | | | | | | | | | | |
| Buenos Aires, Argentina | 0.91 | 58 | 0.75 | 0.77 | 0.80 | 0.82 | 0.75 | 0.74 | 0.83 | 0.65 | 0.71 |
| Ontario, Canada | 0.93 | 64 | 0.79 | 0.76 | 0.85 | 0.84 | 0.78 | 0.84 | 0.84 | 0.71 | 0.78 |
| Quebec, Canada | 0.92 | 60 | 0.77 | 0.75 | 0.84 | 0.83 | 0.74 | 0.76 | 0.82 | 0.69 | 0.78 |
| Norway (8) | 0.92 | 62 | 0.79 | 0.76 | 0.85 | 0.84 | 0.75 | 0.82 | 0.81 | 0.65 | 0.77 |
| Abu Dhabi, UAE | 0.94 | 66 | 0.81 | 0.77 | 0.86 | 0.84 | 0.76 | 0.86 | 0.86 | 0.77 | 0.80 |
| Dubai, UAE | 0.92 | 62 | 0.77 | 0.71 | 0.84 | 0.84 | 0.79 | 0.82 | 0.85 | 0.70 | 0.78 |
| Florida, US | 0.92 | 63 | 0.79 | 0.76 | 0.83 | 0.82 | 0.75 | 0.85 | 0.85 | 0.70 | 0.79 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Students Value Science Scale, Eighth Grade, and TIMSS 2015 Science Achievement

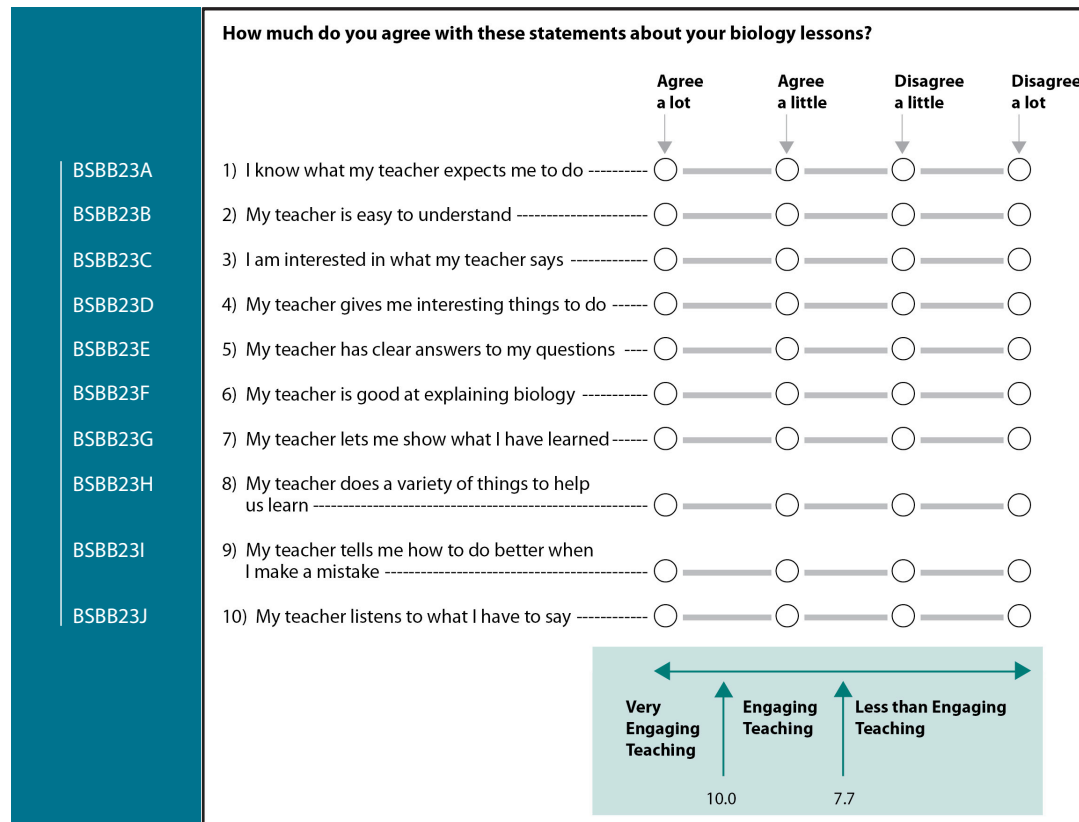
| Country | Pearson's Correlation with Science Achievement | | Variance in Science Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|----------------------------------|--|-------------|---|
| | (r) | (r^2) | |
| Australia | 0.32 | 0.10 | 0.09 |
| Bahrain | 0.20 | 0.04 | 0.03 |
| Botswana (9) | 0.43 | 0.18 | 0.16 |
| Canada | 0.24 | 0.06 | 0.05 |
| Chile | 0.03 | 0.00 | 0.00 |
| Chinese Taipei | 0.35 | 0.12 | 0.10 |
| Egypt | 0.21 | 0.05 | 0.04 |
| England | 0.24 | 0.06 | 0.06 |
| Georgia | 0.09 | 0.01 | 0.01 |
| Hong Kong SAR | 0.21 | 0.04 | 0.04 |
| Hungary | 0.07 | 0.01 | 0.01 |
| Iran, Islamic Rep. of | 0.11 | 0.01 | 0.01 |
| Ireland | 0.31 | 0.10 | 0.08 |
| Israel | 0.17 | 0.03 | 0.03 |
| Italy | 0.15 | 0.02 | 0.01 |
| Japan | 0.32 | 0.10 | 0.07 |
| Jordan | 0.16 | 0.02 | 0.03 |
| Kazakhstan | 0.10 | 0.01 | 0.01 |
| Korea, Rep. of | 0.38 | 0.15 | 0.13 |
| Kuwait | 0.14 | 0.02 | 0.01 |
| Lebanon | 0.22 | 0.05 | 0.05 |
| Lithuania | 0.06 | 0.00 | 0.00 |
| Malaysia | 0.20 | 0.04 | 0.08 |
| Malta | 0.43 | 0.18 | 0.15 |
| Morocco | 0.09 | 0.01 | 0.01 |
| New Zealand | 0.22 | 0.05 | 0.04 |
| Norway (9) | 0.18 | 0.03 | 0.03 |
| Oman | 0.18 | 0.03 | 0.03 |
| Qatar | 0.26 | 0.07 | 0.06 |
| Russian Federation | 0.01 | 0.00 | 0.00 |
| Saudi Arabia | 0.13 | 0.02 | 0.02 |
| Singapore | 0.25 | 0.06 | 0.07 |
| Slovenia | 0.24 | 0.06 | 0.06 |
| South Africa (9) | 0.02 | 0.00 | 0.01 |
| Sweden | 0.13 | 0.02 | 0.03 |
| Thailand | 0.21 | 0.04 | 0.04 |
| Turkey | 0.10 | 0.01 | 0.01 |
| United Arab Emirates | 0.24 | 0.06 | 0.06 |
| United States | 0.21 | 0.04 | 0.05 |
| International Median | 0.20 | 0.04 | 0.04 |
| Benchmarking Participants | | | |
| Buenos Aires, Argentina | -0.01 | 0.00 | 0.00 |
| Ontario, Canada | 0.24 | 0.06 | 0.05 |
| Quebec, Canada | 0.24 | 0.06 | 0.06 |
| Norway (8) | 0.13 | 0.02 | 0.01 |
| Abu Dhabi, UAE | 0.23 | 0.05 | 0.06 |
| Dubai, UAE | 0.23 | 0.05 | 0.05 |
| Florida, US | 0.18 | 0.03 | 0.03 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Students' Views on Engaging Teaching in Biology Lessons Scale, Eighth Grade

The Students' Views on Engaging Teaching in Biology Lessons (EBL) scale was created based on students' degree of agreement with the ten statements described below.

Items in the TIMSS 2015 Students' Views on Engaging Teaching in Biology Lessons Scale, Eighth Grade



Item Parameters for the TIMSS 2015 Students' Views on Engaging Teaching in Biology Lessons Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|---------|----------|----------|----------|---------|-------|
| BSBB23A | 0.23712 | -1.80522 | -0.57382 | 2.37904 | 1.35 |
| BSBB23B | 0.09871 | -1.66400 | -0.60548 | 2.26948 | 0.89 |
| BSBB23C | -0.05390 | -1.55671 | -0.51000 | 2.06671 | 1.04 |
| BSBB23D | 0.50295 | -1.83407 | -0.36609 | 2.20016 | 1.04 |
| BSBB23E | -0.13674 | -1.46308 | -0.64174 | 2.10482 | 0.78 |
| BSBB23F | -0.40148 | -1.23377 | -0.73035 | 1.96412 | 0.79 |
| BSBB23G | 0.15844 | -1.78687 | -0.61699 | 2.40386 | 1.00 |
| BSBB23H | -0.16665 | -1.62319 | -0.56659 | 2.18978 | 0.88 |
| BSBB23I | -0.01693 | -1.59071 | -0.58844 | 2.17915 | 0.91 |
| BSBB23J | -0.22152 | -1.30447 | -0.81869 | 2.12316 | 0.93 |

Scale Transformation Constants for the TIMSS 2015 Students' Views on Engaging Teaching in Biology Lessons Scale, Eighth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 7.952108 | Transformed Scale Score = 7.952108 + 0.927987 • Logit Scale Score |
| B = 0.927987 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Students' Views on Engaging Teaching in Biology Lessons Scale,
Eighth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 3.68279 | |
| 1 | 4.72056 | |
| 2 | 5.21810 | |
| 3 | 5.55682 | |
| 4 | 5.82253 | |
| 5 | 6.04443 | |
| 6 | 6.23952 | |
| 7 | 6.41702 | |
| 8 | 6.58151 | |
| 9 | 6.74042 | |
| 10 | 6.89504 | |
| 11 | 7.04799 | |
| 12 | 7.20164 | |
| 13 | 7.35828 | |
| 14 | 7.52021 | |
| 15 | 7.69015 | 7.7 |
| 16 | 7.86991 | |
| 17 | 8.06292 | |
| 18 | 8.27115 | |
| 19 | 8.49677 | |
| 20 | 8.73848 | |
| 21 | 8.99364 | |
| 22 | 9.25822 | |
| 23 | 9.52944 | |
| 24 | 9.80777 | |
| 25 | 10.09786 | 10.0 |
| 26 | 10.40930 | |
| 27 | 10.75637 | |
| 28 | 11.17501 | |
| 29 | 11.74935 | |
| 30 | 12.86128 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Students' Views on Engaging Teaching in Biology Lessons Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | | |
|--------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| | | | BS8B23A | BS8B23B | BS8B23C | BS8B23D | BS8B23E | BS8B23F | BS8B23G | BS8B23H | BS8B23I | BS8B23J |
| Georgia | 0.92 | 61 | 0.61 | 0.81 | 0.64 | 0.72 | 0.84 | 0.83 | 0.83 | 0.83 | 0.81 | 0.81 |
| Hungary | 0.92 | 59 | 0.72 | 0.78 | 0.77 | 0.68 | 0.82 | 0.83 | 0.76 | 0.76 | 0.78 | 0.79 |
| Kazakhstan | 0.94 | 66 | 0.66 | 0.79 | 0.84 | 0.82 | 0.85 | 0.83 | 0.83 | 0.81 | 0.84 | 0.82 |
| Lebanon | 0.93 | 61 | 0.64 | 0.79 | 0.78 | 0.78 | 0.81 | 0.80 | 0.78 | 0.81 | 0.81 | 0.79 |
| Lithuania | 0.94 | 65 | 0.73 | 0.83 | 0.80 | 0.79 | 0.85 | 0.84 | 0.74 | 0.82 | 0.82 | 0.82 |
| Malta | 0.95 | 67 | 0.74 | 0.86 | 0.82 | 0.84 | 0.86 | 0.85 | 0.76 | 0.80 | 0.82 | 0.82 |
| Morocco | 0.90 | 53 | 0.52 | 0.64 | 0.70 | 0.73 | 0.79 | 0.78 | 0.79 | 0.79 | 0.75 | 0.75 |
| Russian Federation | 0.93 | 62 | 0.65 | 0.79 | 0.82 | 0.78 | 0.83 | 0.81 | 0.74 | 0.81 | 0.81 | 0.78 |
| Slovenia | 0.95 | 67 | 0.76 | 0.81 | 0.80 | 0.82 | 0.87 | 0.86 | 0.80 | 0.84 | 0.82 | 0.81 |
| Sweden | 0.94 | 65 | 0.66 | 0.85 | 0.77 | 0.79 | 0.87 | 0.86 | 0.78 | 0.84 | 0.79 | 0.80 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Students' Views on Engaging Teaching in Biology Lessons Scale, Eighth Grade, and TIMSS 2015 Science Achievement

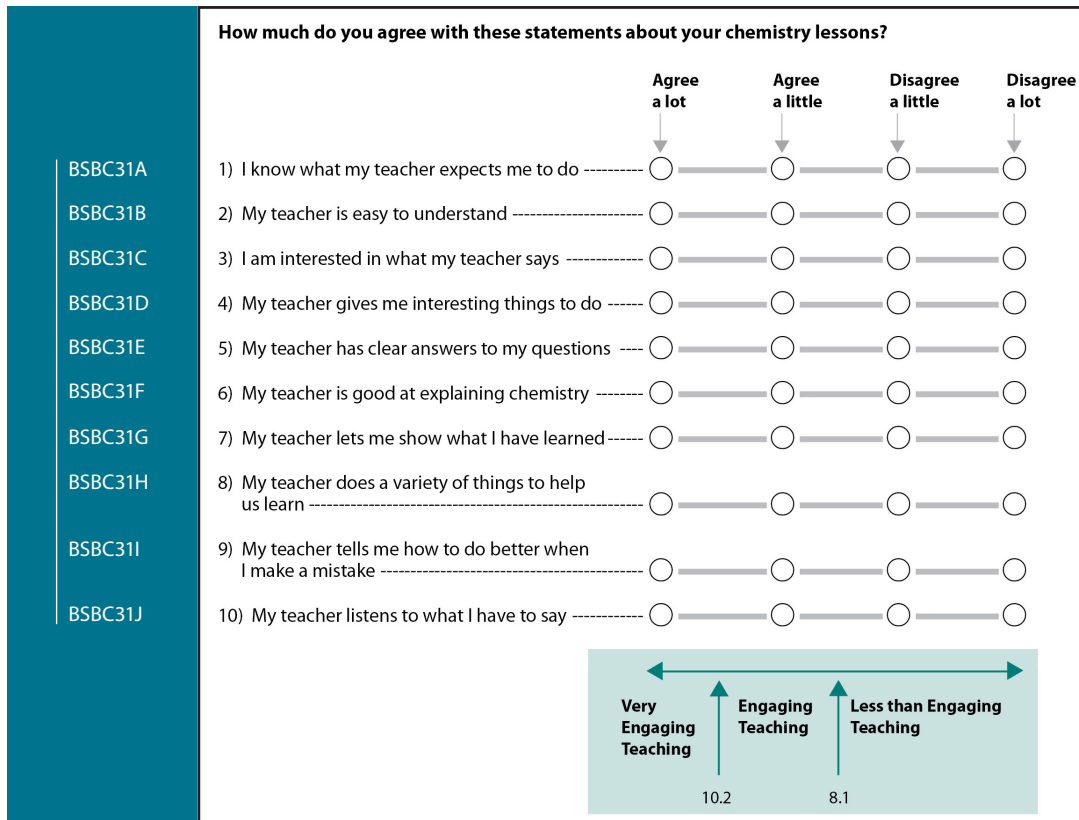
| Country | Pearson's Correlation with Science Achievement | | Variance in Science Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|----------------------|--|-----------|---|
| | (r) | (r^2) | |
| Georgia | 0.17 | 0.03 | 0.02 |
| Hungary | 0.03 | 0.00 | 0.01 |
| Kazakhstan | 0.12 | 0.01 | 0.01 |
| Lebanon | 0.17 | 0.03 | 0.03 |
| Lithuania | -0.06 | 0.00 | 0.00 |
| Malta | 0.21 | 0.04 | 0.05 |
| Morocco | 0.06 | 0.00 | 0.00 |
| Russian Federation | 0.03 | 0.00 | 0.00 |
| Slovenia | 0.04 | 0.00 | 0.00 |
| Sweden | 0.07 | 0.01 | 0.01 |
| International Median | 0.07 | 0.00 | 0.01 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Students' Views on Engaging Teaching in Chemistry Lessons Scale, Eighth Grade

The Students' Views on Engaging Teaching in Chemistry Lessons (ECL) scale was created based on students' degree of agreement with the ten statements described below.

Items in the TIMSS 2015 Students' Views on Engaging Teaching in Chemistry Lessons Scale, Eighth Grade



Item Parameters for the TIMSS 2015 Students' Views on Engaging Teaching in Chemistry Lessons Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|---------|----------|----------|----------|---------|-------|
| BSBC31A | 0.07176 | -1.72687 | -0.68347 | 2.41034 | 1.45 |
| BSBC31B | 0.30353 | -1.76760 | -0.59269 | 2.36029 | 0.92 |
| BSBC31C | 0.02753 | -1.65415 | -0.55147 | 2.20562 | 1.06 |
| BSBC31D | 0.40206 | -1.79741 | -0.49080 | 2.28821 | 0.99 |
| BSBC31E | -0.12482 | -1.51666 | -0.72854 | 2.24520 | 0.76 |
| BSBC31F | -0.24239 | -1.32402 | -0.74195 | 2.06597 | 0.79 |
| BSBC31G | 0.09528 | -1.85543 | -0.68204 | 2.53747 | 0.99 |
| BSBC31H | -0.14875 | -1.57374 | -0.70570 | 2.27944 | 0.91 |
| BSBC31I | -0.13601 | -1.57060 | -0.74049 | 2.31109 | 0.90 |
| BSBC31J | -0.24819 | -1.29577 | -0.93241 | 2.22818 | 0.98 |

Scale Transformation Constants for the TIMSS 2015 Students' Views on Engaging Teaching in Chemistry Lessons Scale, Eighth Grade

Scale Transformation Constants

$$A = 8.279016$$

$$B = 0.837128$$

$$\text{Transformed Scale Score} = 8.279016 + 0.837128 \cdot \text{Logit Scale Score}$$

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Equivalence Table of Raw and Transformed Scale Scores for the TIMSS 2015 Students' Views on Engaging Teaching in Chemistry Lessons Scale, Eighth Grade

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 4.41027 | |
| 1 | 5.34346 | |
| 2 | 5.78855 | |
| 3 | 6.09314 | |
| 4 | 6.32976 | |
| 5 | 6.52799 | |
| 6 | 6.70220 | |
| 7 | 6.86069 | |
| 8 | 7.00882 | |
| 9 | 7.15041 | |
| 10 | 7.28758 | |
| 11 | 7.42475 | |
| 12 | 7.56282 | |
| 13 | 7.70401 | |
| 14 | 7.85062 | |
| 15 | 8.00558 | 8.1 |
| 16 | 8.17066 | |
| 17 | 8.35004 | |
| 18 | 8.54624 | |
| 19 | 8.76229 | |
| 20 | 8.99643 | |
| 21 | 9.24435 | |
| 22 | 9.49933 | |
| 23 | 9.75669 | |
| 24 | 10.01650 | |
| 25 | 10.28369 | 10.2 |
| 26 | 10.56787 | |
| 27 | 10.88289 | |
| 28 | 11.26098 | |
| 29 | 11.77870 | |
| 30 | 12.78091 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Students' Views on Engaging Teaching in Chemistry Lessons Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | | |
|--------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| | | | B58C31A | B58C31B | B58C31C | B58C31D | B58C31E | B58C31F | B58C31G | B58C31H | B58C31I | B58C31J |
| Georgia | 0.94 | 68 | 0.67 | 0.85 | 0.74 | 0.81 | 0.87 | 0.86 | 0.86 | 0.86 | 0.85 | 0.85 |
| Hungary | 0.95 | 67 | 0.75 | 0.83 | 0.80 | 0.82 | 0.86 | 0.86 | 0.81 | 0.81 | 0.84 | 0.79 |
| Kazakhstan | 0.95 | 70 | 0.69 | 0.81 | 0.86 | 0.85 | 0.88 | 0.86 | 0.87 | 0.83 | 0.87 | 0.85 |
| Lebanon | 0.94 | 64 | 0.67 | 0.82 | 0.81 | 0.81 | 0.83 | 0.82 | 0.82 | 0.81 | 0.82 | 0.80 |
| Lithuania | 0.95 | 70 | 0.76 | 0.86 | 0.84 | 0.83 | 0.89 | 0.87 | 0.79 | 0.85 | 0.84 | 0.83 |
| Malta | 0.95 | 70 | 0.74 | 0.87 | 0.82 | 0.85 | 0.88 | 0.87 | 0.81 | 0.83 | 0.86 | 0.80 |
| Morocco | 0.91 | 56 | 0.56 | 0.69 | 0.71 | 0.77 | 0.80 | 0.79 | 0.77 | 0.81 | 0.77 | 0.77 |
| Russian Federation | 0.95 | 69 | 0.72 | 0.83 | 0.85 | 0.84 | 0.88 | 0.87 | 0.82 | 0.84 | 0.85 | 0.82 |
| Slovenia | 0.95 | 69 | 0.78 | 0.81 | 0.81 | 0.83 | 0.88 | 0.86 | 0.83 | 0.86 | 0.83 | 0.83 |
| Sweden | 0.94 | 66 | 0.70 | 0.86 | 0.76 | 0.80 | 0.87 | 0.86 | 0.80 | 0.84 | 0.81 | 0.79 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Students' Views on Engaging Teaching in Chemistry Lessons Scale, Eighth Grade, and TIMSS 2015 Science Achievement

| Country | Pearson's Correlation with Science Achievement | | Variance in Science Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|----------------------|--|-------------------|---|
| | (r) | (r ²) | |
| Georgia | 0.17 | 0.03 | 0.03 |
| Hungary | 0.01 | 0.00 | 0.00 |
| Kazakhstan | 0.14 | 0.02 | 0.02 |
| Lebanon | 0.17 | 0.03 | 0.03 |
| Lithuania | 0.05 | 0.00 | 0.01 |
| Malta | 0.20 | 0.04 | 0.03 |
| Morocco | 0.08 | 0.01 | 0.00 |
| Russian Federation | 0.12 | 0.02 | 0.01 |
| Slovenia | 0.17 | 0.03 | 0.03 |
| Sweden | 0.09 | 0.01 | 0.01 |
| International Median | 0.13 | 0.02 | 0.02 |

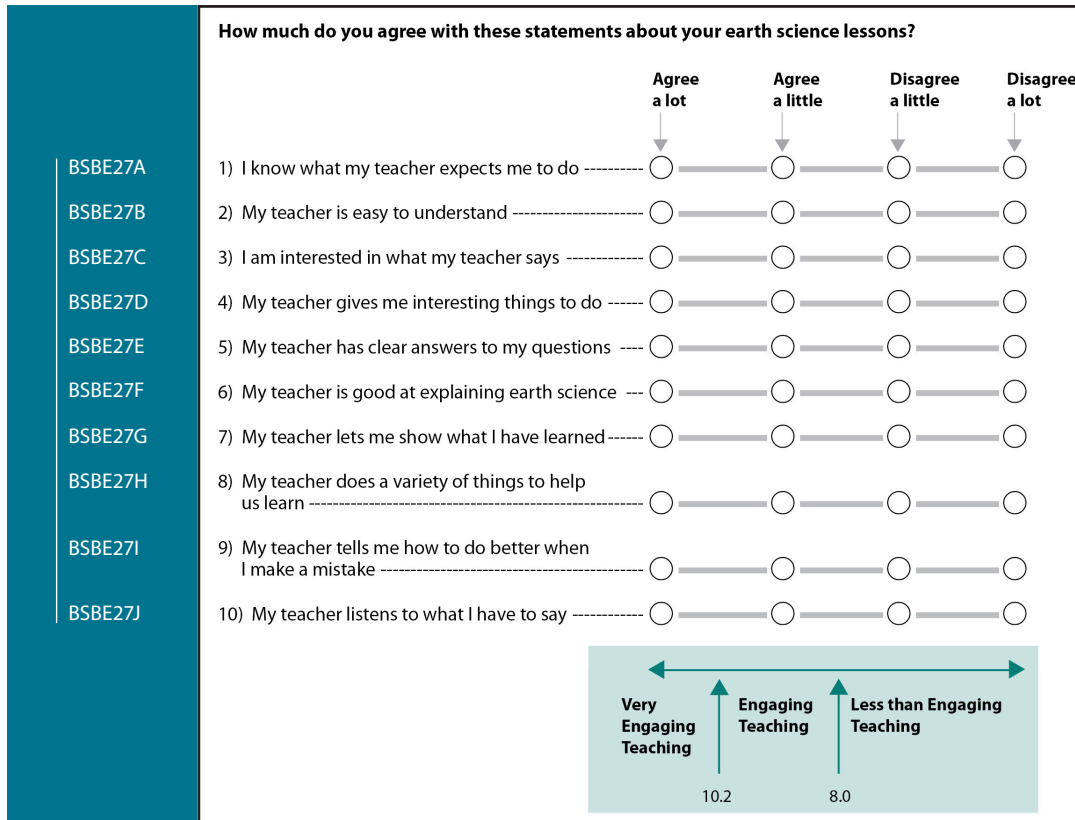
SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Students' Views on Engaging Teaching in Earth Science Lessons Scale, Eighth Grade

The Students' Views on Engaging Teaching in Earth Science Lessons (EEL) scale was created based on students' degree of agreement with the ten statements described below.

Items in the TIMSS 2015 Students' Views on Engaging Teaching in Earth Science Lessons Scale, Eighth Grade



Item Parameters for the TIMSS 2015 Students' Views on Engaging Teaching in Earth Science Lessons Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|---------|----------|----------|----------|---------|-------|
| BSBE27A | 0.12956 | -1.71093 | -0.75256 | 2.46349 | 1.42 |
| BSBE27B | 0.04083 | -1.71141 | -0.72731 | 2.43872 | 0.93 |
| BSBE27C | 0.01333 | -1.54955 | -0.64003 | 2.18958 | 1.03 |
| BSBE27D | 0.54229 | -1.90692 | -0.45837 | 2.36529 | 1.01 |
| BSBE27E | -0.17994 | -1.42332 | -0.85640 | 2.27972 | 0.78 |
| BSBE27F | -0.40825 | -1.23286 | -0.88078 | 2.11364 | 0.81 |
| BSBE27G | 0.18214 | -1.75319 | -0.75123 | 2.50442 | 0.99 |
| BSBE27H | -0.06175 | -1.60758 | -0.65571 | 2.26329 | 0.89 |
| BSBE27I | -0.05005 | -1.56783 | -0.79721 | 2.36504 | 0.88 |
| BSBE27J | -0.20816 | -1.24758 | -0.97820 | 2.22578 | 0.93 |

Scale Transformation Constants for the TIMSS 2015 Students' Views on Engaging Teaching in Earth Science Lessons Scale, Eighth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 8.234304 | Transformed Scale Score = 8.234304 + 0.852159 • Logit Scale Score |
| B = 0.852159 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Equivalence Table of Raw and Transformed Scale Scores for the TIMSS 2015 Students' Views on Engaging Teaching in Earth Science Lessons Scale, Eighth Grade

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 4.33255 | |
| 1 | 5.27283 | |
| 2 | 5.71900 | |
| 3 | 6.02192 | |
| 4 | 6.25730 | |
| 5 | 6.45433 | |
| 6 | 6.62742 | |
| 7 | 6.78489 | |
| 8 | 6.93215 | |
| 9 | 7.07301 | |
| 10 | 7.20936 | |
| 11 | 7.34636 | |
| 12 | 7.48448 | |
| 13 | 7.62603 | |
| 14 | 7.77348 | |
| 15 | 7.93005 | 8.0 |
| 16 | 8.09752 | |
| 17 | 8.28072 | |
| 18 | 8.48271 | |
| 19 | 8.70699 | |
| 20 | 8.95182 | |
| 21 | 9.21199 | |
| 22 | 9.47927 | |
| 23 | 9.74797 | |
| 24 | 10.01797 | |
| 25 | 10.29453 | 10.2 |
| 26 | 10.58780 | |
| 27 | 10.91210 | |
| 28 | 11.30030 | |
| 29 | 11.83049 | |
| 30 | 12.85381 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Students' Views on Engaging Teaching in Earth Science Lessons Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | | |
|--------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| | | | BS8E27A | BS8E27B | BS8E27C | BS8E27D | BS8E27E | BS8E27F | BS8E27G | BS8E27H | BS8E27I | BS8E27J |
| Georgia | 0.93 | 63 | 0.64 | 0.82 | 0.71 | 0.76 | 0.85 | 0.82 | 0.83 | 0.81 | 0.83 | 0.82 |
| Hungary | 0.94 | 67 | 0.74 | 0.82 | 0.81 | 0.81 | 0.86 | 0.85 | 0.82 | 0.81 | 0.82 | 0.81 |
| Kazakhstan | 0.94 | 68 | 0.67 | 0.80 | 0.85 | 0.84 | 0.86 | 0.85 | 0.85 | 0.81 | 0.85 | 0.83 |
| Lebanon | - | - | - | - | - | - | - | - | - | - | - | - |
| Lithuania | 0.95 | 69 | 0.75 | 0.85 | 0.84 | 0.82 | 0.87 | 0.86 | 0.77 | 0.85 | 0.84 | 0.83 |
| Malta | 0.95 | 70 | 0.79 | 0.86 | 0.84 | 0.83 | 0.85 | 0.85 | 0.82 | 0.84 | 0.83 | 0.82 |
| Morocco | 0.91 | 54 | 0.56 | 0.66 | 0.70 | 0.75 | 0.80 | 0.78 | 0.76 | 0.80 | 0.76 | 0.76 |
| Russian Federation | 0.94 | 67 | 0.70 | 0.83 | 0.84 | 0.80 | 0.87 | 0.84 | 0.80 | 0.84 | 0.84 | 0.81 |
| Slovenia | 0.95 | 71 | 0.78 | 0.84 | 0.82 | 0.84 | 0.88 | 0.88 | 0.84 | 0.85 | 0.85 | 0.83 |
| Sweden | - | - | - | - | - | - | - | - | - | - | - | - |

A dash (-) indicates comparable data not available.

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Students' Views on Engaging Teaching in Earth Science Lessons Scale, Eighth Grade, and TIMSS 2015 Science Achievement

| Country | Pearson's Correlation with Science Achievement | | Variance in Science Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|----------------------|--|-------------------|---|
| | (r) | (r ²) | |
| Georgia | 0.14 | 0.02 | 0.02 |
| Hungary | -0.01 | 0.00 | 0.00 |
| Kazakhstan | 0.10 | 0.01 | 0.01 |
| Lebanon | - | - | - |
| Lithuania | 0.08 | 0.01 | 0.01 |
| Malta | 0.11 | 0.01 | 0.01 |
| Morocco | 0.07 | 0.00 | 0.00 |
| Russian Federation | 0.03 | 0.00 | 0.00 |
| Slovenia | 0.06 | 0.00 | 0.00 |
| Sweden | - | - | - |
| International Median | 0.07 | 0.01 | 0.01 |

A dash (-) indicates comparable data not available.

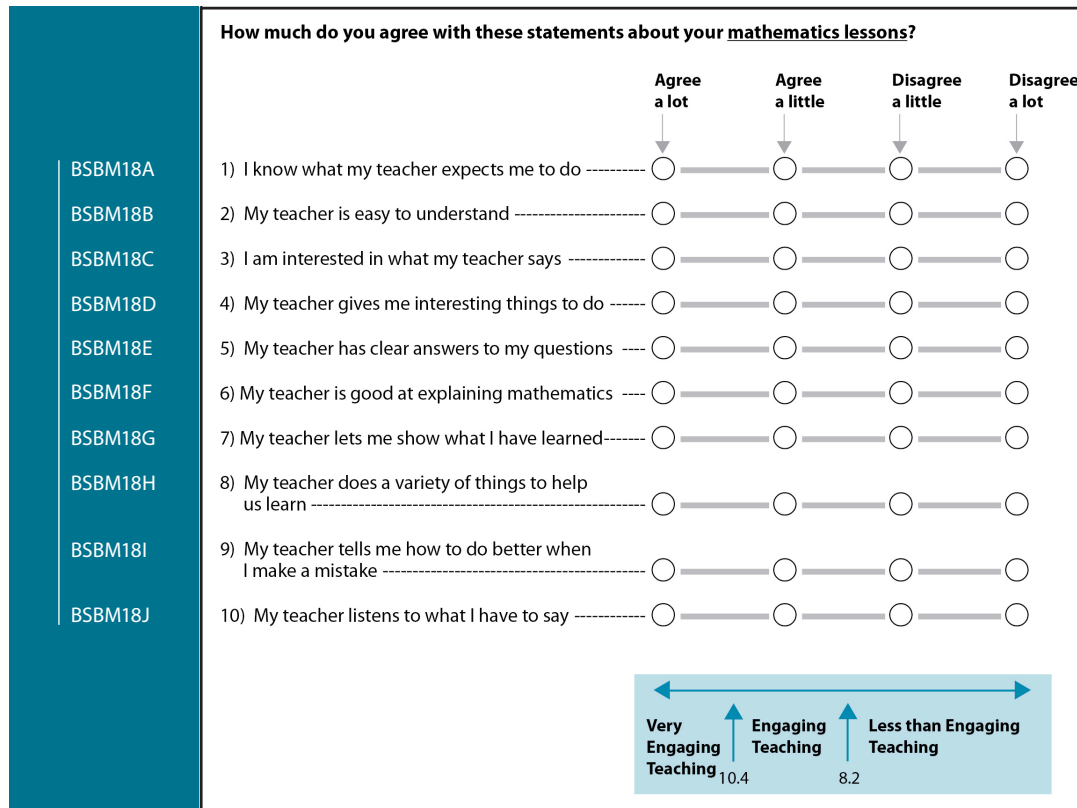
SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Students' Views on Engaging Teaching in Mathematics Lessons Scale, Eighth Grade

The Students' Views on Engaging Teaching in Mathematics Lessons (EML) scale was created based on students' degree of agreement with the ten statements described below.

Items in the TIMSS 2015 Students' Views on Engaging Teaching in Mathematics Lessons Scale, Eighth Grade



Item Parameters for the TIMSS 2015 Students' Views on Engaging Teaching in Mathematics Lessons Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|---------|----------|----------|----------|---------|-------|
| BSBM18A | -0.20590 | -1.33968 | -0.59371 | 1.93339 | 1.39 |
| BSBM18B | 0.05569 | -1.36981 | -0.40937 | 1.77918 | 0.96 |
| BSBM18C | 0.09829 | -1.52269 | -0.25840 | 1.78109 | 1.06 |
| BSBM18D | 0.77545 | -1.62386 | -0.16029 | 1.78415 | 1.06 |
| BSBM18E | -0.10037 | -1.22616 | -0.38485 | 1.61101 | 0.86 |
| BSBM18F | -0.28381 | -0.96873 | -0.40509 | 1.37382 | 0.85 |
| BSBM18G | 0.25944 | -1.42466 | -0.37697 | 1.80163 | 1.05 |
| BSBM18H | -0.15383 | -1.17293 | -0.38347 | 1.55640 | 0.94 |
| BSBM18I | -0.30578 | -1.07352 | -0.46176 | 1.53528 | 0.93 |
| BSBM18J | -0.13918 | -1.03166 | -0.50207 | 1.53373 | 0.99 |

Scale Transformation Constants for the TIMSS 2015 Students' Views on Engaging Teaching in Mathematics Lessons Scale, Eighth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 8.296036 | Transformed Scale Score = 8.296036 + 1.105518 • Logit Scale Score |
| B = 1.105518 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Students' Views on Engaging Teaching in Mathematics Lessons
Scale, Eighth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 3.54710 | |
| 1 | 4.77380 | |
| 2 | 5.35650 | |
| 3 | 5.75348 | |
| 4 | 6.05996 | |
| 5 | 6.31688 | |
| 6 | 6.54073 | |
| 7 | 6.74318 | |
| 8 | 6.93105 | |
| 9 | 7.10903 | |
| 10 | 7.28056 | |
| 11 | 7.44836 | |
| 12 | 7.61467 | |
| 13 | 7.78151 | |
| 14 | 7.95117 | |
| 15 | 8.12401 | 8.2 |
| 16 | 8.30286 | |
| 17 | 8.48885 | |
| 18 | 8.68366 | |
| 19 | 8.88834 | |
| 20 | 9.10416 | |
| 21 | 9.33228 | |
| 22 | 9.57401 | |
| 23 | 9.83140 | |
| 24 | 10.10784 | |
| 25 | 10.40917 | 10.4 |
| 26 | 10.74435 | |
| 27 | 11.13328 | |
| 28 | 11.61366 | |
| 29 | 12.28584 | |
| 30 | 13.60366 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Students' Views on Engaging Teaching in Mathematics Lessons Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| | | | BSBM18A | BSBM18B | BSBM18C | BSBM18D | BSBM18E | BSBM18F | BSBM18G | BSBM18H | BSBM18I | BSBM18J |
| Australia | 0.94 | 64 | 0.68 | 0.84 | 0.80 | 0.79 | 0.85 | 0.86 | 0.75 | 0.81 | 0.82 | 0.80 |
| Bahrain | 0.92 | 59 | 0.64 | 0.79 | 0.71 | 0.77 | 0.82 | 0.82 | 0.74 | 0.80 | 0.80 | 0.78 |
| Botswana (9) | 0.86 | 44 | 0.52 | 0.68 | 0.67 | 0.67 | 0.72 | 0.72 | 0.65 | 0.65 | 0.67 | 0.67 |
| Canada | 0.93 | 61 | 0.66 | 0.83 | 0.76 | 0.76 | 0.83 | 0.85 | 0.75 | 0.79 | 0.78 | 0.78 |
| Chile | 0.94 | 64 | 0.68 | 0.81 | 0.76 | 0.79 | 0.85 | 0.84 | 0.78 | 0.82 | 0.82 | 0.82 |
| Chinese Taipei | 0.92 | 58 | 0.70 | 0.78 | 0.77 | 0.75 | 0.78 | 0.76 | 0.78 | 0.78 | 0.77 | 0.74 |
| Egypt | 0.88 | 48 | 0.49 | 0.62 | 0.70 | 0.73 | 0.76 | 0.74 | 0.68 | 0.72 | 0.71 | 0.71 |
| England | 0.93 | 61 | 0.67 | 0.82 | 0.77 | 0.78 | 0.83 | 0.85 | 0.73 | 0.79 | 0.78 | 0.78 |
| Georgia | 0.89 | 52 | 0.49 | 0.75 | 0.54 | 0.69 | 0.81 | 0.80 | 0.78 | 0.78 | 0.74 | 0.77 |
| Hong Kong SAR | 0.94 | 65 | 0.72 | 0.82 | 0.81 | 0.79 | 0.85 | 0.84 | 0.81 | 0.81 | 0.82 | 0.80 |
| Hungary | 0.91 | 55 | 0.63 | 0.76 | 0.70 | 0.74 | 0.79 | 0.81 | 0.74 | 0.77 | 0.77 | 0.72 |
| Iran, Islamic Rep. of | 0.90 | 52 | 0.54 | 0.72 | 0.74 | 0.70 | 0.77 | 0.78 | 0.75 | 0.73 | 0.74 | 0.72 |
| Ireland | 0.92 | 57 | 0.62 | 0.84 | 0.73 | 0.74 | 0.84 | 0.84 | 0.71 | 0.73 | 0.76 | 0.74 |
| Israel | 0.92 | 59 | 0.62 | 0.80 | 0.75 | 0.75 | 0.83 | 0.82 | 0.78 | 0.75 | 0.80 | 0.78 |
| Italy | 0.89 | 51 | 0.52 | 0.73 | 0.66 | 0.67 | 0.79 | 0.80 | 0.73 | 0.73 | 0.73 | 0.74 |
| Japan | 0.91 | 55 | 0.57 | 0.81 | 0.78 | 0.75 | 0.76 | 0.80 | 0.61 | 0.78 | 0.78 | 0.75 |
| Jordan | 0.89 | 50 | 0.51 | 0.69 | 0.66 | 0.71 | 0.79 | 0.77 | 0.69 | 0.77 | 0.75 | 0.71 |
| Kazakhstan | 0.92 | 59 | 0.57 | 0.76 | 0.79 | 0.78 | 0.81 | 0.79 | 0.80 | 0.78 | 0.80 | 0.79 |
| Korea, Rep. of | 0.92 | 58 | 0.61 | 0.77 | 0.78 | 0.77 | 0.78 | 0.80 | 0.65 | 0.81 | 0.82 | 0.81 |
| Kuwait | 0.89 | 49 | 0.52 | 0.71 | 0.67 | 0.72 | 0.79 | 0.77 | 0.68 | 0.73 | 0.69 | 0.71 |
| Lebanon | 0.91 | 55 | 0.56 | 0.76 | 0.74 | 0.72 | 0.80 | 0.77 | 0.75 | 0.77 | 0.78 | 0.76 |
| Lithuania | 0.91 | 56 | 0.60 | 0.80 | 0.73 | 0.72 | 0.81 | 0.80 | 0.67 | 0.78 | 0.76 | 0.77 |
| Malaysia | 0.91 | 55 | 0.62 | 0.78 | 0.78 | 0.73 | 0.77 | 0.79 | 0.70 | 0.77 | 0.75 | 0.72 |
| Malta | 0.93 | 61 | 0.69 | 0.81 | 0.77 | 0.78 | 0.82 | 0.84 | 0.74 | 0.78 | 0.79 | 0.77 |
| Morocco | 0.88 | 48 | 0.43 | 0.62 | 0.62 | 0.68 | 0.75 | 0.75 | 0.76 | 0.78 | 0.73 | 0.72 |
| New Zealand | 0.93 | 62 | 0.66 | 0.82 | 0.77 | 0.78 | 0.84 | 0.84 | 0.75 | 0.79 | 0.80 | 0.78 |
| Norway (9) | 0.92 | 59 | 0.60 | 0.82 | 0.72 | 0.75 | 0.81 | 0.83 | 0.76 | 0.77 | 0.79 | 0.78 |
| Oman | 0.86 | 45 | 0.44 | 0.66 | 0.69 | 0.61 | 0.74 | 0.73 | 0.68 | 0.71 | 0.71 | 0.69 |
| Qatar | 0.93 | 62 | 0.68 | 0.81 | 0.76 | 0.78 | 0.84 | 0.82 | 0.77 | 0.81 | 0.81 | 0.79 |
| Russian Federation | 0.91 | 56 | 0.57 | 0.75 | 0.77 | 0.74 | 0.81 | 0.80 | 0.73 | 0.80 | 0.77 | 0.75 |
| Saudi Arabia | 0.91 | 54 | 0.57 | 0.74 | 0.72 | 0.73 | 0.79 | 0.77 | 0.68 | 0.79 | 0.78 | 0.76 |
| Singapore | 0.92 | 59 | 0.68 | 0.81 | 0.79 | 0.77 | 0.81 | 0.82 | 0.74 | 0.74 | 0.78 | 0.75 |
| Slovenia | 0.91 | 56 | 0.65 | 0.73 | 0.65 | 0.72 | 0.81 | 0.82 | 0.75 | 0.78 | 0.78 | 0.77 |
| South Africa (9) | 0.86 | 44 | 0.49 | 0.70 | 0.67 | 0.69 | 0.68 | 0.73 | 0.68 | 0.64 | 0.68 | 0.68 |
| Sweden | 0.92 | 59 | 0.63 | 0.82 | 0.70 | 0.72 | 0.82 | 0.83 | 0.76 | 0.82 | 0.76 | 0.77 |
| Thailand | 0.90 | 52 | 0.51 | 0.76 | 0.71 | 0.76 | 0.75 | 0.76 | 0.73 | 0.76 | 0.73 | 0.72 |
| Turkey | 0.89 | 52 | 0.60 | 0.77 | 0.69 | 0.51 | 0.80 | 0.79 | 0.73 | 0.72 | 0.76 | 0.76 |
| United Arab Emirates | 0.92 | 59 | 0.62 | 0.80 | 0.74 | 0.76 | 0.82 | 0.81 | 0.77 | 0.76 | 0.78 | 0.77 |
| United States | 0.94 | 64 | 0.67 | 0.83 | 0.78 | 0.79 | 0.85 | 0.86 | 0.77 | 0.81 | 0.81 | 0.80 |
| Benchmarking Participants | | | | | | | | | | | | |
| Buenos Aires, Argentina | 0.92 | 59 | 0.59 | 0.77 | 0.72 | 0.75 | 0.82 | 0.84 | 0.76 | 0.81 | 0.80 | 0.76 |
| Ontario, Canada | 0.93 | 61 | 0.67 | 0.82 | 0.78 | 0.77 | 0.83 | 0.84 | 0.75 | 0.80 | 0.78 | 0.79 |
| Quebec, Canada | 0.92 | 57 | 0.62 | 0.83 | 0.73 | 0.71 | 0.82 | 0.84 | 0.73 | 0.76 | 0.78 | 0.75 |
| Norway (8) | 0.91 | 57 | 0.58 | 0.80 | 0.71 | 0.74 | 0.80 | 0.83 | 0.74 | 0.77 | 0.77 | 0.77 |
| Abu Dhabi, UAE | 0.92 | 59 | 0.62 | 0.80 | 0.73 | 0.77 | 0.82 | 0.81 | 0.77 | 0.76 | 0.78 | 0.77 |
| Dubai, UAE | 0.92 | 59 | 0.63 | 0.80 | 0.76 | 0.78 | 0.82 | 0.82 | 0.75 | 0.75 | 0.78 | 0.77 |
| Florida, US | 0.93 | 62 | 0.65 | 0.83 | 0.78 | 0.77 | 0.84 | 0.84 | 0.75 | 0.79 | 0.81 | 0.78 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Students' Views on Engaging Teaching in Mathematics Lessons Scale, Eighth Grade, and TIMSS 2015 Mathematics Achievement

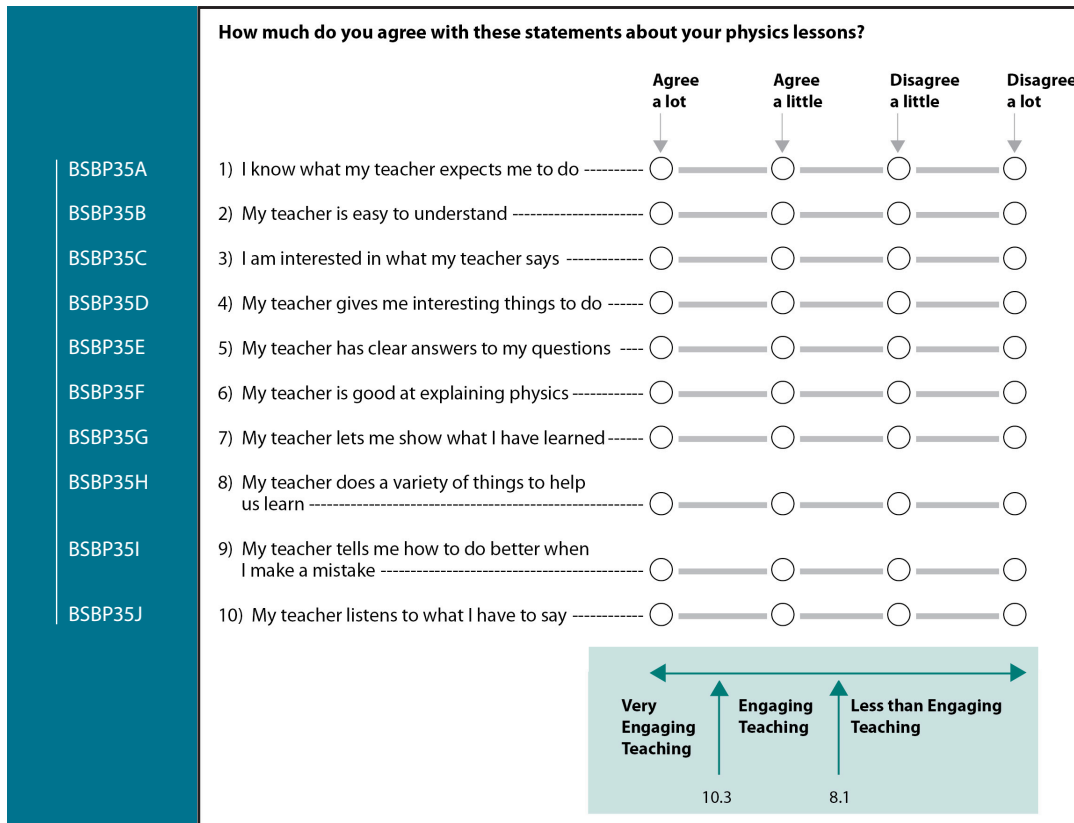
| Country | Pearson's Correlation with Mathematics Achievement | | Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|----------------------------------|--|-------------------|---|
| | (r) | (r ²) | |
| Australia | 0.16 | 0.03 | 0.03 |
| Bahrain | 0.13 | 0.02 | 0.02 |
| Botswana (9) | 0.18 | 0.03 | 0.04 |
| Canada | 0.10 | 0.01 | 0.01 |
| Chile | 0.12 | 0.01 | 0.01 |
| Chinese Taipei | 0.24 | 0.06 | 0.05 |
| Egypt | 0.13 | 0.02 | 0.02 |
| England | 0.14 | 0.02 | 0.02 |
| Georgia | 0.17 | 0.03 | 0.02 |
| Hong Kong SAR | 0.13 | 0.02 | 0.01 |
| Hungary | 0.10 | 0.01 | 0.01 |
| Iran, Islamic Rep. of | 0.07 | 0.01 | 0.01 |
| Ireland | 0.04 | 0.00 | 0.00 |
| Israel | 0.03 | 0.00 | 0.00 |
| Italy | 0.08 | 0.01 | 0.01 |
| Japan | 0.18 | 0.03 | 0.02 |
| Jordan | 0.09 | 0.01 | 0.01 |
| Kazakhstan | 0.16 | 0.03 | 0.02 |
| Korea, Rep. of | 0.23 | 0.05 | 0.03 |
| Kuwait | 0.05 | 0.00 | 0.00 |
| Lebanon | 0.11 | 0.01 | 0.01 |
| Lithuania | 0.12 | 0.01 | 0.01 |
| Malaysia | 0.12 | 0.01 | 0.01 |
| Malta | 0.12 | 0.01 | 0.01 |
| Morocco | 0.07 | 0.01 | 0.01 |
| New Zealand | 0.14 | 0.02 | 0.02 |
| Norway (9) | 0.19 | 0.04 | 0.03 |
| Oman | 0.16 | 0.03 | 0.03 |
| Qatar | 0.20 | 0.04 | 0.04 |
| Russian Federation | 0.13 | 0.02 | 0.01 |
| Saudi Arabia | 0.12 | 0.01 | 0.01 |
| Singapore | 0.13 | 0.02 | 0.02 |
| Slovenia | 0.20 | 0.04 | 0.03 |
| South Africa (9) | 0.04 | 0.00 | 0.00 |
| Sweden | 0.17 | 0.03 | 0.03 |
| Thailand | 0.01 | 0.00 | 0.00 |
| Turkey | 0.14 | 0.02 | 0.02 |
| United Arab Emirates | 0.19 | 0.04 | 0.03 |
| United States | 0.12 | 0.01 | 0.02 |
| International Median | 0.13 | 0.02 | 0.02 |
| Benchmarking Participants | | | |
| Buenos Aires, Argentina | 0.05 | 0.00 | 0.00 |
| Ontario, Canada | 0.11 | 0.01 | 0.02 |
| Quebec, Canada | 0.15 | 0.02 | 0.02 |
| Norway (8) | 0.14 | 0.02 | 0.02 |
| Abu Dhabi, UAE | 0.14 | 0.02 | 0.02 |
| Dubai, UAE | 0.16 | 0.03 | 0.02 |
| Florida, US | 0.08 | 0.01 | 0.01 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Students' Views on Engaging Teaching in Physics Lessons Scale, Eighth Grade

The Students' Views on Engaging Teaching in Physics Lessons (EPL) scale was created based on students' degree of agreement with the ten statements described below.

Items in the TIMSS 2015 Students' Views on Engaging Teaching in Physics Lessons Scale, Eighth Grade



Item Parameters for the TIMSS 2015 Students' Views on Engaging Teaching in Physics Lessons Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|---------|----------|----------|----------|---------|-------|
| BSBP35A | 0.02582 | -1.84518 | -0.67504 | 2.52022 | 1.46 |
| BSBP35B | 0.22966 | -1.85433 | -0.64159 | 2.49592 | 0.96 |
| BSBP35C | 0.05918 | -1.72396 | -0.58921 | 2.31317 | 1.06 |
| BSBP35D | 0.44841 | -1.95198 | -0.48476 | 2.43674 | 1.03 |
| BSBP35E | -0.08867 | -1.60947 | -0.74617 | 2.35564 | 0.81 |
| BSBP35F | -0.23221 | -1.42369 | -0.73236 | 2.15605 | 0.85 |
| BSBP35G | 0.12388 | -1.89124 | -0.70918 | 2.60042 | 1.06 |
| BSBP35H | -0.15481 | -1.68435 | -0.69214 | 2.37649 | 0.92 |
| BSBP35I | -0.15098 | -1.72057 | -0.72485 | 2.44542 | 0.92 |
| BSBP35J | -0.26028 | -1.44319 | -0.89555 | 2.33874 | 1.04 |

Scale Transformation Constants for the TIMSS 2015 Students' Views on Engaging Teaching in Physics Lessons Scale, Eighth Grade

| Scale Transformation Constants | |
|--------------------------------|--|
| A = 8.36096 | Transformed Scale Score = 8.36096 + 0.800724 • Logit Scale Score |
| B = 0.800724 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Equivalence Table of Raw and Transformed Scale Scores for the TIMSS 2015 Students' Views on Engaging Teaching in Physics Lessons Scale, Eighth Grade

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 4.57253 | |
| 1 | 5.47234 | |
| 2 | 5.90450 | |
| 3 | 6.20036 | |
| 4 | 6.43141 | |
| 5 | 6.62544 | |
| 6 | 6.79626 | |
| 7 | 6.95186 | |
| 8 | 7.09747 | |
| 9 | 7.23679 | |
| 10 | 7.37186 | |
| 11 | 7.50715 | |
| 12 | 7.64349 | |
| 13 | 7.78312 | |
| 14 | 7.92841 | |
| 15 | 8.08240 | 8.1 |
| 16 | 8.24702 | |
| 17 | 8.42679 | |
| 18 | 8.62451 | |
| 19 | 8.84363 | |
| 20 | 9.08172 | |
| 21 | 9.33294 | |
| 22 | 9.58877 | |
| 23 | 9.84380 | |
| 24 | 10.09848 | |
| 25 | 10.35833 | 10.3 |
| 26 | 10.63329 | |
| 27 | 10.93727 | |
| 28 | 11.30073 | |
| 29 | 11.79730 | |
| 30 | 12.75728 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Students' Views on Engaging Teaching in Physics Lessons Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | | |
|--------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| | | | BS8P35A | BS8P35B | BS8P35C | BS8P35D | BS8P35E | BS8P35F | BS8P35G | BS8P35H | BS8P35I | BS8P35J |
| Georgia | 0.95 | 69 | 0.68 | 0.84 | 0.76 | 0.82 | 0.87 | 0.87 | 0.86 | 0.87 | 0.88 | 0.85 |
| Hungary | 0.95 | 68 | 0.75 | 0.83 | 0.81 | 0.84 | 0.87 | 0.86 | 0.82 | 0.82 | 0.84 | 0.81 |
| Kazakhstan | 0.95 | 71 | 0.69 | 0.81 | 0.86 | 0.86 | 0.88 | 0.87 | 0.87 | 0.83 | 0.87 | 0.84 |
| Lebanon | 0.95 | 67 | 0.70 | 0.84 | 0.84 | 0.83 | 0.86 | 0.84 | 0.81 | 0.84 | 0.84 | 0.80 |
| Lithuania | 0.95 | 71 | 0.78 | 0.88 | 0.85 | 0.84 | 0.89 | 0.85 | 0.80 | 0.85 | 0.84 | 0.84 |
| Malta | 0.95 | 70 | 0.78 | 0.87 | 0.84 | 0.83 | 0.89 | 0.88 | 0.80 | 0.84 | 0.84 | 0.81 |
| Morocco | 0.92 | 58 | 0.56 | 0.70 | 0.73 | 0.78 | 0.82 | 0.81 | 0.80 | 0.82 | 0.78 | 0.78 |
| Russian Federation | 0.95 | 70 | 0.72 | 0.84 | 0.86 | 0.82 | 0.88 | 0.86 | 0.82 | 0.86 | 0.86 | 0.83 |
| Slovenia | 0.96 | 71 | 0.78 | 0.82 | 0.82 | 0.84 | 0.88 | 0.87 | 0.85 | 0.87 | 0.86 | 0.83 |
| Sweden | 0.94 | 66 | 0.72 | 0.86 | 0.75 | 0.79 | 0.87 | 0.86 | 0.79 | 0.85 | 0.80 | 0.81 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Students' Views on Engaging Teaching in Physics Lessons Scale, Eighth Grade, and TIMSS 2015 Science Achievement

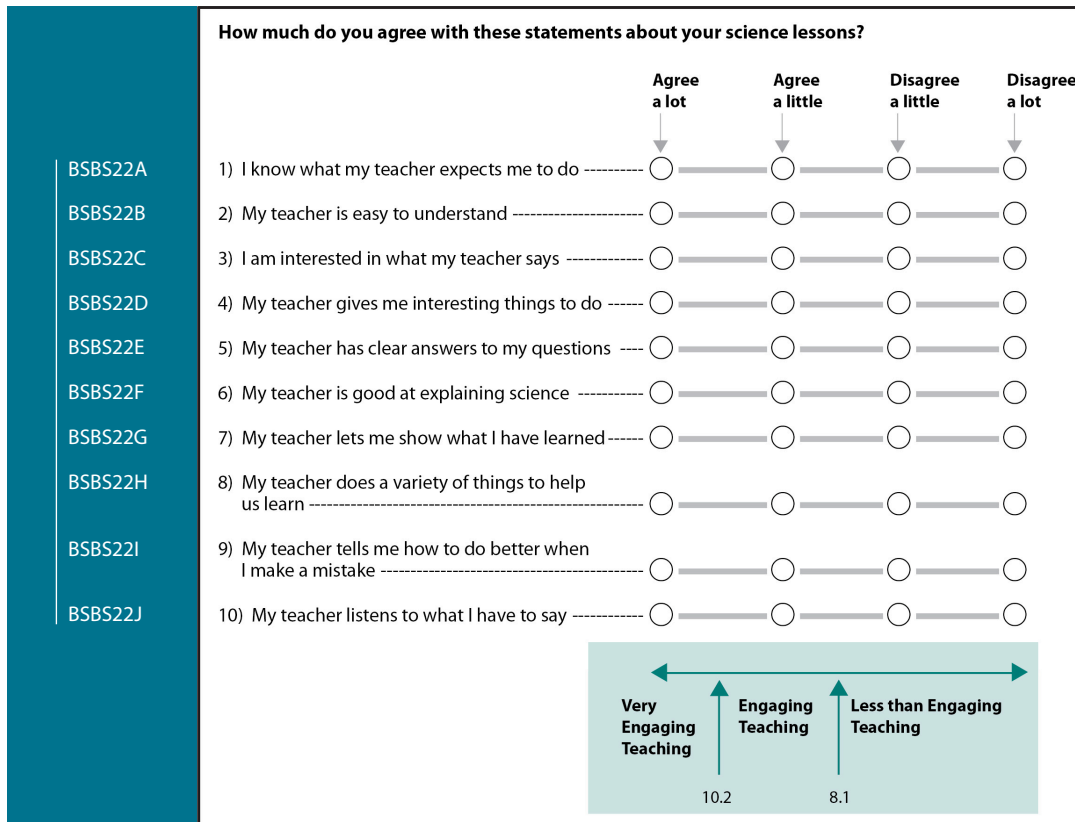
| Country | Pearson's Correlation with Science Achievement | | Variance in Science Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|----------------------|--|-------------------|---|
| | (r) | (r ²) | |
| Georgia | 0.13 | 0.02 | 0.02 |
| Hungary | 0.06 | 0.00 | 0.01 |
| Kazakhstan | 0.15 | 0.02 | 0.02 |
| Lebanon | 0.14 | 0.02 | 0.02 |
| Lithuania | 0.10 | 0.01 | 0.01 |
| Malta | 0.21 | 0.05 | 0.05 |
| Morocco | 0.08 | 0.01 | 0.01 |
| Russian Federation | 0.12 | 0.01 | 0.02 |
| Slovenia | 0.14 | 0.02 | 0.01 |
| Sweden | 0.09 | 0.01 | 0.01 |
| International Median | 0.12 | 0.02 | 0.01 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Students' Views on Engaging Teaching in Science Lessons Scale, Eighth Grade

The Students' Views on Engaging Teaching in Science Lessons (ESL) scale was created based on students' degree of agreement with the ten statements described below.

Items in the TIMSS 2015 Students' Views on Engaging Teaching in Science Lessons Scale, Eighth Grade



Item Parameters for the TIMSS 2015 Students' Views on Engaging Teaching in Science Lessons Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | tau_3 | Infit |
|---------|----------|----------|----------|---------|-------|
| BSBS22A | -0.04924 | -1.64346 | -0.54140 | 2.18486 | 1.40 |
| BSBS22B | 0.05145 | -1.53889 | -0.46940 | 2.00829 | 0.96 |
| BSBS22C | -0.08308 | -1.60569 | -0.28773 | 1.89342 | 0.99 |
| BSBS22D | 0.38580 | -1.67313 | -0.26587 | 1.93900 | 1.04 |
| BSBS22E | -0.12954 | -1.48983 | -0.40490 | 1.89473 | 0.86 |
| BSBS22F | -0.32397 | -1.28029 | -0.44404 | 1.72433 | 0.85 |
| BSBS22G | 0.40041 | -1.82277 | -0.27075 | 2.09352 | 1.10 |
| BSBS22H | -0.15706 | -1.48381 | -0.41006 | 1.89387 | 0.97 |
| BSBS22I | -0.07063 | -1.53419 | -0.39286 | 1.92705 | 0.98 |
| BSBS22J | -0.02414 | -1.35914 | -0.47354 | 1.83268 | 1.05 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Scale Transformation Constants for the TIMSS 2015 Students' Views on Engaging Teaching in Science Lessons Scale, Eighth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 8.256995 | Transformed Scale Score = 8.256995 + 0.933751 • Logit Scale Score |
| B = 0.933751 | |

Equivalence Table of Raw and Transformed Scale Scores for the TIMSS 2015 Students' Views on Engaging Teaching in Science Lessons Scale, Eighth Grade

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 3.99370 | |
| 1 | 5.05193 | |
| 2 | 5.56338 | |
| 3 | 5.91581 | |
| 4 | 6.19102 | |
| 5 | 6.42207 | |
| 6 | 6.62528 | |
| 7 | 6.81001 | |
| 8 | 6.98219 | |
| 9 | 7.14596 | |
| 10 | 7.30443 | |
| 11 | 7.46008 | |
| 12 | 7.61501 | |
| 13 | 7.77116 | |
| 14 | 7.93069 | |
| 15 | 8.09420 | 8.1 |
| 16 | 8.26433 | |
| 17 | 8.44227 | |
| 18 | 8.62934 | |
| 19 | 8.82641 | |
| 20 | 9.03371 | |
| 21 | 9.25114 | |
| 22 | 9.47855 | |
| 23 | 9.71647 | |
| 24 | 9.96698 | |
| 25 | 10.23475 | 10.2 |
| 26 | 10.52856 | |
| 27 | 10.86204 | |
| 28 | 11.27059 | |
| 29 | 11.83812 | |
| 30 | 12.94849 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Students' Views on Engaging Teaching in Science Lessons Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| | | | BS8S22A | BS8S22B | BS8S22C | BS8S22D | BS8S22E | BS8S22F | BS8S22G | BS8S22H | BS8S22I | BS8S22J |
| Australia | 0.95 | 69 | 0.74 | 0.86 | 0.83 | 0.84 | 0.88 | 0.84 | 0.79 | 0.85 | 0.84 | 0.84 |
| Bahrain | 0.94 | 64 | 0.67 | 0.81 | 0.78 | 0.82 | 0.85 | 0.83 | 0.76 | 0.81 | 0.83 | 0.80 |
| Botswana (9) | 0.89 | 51 | 0.57 | 0.74 | 0.70 | 0.73 | 0.77 | 0.76 | 0.70 | 0.69 | 0.72 | 0.71 |
| Canada | 0.95 | 68 | 0.72 | 0.86 | 0.83 | 0.82 | 0.87 | 0.87 | 0.81 | 0.84 | 0.83 | 0.81 |
| Chile | 0.95 | 68 | 0.72 | 0.80 | 0.82 | 0.83 | 0.87 | 0.85 | 0.82 | 0.84 | 0.85 | 0.84 |
| Chinese Taipei | 0.93 | 61 | 0.74 | 0.80 | 0.81 | 0.80 | 0.80 | 0.78 | 0.78 | 0.80 | 0.79 | 0.74 |
| Egypt | 0.89 | 51 | 0.50 | 0.66 | 0.74 | 0.75 | 0.77 | 0.77 | 0.66 | 0.77 | 0.74 | 0.71 |
| England | 0.94 | 66 | 0.77 | 0.83 | 0.81 | 0.84 | 0.86 | 0.86 | 0.76 | 0.81 | 0.80 | 0.82 |
| Georgia | - | - | - | - | - | - | - | - | - | - | - | - |
| Hong Kong SAR | 0.96 | 72 | 0.79 | 0.86 | 0.85 | 0.86 | 0.88 | 0.87 | 0.84 | 0.85 | 0.85 | 0.83 |
| Hungary | - | - | - | - | - | - | - | - | - | - | - | - |
| Iran, Islamic Rep. of | 0.92 | 59 | 0.63 | 0.79 | 0.80 | 0.72 | 0.81 | 0.79 | 0.78 | 0.77 | 0.78 | 0.77 |
| Ireland | 0.95 | 67 | 0.73 | 0.87 | 0.83 | 0.82 | 0.86 | 0.87 | 0.78 | 0.80 | 0.80 | 0.80 |
| Israel | 0.95 | 70 | 0.76 | 0.86 | 0.82 | 0.83 | 0.87 | 0.88 | 0.83 | 0.83 | 0.84 | 0.83 |
| Italy | 0.92 | 58 | 0.57 | 0.77 | 0.71 | 0.76 | 0.84 | 0.81 | 0.77 | 0.77 | 0.78 | 0.78 |
| Japan | 0.93 | 61 | 0.64 | 0.83 | 0.80 | 0.79 | 0.82 | 0.83 | 0.67 | 0.81 | 0.82 | 0.78 |
| Jordan | 0.92 | 58 | 0.57 | 0.73 | 0.75 | 0.78 | 0.82 | 0.82 | 0.74 | 0.83 | 0.78 | 0.76 |
| Kazakhstan | - | - | - | - | - | - | - | - | - | - | - | - |
| Korea, Rep. of | 0.94 | 65 | 0.72 | 0.82 | 0.83 | 0.83 | 0.83 | 0.83 | 0.70 | 0.83 | 0.84 | 0.84 |
| Kuwait | 0.90 | 54 | 0.59 | 0.73 | 0.73 | 0.74 | 0.81 | 0.79 | 0.71 | 0.78 | 0.74 | 0.72 |
| Lebanon | - | - | - | - | - | - | - | - | - | - | - | - |
| Lithuania | - | - | - | - | - | - | - | - | - | - | - | - |
| Malaysia | 0.93 | 62 | 0.70 | 0.80 | 0.83 | 0.80 | 0.82 | 0.83 | 0.76 | 0.79 | 0.81 | 0.76 |
| Malta | - | - | - | - | - | - | - | - | - | - | - | - |
| Morocco | - | - | - | - | - | - | - | - | - | - | - | - |
| New Zealand | 0.94 | 67 | 0.72 | 0.84 | 0.82 | 0.83 | 0.87 | 0.85 | 0.78 | 0.82 | 0.82 | 0.81 |
| Norway (9) | 0.94 | 66 | 0.67 | 0.86 | 0.79 | 0.82 | 0.85 | 0.86 | 0.79 | 0.82 | 0.82 | 0.80 |
| Oman | 0.89 | 51 | 0.51 | 0.74 | 0.73 | 0.73 | 0.78 | 0.76 | 0.72 | 0.76 | 0.72 | 0.70 |
| Qatar | 0.95 | 70 | 0.76 | 0.86 | 0.82 | 0.85 | 0.88 | 0.88 | 0.81 | 0.85 | 0.85 | 0.80 |
| Russian Federation | - | - | - | - | - | - | - | - | - | - | - | - |
| Saudi Arabia | 0.93 | 61 | 0.65 | 0.79 | 0.81 | 0.79 | 0.82 | 0.82 | 0.71 | 0.84 | 0.80 | 0.79 |
| Singapore | 0.93 | 63 | 0.73 | 0.82 | 0.81 | 0.81 | 0.83 | 0.83 | 0.75 | 0.78 | 0.79 | 0.77 |
| Slovenia | - | - | - | - | - | - | - | - | - | - | - | - |
| South Africa (9) | 0.89 | 51 | 0.60 | 0.74 | 0.72 | 0.74 | 0.72 | 0.75 | 0.73 | 0.68 | 0.74 | 0.70 |
| Sweden | - | - | - | - | - | - | - | - | - | - | - | - |
| Thailand | 0.92 | 59 | 0.55 | 0.81 | 0.76 | 0.81 | 0.80 | 0.82 | 0.77 | 0.80 | 0.76 | 0.75 |
| Turkey | 0.91 | 58 | 0.65 | 0.80 | 0.75 | 0.58 | 0.83 | 0.83 | 0.79 | 0.74 | 0.81 | 0.80 |
| United Arab Emirates | 0.95 | 67 | 0.71 | 0.84 | 0.80 | 0.82 | 0.86 | 0.85 | 0.82 | 0.81 | 0.83 | 0.81 |
| United States | 0.96 | 71 | 0.76 | 0.86 | 0.83 | 0.85 | 0.88 | 0.89 | 0.82 | 0.85 | 0.84 | 0.83 |
| Benchmarking Participants | | | | | | | | | | | | |
| Buenos Aires, Argentina | 0.94 | 64 | 0.65 | 0.79 | 0.79 | 0.80 | 0.86 | 0.85 | 0.79 | 0.81 | 0.82 | 0.80 |
| Ontario, Canada | 0.95 | 70 | 0.73 | 0.86 | 0.83 | 0.83 | 0.87 | 0.88 | 0.81 | 0.85 | 0.84 | 0.83 |
| Quebec, Canada | 0.94 | 65 | 0.69 | 0.84 | 0.81 | 0.80 | 0.87 | 0.86 | 0.80 | 0.82 | 0.80 | 0.78 |
| Norway (8) | 0.94 | 63 | 0.65 | 0.84 | 0.76 | 0.80 | 0.84 | 0.85 | 0.79 | 0.81 | 0.81 | 0.80 |
| Abu Dhabi, UAE | 0.95 | 68 | 0.72 | 0.84 | 0.81 | 0.83 | 0.87 | 0.86 | 0.84 | 0.82 | 0.84 | 0.81 |
| Dubai, UAE | 0.94 | 64 | 0.70 | 0.83 | 0.78 | 0.81 | 0.84 | 0.85 | 0.78 | 0.80 | 0.81 | 0.80 |
| Florida, US | 0.96 | 72 | 0.76 | 0.86 | 0.85 | 0.86 | 0.89 | 0.89 | 0.83 | 0.87 | 0.86 | 0.84 |

A dash (-) indicates comparable data not available.

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Students' Views on Engaging Teaching in Science Lessons Scale, Eighth Grade, and TIMSS 2015 Science Achievement

| Country | Pearson's Correlation with Science Achievement | | Variance in Science Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|----------------------------------|--|-------------------|---|
| | (r) | (r ²) | |
| Australia | 0.22 | 0.05 | 0.05 |
| Bahrain | 0.16 | 0.02 | 0.02 |
| Botswana (9) | 0.19 | 0.04 | 0.04 |
| Canada | 0.09 | 0.01 | 0.01 |
| Chile | 0.09 | 0.01 | 0.00 |
| Chinese Taipei | 0.21 | 0.04 | 0.03 |
| Egypt | 0.21 | 0.04 | 0.04 |
| England | 0.10 | 0.01 | 0.01 |
| Georgia | - | - | - |
| Hong Kong SAR | 0.16 | 0.03 | 0.02 |
| Hungary | - | - | - |
| Iran, Islamic Rep. of | 0.05 | 0.00 | 0.00 |
| Ireland | 0.19 | 0.04 | 0.03 |
| Israel | 0.12 | 0.01 | 0.01 |
| Italy | 0.03 | 0.00 | 0.00 |
| Japan | 0.21 | 0.04 | 0.04 |
| Jordan | 0.15 | 0.02 | 0.02 |
| Kazakhstan | - | - | - |
| Korea, Rep. of | 0.32 | 0.10 | 0.09 |
| Kuwait | 0.11 | 0.01 | 0.01 |
| Lebanon | - | - | - |
| Lithuania | - | - | - |
| Malaysia | 0.23 | 0.05 | 0.06 |
| Malta | - | - | - |
| Morocco | - | - | - |
| New Zealand | 0.15 | 0.02 | 0.02 |
| Norway (9) | 0.12 | 0.01 | 0.02 |
| Oman | 0.16 | 0.03 | 0.03 |
| Qatar | 0.20 | 0.04 | 0.04 |
| Russian Federation | - | - | - |
| Saudi Arabia | 0.16 | 0.03 | 0.02 |
| Singapore | 0.08 | 0.01 | 0.01 |
| Slovenia | - | - | - |
| South Africa (9) | 0.05 | 0.00 | 0.00 |
| Sweden | - | - | - |
| Thailand | 0.07 | 0.00 | 0.00 |
| Turkey | 0.17 | 0.03 | 0.03 |
| United Arab Emirates | 0.15 | 0.02 | 0.02 |
| United States | 0.11 | 0.01 | 0.01 |
| International Median | 0.15 | 0.02 | 0.02 |
| Benchmarking Participants | | | |
| Buenos Aires, Argentina | 0.03 | 0.00 | 0.00 |
| Ontario, Canada | 0.09 | 0.01 | 0.01 |
| Quebec, Canada | 0.11 | 0.01 | 0.01 |
| Norway (8) | 0.10 | 0.01 | 0.01 |
| Abu Dhabi, UAE | 0.13 | 0.02 | 0.02 |
| Dubai, UAE | 0.10 | 0.01 | 0.01 |
| Florida, US | 0.12 | 0.01 | 0.01 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

A dash (-) indicates comparable data not available.

Teacher Job Satisfaction Scale, Eighth Grade

The Teacher Job Satisfaction (TJS) scale was created based on how often teachers responded positively to the seven statements described below.

Items in the TIMSS 2015 Teacher Job Satisfaction Scale, Eighth Grade¹

| | | How often do you feel the following way about being a teacher? | | | |
|---------|---|--|-----------------------|-----------------------|-----------------------|
| | | Very often | Often | Sometimes | Never or almost never |
| BTBG10A | 1) I am content with my profession as a teacher ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| BTBG10B | 2) I am satisfied with being a teacher at this school --- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| BTBG10C | 3) I find my work full of meaning and purpose ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| BTBG10D | 4) I am enthusiastic about my job ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| BTBG10E | 5) My work inspires me----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| BTBG10F | 6) I am proud of the work I do ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| BTBG10G | 7) I am going to continue teaching for as long as I can ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

| | |
|----------------|---------------------|
| ← | → |
| Very Satisfied | Less than Satisfied |
| 10.3 | 7.0 |

¹ For the purpose of scaling, categories in which there were very few respondents were combined. The categories "Sometimes" and "Never or almost never" were combined for all variables. The scale statistics that are reported herein reflect analysis of the items following collapsing.

Item Parameters for the TIMSS 2015 Teacher Job Satisfaction Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | Infit |
|---------|----------|----------|---------|-------|
| BTBG10A | 0.14816 | -1.72080 | 1.72080 | 0.99 |
| BTBG10B | 0.39021 | -1.65209 | 1.65209 | 1.34 |
| BTBG10C | -0.51295 | -1.72738 | 1.72738 | 1.06 |
| BTBG10D | -0.27152 | -1.81713 | 1.81713 | 0.85 |
| BTBG10E | 0.32148 | -1.74038 | 1.74038 | 0.89 |
| BTBG10F | -0.47731 | -1.60579 | 1.60579 | 0.96 |
| BTBG10G | 0.40193 | -1.26209 | 1.26209 | 1.27 |

Scale Transformation Constants for the TIMSS 2015 Teacher Job Satisfaction Scale, Eighth Grade

Scale Transformation Constants

A = 8.635655

B = 0.874431

Transformed Scale Score = 8.635655 + 0.874431 • Logit Scale Score

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Teacher Job Satisfaction Scale, Eighth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 4.73467 | |
| 1 | 5.83713 | |
| 2 | 6.44235 | |
| 3 | 6.91770 | 7.0 |
| 4 | 7.34908 | |
| 5 | 7.76911 | |
| 6 | 8.20415 | |
| 7 | 8.65502 | |
| 8 | 9.10176 | |
| 9 | 9.52415 | |
| 10 | 9.93219 | |
| 11 | 10.34781 | 10.3 |
| 12 | 10.80981 | |
| 13 | 11.40090 | |
| 14 | 12.49436 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Teacher Job Satisfaction Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|----------|----------|----------|----------|----------|----------|
| | | | BTJCS10A | BTJCS10B | BTJCS10C | BTJCS10D | BTJCS10E | BTJCS10F | BTJCS10G |
| Australia | 0.93 | 72 | 0.87 | 0.79 | 0.89 | 0.91 | 0.90 | 0.78 | 0.78 |
| Bahrain | 0.90 | 65 | 0.84 | 0.72 | 0.74 | 0.85 | 0.87 | 0.80 | 0.80 |
| Botswana (9) | 0.87 | 57 | 0.67 | 0.68 | 0.77 | 0.82 | 0.85 | 0.84 | 0.64 |
| Canada | 0.90 | 63 | 0.83 | 0.75 | 0.78 | 0.86 | 0.85 | 0.70 | 0.77 |
| Chile | 0.87 | 58 | 0.76 | 0.70 | 0.74 | 0.79 | 0.80 | 0.82 | 0.72 |
| Chinese Taipei | 0.93 | 72 | 0.85 | 0.77 | 0.87 | 0.90 | 0.83 | 0.88 | 0.81 |
| Egypt | 0.85 | 55 | 0.82 | 0.63 | 0.70 | 0.82 | 0.68 | 0.80 | 0.70 |
| England | 0.90 | 62 | 0.78 | 0.70 | 0.81 | 0.84 | 0.85 | 0.76 | 0.74 |
| Georgia | 0.87 | 56 | 0.76 | 0.69 | 0.67 | 0.72 | 0.78 | 0.85 | 0.76 |
| Hong Kong SAR | 0.93 | 69 | 0.83 | 0.81 | 0.82 | 0.85 | 0.85 | 0.88 | 0.79 |
| Hungary | 0.90 | 64 | 0.80 | 0.72 | 0.83 | 0.82 | 0.85 | 0.83 | 0.73 |
| Iran, Islamic Rep. of | 0.86 | 56 | 0.76 | 0.49 | 0.69 | 0.86 | 0.85 | 0.75 | 0.78 |
| Ireland | 0.91 | 67 | 0.84 | 0.74 | 0.87 | 0.87 | 0.85 | 0.79 | 0.75 |
| Israel | 0.92 | 68 | 0.84 | 0.74 | 0.83 | 0.87 | 0.85 | 0.84 | 0.79 |
| Italy | 0.89 | 62 | 0.80 | 0.74 | 0.67 | 0.85 | 0.82 | 0.84 | 0.75 |
| Japan | 0.91 | 65 | 0.83 | 0.75 | 0.84 | 0.81 | 0.88 | 0.79 | 0.72 |
| Jordan | 0.90 | 64 | 0.83 | 0.72 | 0.78 | 0.88 | 0.85 | 0.81 | 0.74 |
| Kazakhstan | 0.89 | 60 | 0.78 | 0.74 | 0.75 | 0.82 | 0.80 | 0.77 | 0.78 |
| Korea, Rep. of | 0.94 | 73 | 0.84 | 0.81 | 0.87 | 0.86 | 0.90 | 0.89 | 0.81 |
| Kuwait | 0.90 | 64 | 0.81 | 0.73 | 0.79 | 0.86 | 0.81 | 0.79 | 0.80 |
| Lebanon | 0.86 | 55 | 0.73 | 0.74 | 0.75 | 0.74 | 0.77 | 0.75 | 0.73 |
| Lithuania | 0.92 | 67 | 0.83 | 0.81 | 0.78 | 0.87 | 0.87 | 0.85 | 0.74 |
| Malaysia | 0.92 | 69 | 0.82 | 0.78 | 0.83 | 0.88 | 0.87 | 0.85 | 0.78 |
| Malta | 0.94 | 75 | 0.89 | 0.77 | 0.88 | 0.91 | 0.89 | 0.85 | 0.86 |
| Morocco | 0.88 | 58 | 0.77 | 0.69 | 0.74 | 0.84 | 0.83 | 0.80 | 0.65 |
| New Zealand | 0.91 | 67 | 0.81 | 0.75 | 0.84 | 0.87 | 0.86 | 0.81 | 0.76 |
| Norway (9) | 0.92 | 68 | 0.86 | 0.79 | 0.80 | 0.88 | 0.89 | 0.79 | 0.74 |
| Oman | 0.90 | 64 | 0.80 | 0.69 | 0.71 | 0.87 | 0.86 | 0.81 | 0.83 |
| Qatar | 0.88 | 58 | 0.80 | 0.73 | 0.74 | 0.82 | 0.84 | 0.74 | 0.67 |
| Russian Federation | 0.91 | 65 | 0.81 | 0.79 | 0.78 | 0.84 | 0.85 | 0.81 | 0.74 |
| Saudi Arabia | 0.85 | 56 | 0.80 | 0.51 | 0.70 | 0.87 | 0.80 | 0.78 | 0.72 |
| Singapore | 0.95 | 76 | 0.89 | 0.80 | 0.88 | 0.91 | 0.90 | 0.90 | 0.82 |
| Slovenia | 0.91 | 65 | 0.83 | 0.67 | 0.84 | 0.88 | 0.87 | 0.81 | 0.73 |
| South Africa (9) | 0.91 | 66 | 0.77 | 0.73 | 0.85 | 0.86 | 0.89 | 0.81 | 0.77 |
| Sweden | 0.89 | 61 | 0.83 | 0.74 | 0.69 | 0.84 | 0.84 | 0.75 | 0.74 |
| Thailand | 0.90 | 64 | 0.79 | 0.79 | 0.79 | 0.78 | 0.84 | 0.85 | 0.75 |
| Turkey | 0.88 | 59 | 0.79 | 0.54 | 0.74 | 0.88 | 0.84 | 0.78 | 0.75 |
| United Arab Emirates | 0.89 | 62 | 0.79 | 0.75 | 0.74 | 0.83 | 0.84 | 0.79 | 0.75 |
| United States | 0.92 | 69 | 0.84 | 0.78 | 0.87 | 0.88 | 0.88 | 0.76 | 0.79 |
| Benchmarking Participants | | | | | | | | | |
| Buenos Aires, Argentina | 0.86 | 55 | 0.79 | 0.50 | 0.82 | 0.80 | 0.86 | 0.77 | 0.57 |
| Ontario, Canada | 0.91 | 65 | 0.85 | 0.79 | 0.84 | 0.86 | 0.85 | 0.65 | 0.79 |
| Quebec, Canada | 0.89 | 61 | 0.83 | 0.66 | 0.70 | 0.86 | 0.86 | 0.79 | 0.75 |
| Norway (8) | 0.91 | 66 | 0.82 | 0.74 | 0.83 | 0.87 | 0.87 | 0.79 | 0.76 |
| Abu Dhabi, UAE | 0.89 | 62 | 0.81 | 0.77 | 0.69 | 0.82 | 0.84 | 0.82 | 0.75 |
| Dubai, UAE | 0.91 | 65 | 0.81 | 0.75 | 0.79 | 0.86 | 0.86 | 0.79 | 0.77 |
| Florida, US | 0.91 | 66 | 0.85 | 0.68 | 0.87 | 0.87 | 0.88 | 0.67 | 0.82 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Teacher Job Satisfaction Scale, Eighth Grade, and TIMSS 2015 Achievement

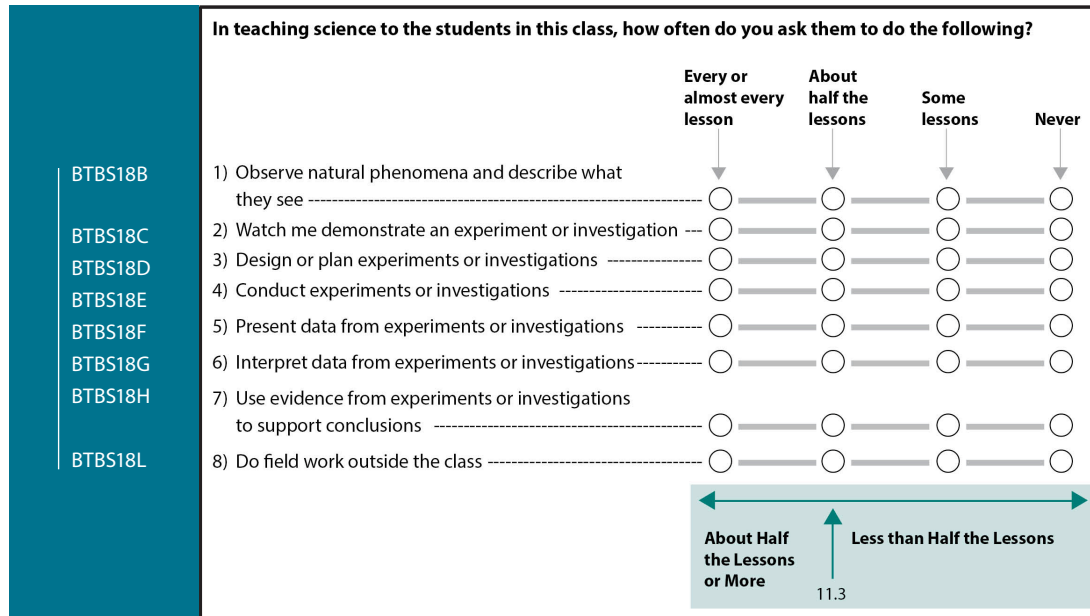
| Country | Pearson's Correlation with Achievement | | | | Variance in Achievement Accounted for by Difference Between Regions of the Scale (η^2) | |
|----------------------------------|--|---------|-------------|---------|---|---------|
| | (r) | | (r) | | Mathematics | Science |
| | Mathematics | Science | Mathematics | Science | | |
| Australia | 0.10 | 0.08 | 0.01 | 0.01 | 0.01 | 0.01 |
| Bahrain | 0.07 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 |
| Botswana (9) | 0.03 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Canada | -0.03 | 0.01 | 0.00 | 0.00 | 0.02 | 0.00 |
| Chile | 0.11 | 0.05 | 0.01 | 0.00 | 0.01 | 0.01 |
| Chinese Taipei | 0.08 | 0.08 | 0.01 | 0.01 | 0.01 | 0.00 |
| Egypt | 0.11 | 0.13 | 0.01 | 0.02 | 0.01 | 0.01 |
| England | 0.09 | 0.10 | 0.01 | 0.01 | 0.01 | 0.02 |
| Georgia | 0.04 | 0.05 | 0.00 | 0.00 | 0.01 | 0.00 |
| Hong Kong SAR | 0.18 | 0.19 | 0.03 | 0.04 | 0.03 | 0.04 |
| Hungary | 0.15 | 0.17 | 0.02 | 0.03 | 0.01 | 0.02 |
| Iran, Islamic Rep. of | 0.05 | 0.16 | 0.00 | 0.03 | 0.01 | 0.02 |
| Ireland | 0.15 | 0.11 | 0.02 | 0.01 | 0.02 | 0.01 |
| Israel | 0.06 | -0.01 | 0.00 | 0.00 | 0.00 | 0.01 |
| Italy | 0.06 | 0.04 | 0.00 | 0.00 | 0.01 | 0.01 |
| Japan | 0.02 | 0.08 | 0.00 | 0.01 | 0.00 | 0.01 |
| Jordan | 0.06 | 0.17 | 0.00 | 0.03 | 0.01 | 0.02 |
| Kazakhstan | 0.06 | -0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| Korea, Rep. of | -0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Kuwait | 0.06 | 0.10 | 0.00 | 0.01 | 0.00 | 0.02 |
| Lebanon | 0.09 | 0.07 | 0.01 | 0.01 | 0.02 | 0.01 |
| Lithuania | 0.04 | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 |
| Malaysia | 0.02 | -0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Malta | 0.09 | 0.19 | 0.01 | 0.04 | 0.03 | 0.03 |
| Morocco | 0.08 | 0.07 | 0.01 | 0.00 | 0.01 | 0.00 |
| New Zealand | 0.02 | 0.05 | 0.00 | 0.00 | 0.01 | 0.00 |
| Norway (9) | -0.03 | -0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| Oman | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Qatar | -0.01 | -0.08 | 0.00 | 0.01 | 0.01 | 0.01 |
| Russian Federation | 0.14 | 0.01 | 0.02 | 0.00 | 0.02 | 0.00 |
| Saudi Arabia | 0.05 | 0.17 | 0.00 | 0.03 | 0.00 | 0.03 |
| Singapore | 0.08 | 0.06 | 0.01 | 0.00 | 0.01 | 0.00 |
| Slovenia | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| South Africa (9) | 0.09 | 0.16 | 0.01 | 0.02 | 0.01 | 0.02 |
| Sweden | -0.02 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| Thailand | 0.05 | 0.08 | 0.00 | 0.01 | 0.00 | 0.01 |
| Turkey | 0.13 | 0.17 | 0.02 | 0.03 | 0.01 | 0.02 |
| United Arab Emirates | -0.01 | 0.12 | 0.00 | 0.01 | 0.00 | 0.01 |
| United States | 0.04 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| International Median | 0.06 | 0.06 | 0.00 | 0.00 | 0.01 | 0.01 |
| Benchmarking Participants | | | | | | |
| Buenos Aires, Argentina | -0.14 | -0.09 | 0.02 | 0.01 | 0.02 | 0.01 |
| Ontario, Canada | 0.03 | -0.03 | 0.00 | 0.00 | 0.01 | 0.00 |
| Quebec, Canada | -0.09 | 0.11 | 0.01 | 0.01 | 0.02 | 0.01 |
| Norway (8) | 0.01 | 0.03 | 0.00 | 0.00 | 0.00 | 0.01 |
| Abu Dhabi, UAE | 0.00 | 0.07 | 0.00 | 0.01 | 0.00 | 0.01 |
| Dubai, UAE | -0.01 | 0.16 | 0.00 | 0.03 | 0.00 | 0.02 |
| Florida, US | 0.04 | 0.15 | 0.00 | 0.02 | 0.02 | 0.04 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Teachers Emphasize Science Investigation Scale, Eighth Grade

The Teachers Emphasize Science Investigation (ESI) scale was created based on teachers' responses to how often they used the eight instructional activities described below.

Items in the TIMSS 2015 Teachers Emphasize Science Investigation Scale, Eighth Grade¹



¹ For the purpose of scaling, categories in which there were very few respondents were combined. The categories "Some Lessons" and "Never" were combined for all variables. The scale statistics that are reported herein reflect analysis of the items following collapsing.

Item Parameters for the TIMSS 2015 Teachers Emphasize Science Investigation Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | Infit |
|---------|----------|----------|---------|-------|
| BTBS18B | -0.97437 | -0.97800 | 0.97800 | 1.31 |
| BTBS18C | -0.66109 | -0.56569 | 0.56569 | 1.35 |
| BTBS18D | 0.26321 | -0.86969 | 0.86969 | 0.88 |
| BTBS18E | -0.08614 | -1.06106 | 1.06106 | 0.91 |
| BTBS18F | 0.14856 | -0.94708 | 0.94708 | 0.76 |
| BTBS18G | -0.14686 | -0.96567 | 0.96567 | 0.79 |
| BTBS18H | -0.40814 | -0.95404 | 0.95404 | 0.98 |
| BTBS18L | 1.86483 | -0.38627 | 0.38627 | 1.30 |

Scale Transformation Constants for the TIMSS 2015 Teachers Emphasize Science Investigation Scale, Eighth Grade

Scale Transformation Constants

A = 11.333349

B = 1.121755

Transformed Scale Score = 11.333349 + 1.121755 • Logit Scale Score

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Teachers Emphasize Science Investigation Scale, Eighth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 6.89663 | |
| 1 | 8.25918 | |
| 2 | 8.96497 | |
| 3 | 9.47986 | |
| 4 | 9.90541 | |
| 5 | 10.28520 | |
| 6 | 10.63710 | |
| 7 | 10.97567 | |
| 8 | 11.31029 | 11.3 |
| 9 | 11.65165 | |
| 10 | 12.00438 | |
| 11 | 12.37727 | |
| 12 | 12.77796 | |
| 13 | 13.22328 | |
| 14 | 13.74474 | |
| 15 | 14.43167 | |
| 16 | 15.73375 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Teachers Emphasize Science Investigation Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|---------|---------|
| | | | BTBS18B | BTBS18C | BTBS18D | BTBS18E | BTBS18F | BTBS18G | BTBS18H | BTBS18L |
| Australia | 0.85 | 49 | 0.60 | 0.60 | 0.76 | 0.73 | 0.83 | 0.84 | 0.77 | 0.36 |
| Bahrain | 0.89 | 58 | 0.59 | 0.56 | 0.83 | 0.86 | 0.88 | 0.87 | 0.83 | 0.55 |
| Botswana (9) | 0.87 | 54 | 0.56 | 0.55 | 0.78 | 0.84 | 0.89 | 0.88 | 0.83 | 0.40 |
| Canada | 0.83 | 48 | 0.55 | 0.45 | 0.74 | 0.83 | 0.86 | 0.84 | 0.81 | 0.16 |
| Chile | 0.87 | 53 | 0.76 | 0.71 | 0.75 | 0.78 | 0.83 | 0.77 | 0.72 | 0.48 |
| Chinese Taipei | 0.88 | 56 | 0.57 | 0.79 | 0.82 | 0.82 | 0.90 | 0.85 | 0.77 | 0.26 |
| Egypt | 0.85 | 51 | 0.51 | 0.54 | 0.80 | 0.82 | 0.87 | 0.82 | 0.73 | 0.49 |
| England | 0.81 | 44 | 0.39 | 0.45 | 0.67 | 0.79 | 0.87 | 0.85 | 0.79 | 0.13 |
| Georgia | 0.82 | 50 | 0.45 | 0.53 | 0.85 | 0.87 | 0.85 | 0.81 | 0.61 | 0.52 |
| Hong Kong SAR | 0.84 | 49 | 0.55 | 0.61 | 0.66 | 0.74 | 0.82 | 0.85 | 0.88 | 0.34 |
| Hungary | 0.83 | 48 | 0.64 | 0.63 | 0.73 | 0.79 | 0.79 | 0.75 | 0.68 | 0.53 |
| Iran, Islamic Rep. of | 0.85 | 51 | 0.56 | 0.48 | 0.69 | 0.80 | 0.86 | 0.86 | 0.78 | 0.59 |
| Ireland | 0.82 | 47 | 0.39 | 0.47 | 0.67 | 0.75 | 0.87 | 0.88 | 0.82 | 0.42 |
| Israel | 0.85 | 50 | 0.64 | 0.51 | 0.83 | 0.78 | 0.83 | 0.80 | 0.68 | 0.49 |
| Italy | 0.88 | 59 | 0.47 | 0.69 | 0.83 | 0.86 | 0.88 | 0.83 | 0.87 | 0.59 |
| Japan | 0.79 | 42 | 0.63 | 0.51 | 0.41 | 0.75 | 0.81 | 0.80 | 0.76 | 0.29 |
| Jordan | 0.85 | 50 | 0.50 | 0.57 | 0.77 | 0.82 | 0.87 | 0.83 | 0.69 | 0.48 |
| Kazakhstan | 0.88 | 55 | 0.62 | 0.66 | 0.79 | 0.86 | 0.81 | 0.79 | 0.66 | 0.67 |
| Korea, Rep. of | 0.87 | 55 | 0.69 | 0.69 | 0.84 | 0.84 | 0.87 | 0.83 | 0.51 | 0.58 |
| Kuwait | 0.86 | 52 | 0.61 | 0.48 | 0.83 | 0.79 | 0.87 | 0.86 | 0.78 | 0.42 |
| Lebanon | 0.82 | 46 | 0.56 | 0.65 | 0.74 | 0.82 | 0.79 | 0.70 | 0.57 | 0.50 |
| Lithuania | 0.87 | 57 | 0.59 | 0.63 | 0.83 | 0.88 | 0.88 | 0.85 | 0.72 | 0.55 |
| Malaysia | 0.86 | 53 | 0.45 | 0.55 | 0.72 | 0.77 | 0.85 | 0.87 | 0.89 | 0.60 |
| Malta | 0.81 | 49 | 0.38 | 0.54 | 0.71 | 0.83 | 0.88 | 0.89 | 0.72 | 0.44 |
| Morocco | 0.81 | 44 | 0.47 | 0.42 | 0.74 | 0.74 | 0.84 | 0.81 | 0.69 | 0.36 |
| New Zealand | 0.81 | 45 | 0.52 | 0.27 | 0.64 | 0.74 | 0.85 | 0.84 | 0.83 | 0.46 |
| Norway (9) | 0.86 | 51 | 0.74 | 0.69 | 0.74 | 0.73 | 0.80 | 0.78 | 0.68 | 0.51 |
| Oman | 0.83 | 47 | 0.59 | 0.61 | 0.71 | 0.80 | 0.80 | 0.79 | 0.65 | 0.41 |
| Qatar | 0.87 | 54 | 0.58 | 0.64 | 0.77 | 0.81 | 0.83 | 0.84 | 0.77 | 0.56 |
| Russian Federation | 0.86 | 53 | 0.55 | 0.61 | 0.78 | 0.87 | 0.86 | 0.85 | 0.79 | 0.39 |
| Saudi Arabia | 0.87 | 53 | 0.63 | 0.60 | 0.80 | 0.83 | 0.85 | 0.81 | 0.82 | 0.32 |
| Singapore | 0.82 | 48 | 0.48 | 0.66 | 0.71 | 0.76 | 0.83 | 0.80 | 0.70 | 0.48 |
| Slovenia | 0.87 | 56 | 0.48 | 0.62 | 0.81 | 0.88 | 0.91 | 0.89 | 0.73 | 0.56 |
| South Africa (9) | 0.91 | 63 | 0.64 | 0.75 | 0.85 | 0.88 | 0.86 | 0.88 | 0.84 | 0.58 |
| Sweden | 0.84 | 49 | 0.46 | 0.40 | 0.71 | 0.85 | 0.89 | 0.89 | 0.85 | 0.12 |
| Thailand | 0.90 | 59 | 0.51 | 0.57 | 0.84 | 0.88 | 0.90 | 0.89 | 0.86 | 0.54 |
| Turkey | 0.85 | 50 | 0.47 | 0.54 | 0.71 | 0.87 | 0.83 | 0.82 | 0.81 | 0.48 |
| United Arab Emirates | 0.87 | 54 | 0.56 | 0.61 | 0.78 | 0.85 | 0.86 | 0.85 | 0.82 | 0.40 |
| United States | 0.89 | 57 | 0.64 | 0.63 | 0.82 | 0.83 | 0.87 | 0.85 | 0.79 | 0.54 |
| Benchmarking Participants | | | | | | | | | | |
| Buenos Aires, Argentina | 0.88 | 56 | 0.57 | 0.75 | 0.87 | 0.87 | 0.81 | 0.83 | 0.72 | 0.50 |
| Ontario, Canada | 0.84 | 49 | 0.56 | 0.50 | 0.74 | 0.82 | 0.82 | 0.83 | 0.76 | 0.40 |
| Quebec, Canada | 0.82 | 50 | 0.52 | 0.49 | 0.72 | 0.83 | 0.89 | 0.82 | 0.89 | -0.01 |
| Norway (8) | 0.82 | 46 | 0.55 | 0.46 | 0.79 | 0.74 | 0.76 | 0.77 | 0.72 | 0.58 |
| Abu Dhabi, UAE | 0.88 | 57 | 0.44 | 0.65 | 0.83 | 0.88 | 0.91 | 0.87 | 0.84 | 0.43 |
| Dubai, UAE | 0.85 | 51 | 0.63 | 0.65 | 0.66 | 0.79 | 0.85 | 0.87 | 0.81 | 0.31 |
| Florida, US | 0.88 | 54 | 0.62 | 0.66 | 0.79 | 0.81 | 0.79 | 0.87 | 0.78 | 0.50 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Teachers Emphasize Science Investigation Scale, Eighth Grade, and TIMSS 2015 Science Achievement

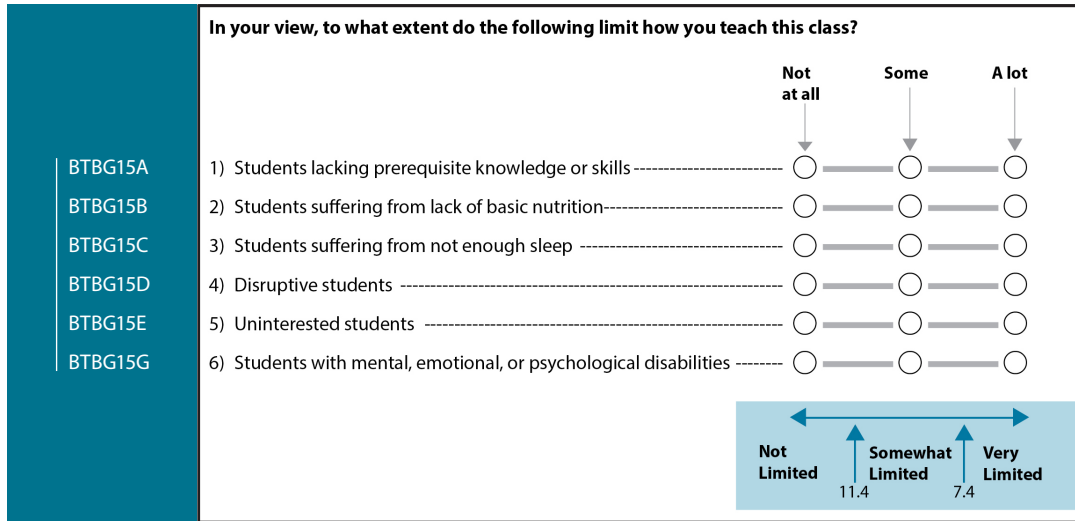
| Country | Pearson's Correlation with Science Achievement | | Variance in Science Achievement Accounted for by Difference Between Regions of the Scale (η^2) |
|----------------------------------|--|-------------|---|
| | (r) | (r^2) | |
| Australia | 0.08 | 0.01 | 0.00 |
| Bahrain | 0.08 | 0.01 | 0.01 |
| Botswana (9) | 0.03 | 0.00 | 0.00 |
| Canada | -0.03 | 0.00 | 0.00 |
| Chile | -0.11 | 0.01 | 0.01 |
| Chinese Taipei | 0.08 | 0.01 | 0.00 |
| Egypt | 0.03 | 0.00 | 0.00 |
| England | 0.11 | 0.01 | 0.00 |
| Georgia | 0.01 | 0.00 | 0.00 |
| Hong Kong SAR | 0.18 | 0.03 | 0.03 |
| Hungary | 0.09 | 0.01 | 0.01 |
| Iran, Islamic Rep. of | 0.10 | 0.01 | 0.01 |
| Ireland | 0.02 | 0.00 | 0.00 |
| Israel | -0.11 | 0.01 | 0.00 |
| Italy | -0.03 | 0.00 | 0.00 |
| Japan | -0.03 | 0.00 | 0.00 |
| Jordan | 0.07 | 0.00 | 0.01 |
| Kazakhstan | -0.05 | 0.00 | 0.00 |
| Korea, Rep. of | 0.03 | 0.00 | 0.00 |
| Kuwait | 0.03 | 0.00 | 0.00 |
| Lebanon | 0.05 | 0.00 | 0.00 |
| Lithuania | -0.04 | 0.00 | 0.00 |
| Malaysia | 0.10 | 0.01 | 0.00 |
| Malta | 0.09 | 0.01 | 0.00 |
| Morocco | 0.03 | 0.00 | 0.00 |
| New Zealand | 0.02 | 0.00 | 0.00 |
| Norway (9) | 0.04 | 0.00 | 0.00 |
| Oman | 0.02 | 0.00 | 0.00 |
| Qatar | -0.11 | 0.01 | 0.00 |
| Russian Federation | 0.06 | 0.00 | 0.00 |
| Saudi Arabia | 0.15 | 0.02 | 0.01 |
| Singapore | 0.00 | 0.00 | 0.00 |
| Slovenia | 0.01 | 0.00 | 0.00 |
| South Africa (9) | 0.05 | 0.00 | 0.00 |
| Sweden | 0.04 | 0.00 | 0.00 |
| Thailand | 0.12 | 0.01 | 0.01 |
| Turkey | 0.06 | 0.00 | 0.00 |
| United Arab Emirates | 0.07 | 0.00 | 0.00 |
| United States | 0.06 | 0.00 | 0.00 |
| International Median | 0.04 | 0.00 | 0.00 |
| Benchmarking Participants | | | |
| Buenos Aires, Argentina | -0.09 | 0.01 | 0.00 |
| Ontario, Canada | -0.04 | 0.00 | 0.00 |
| Quebec, Canada | -0.02 | 0.00 | 0.01 |
| Norway (8) | 0.02 | 0.00 | 0.00 |
| Abu Dhabi, UAE | 0.02 | 0.00 | 0.00 |
| Dubai, UAE | 0.04 | 0.00 | 0.00 |
| Florida, US | -0.05 | 0.00 | 0.01 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Teaching Limited by Student Needs Scale, Eighth Grade

The Teaching Limited by Student Needs (LSN) scale was created based on teachers' responses concerning six needs described below.

Items in the TIMSS 2015 Teaching Limited by Student Needs Scale, Eighth Grade



Item Parameters for the TIMSS 2015 Teaching Limited by Student Needs Scale, Eighth Grade

| Item | delta | tau_1 | tau_2 | Infit |
|---------|----------|----------|---------|-------|
| BTBG15A | 1.14171 | -1.83653 | 1.83653 | 1.03 |
| BTBG15B | -1.14425 | -1.12334 | 1.12334 | 1.09 |
| BTBG15C | -0.16051 | -1.68796 | 1.68796 | 1.04 |
| BTBG15D | 0.30396 | -1.44379 | 1.44379 | 0.94 |
| BTBG15E | 0.86567 | -1.84509 | 1.84509 | 0.89 |
| BTBG15G | -1.00658 | -1.45309 | 1.45309 | 1.07 |

Scale Transformation Constants for the TIMSS 2015 Teaching Limited by Student Needs Scale, Eighth Grade

| Scale Transformation Constants | |
|--------------------------------|---|
| A = 9.392409 | Transformed Scale Score = 9.392409 + 1.217478 • Logit Scale Score |
| B = 1.217478 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

**Equivalence Table of Raw and Transformed Scale Scores for the TIMSS
2015 Teaching Limited by Student Needs Scale, Eighth Grade**

| Raw Score | Transformed Scale Score | Cutpoint |
|-----------|-------------------------|----------|
| 0 | 4.10087 | |
| 1 | 5.69119 | |
| 2 | 6.59237 | |
| 3 | 7.31350 | 7.4 |
| 4 | 7.96367 | |
| 5 | 8.59178 | |
| 6 | 9.23167 | |
| 7 | 9.91091 | |
| 8 | 10.64876 | |
| 9 | 11.44991 | 11.4 |
| 10 | 12.32894 | |
| 11 | 13.37525 | |
| 12 | 15.08058 | |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015



Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2015 Teaching Limited by Student Needs Scale, Eighth Grade

| Country | Cronbach's Alpha Reliability Coefficient | Percent of Variance Explained | Component Loadings for Each Item | | | | | |
|----------------------------------|--|-------------------------------|----------------------------------|---------|---------|---------|---------|---------|
| | | | BTBG15A | BTBG15B | BTBG15C | BTBG15D | BTBG15E | BTBG15G |
| Australia | 0.78 | 48 | 0.66 | 0.55 | 0.73 | 0.75 | 0.77 | 0.66 |
| Bahrain | 0.75 | 44 | 0.67 | 0.58 | 0.62 | 0.77 | 0.74 | 0.58 |
| Botswana (9) | 0.61 | 35 | 0.28 | 0.61 | 0.70 | 0.60 | 0.65 | 0.61 |
| Canada | 0.76 | 46 | 0.64 | 0.65 | 0.74 | 0.64 | 0.72 | 0.67 |
| Chile | 0.75 | 44 | 0.65 | 0.68 | 0.68 | 0.69 | 0.71 | 0.59 |
| Chinese Taipei | 0.75 | 45 | 0.65 | 0.65 | 0.61 | 0.71 | 0.70 | 0.69 |
| Egypt | 0.68 | 39 | 0.55 | 0.56 | 0.58 | 0.75 | 0.75 | 0.53 |
| England | 0.80 | 50 | 0.64 | 0.67 | 0.74 | 0.74 | 0.76 | 0.68 |
| Georgia | 0.65 | 37 | 0.60 | 0.49 | 0.56 | 0.65 | 0.69 | 0.63 |
| Hong Kong SAR | 0.71 | 41 | 0.62 | 0.47 | 0.64 | 0.73 | 0.67 | 0.69 |
| Hungary | 0.80 | 50 | 0.66 | 0.65 | 0.72 | 0.74 | 0.73 | 0.71 |
| Iran, Islamic Rep. of | 0.74 | 43 | 0.48 | 0.63 | 0.66 | 0.75 | 0.69 | 0.72 |
| Ireland | 0.76 | 45 | 0.56 | 0.65 | 0.68 | 0.72 | 0.76 | 0.66 |
| Israel | 0.82 | 52 | 0.69 | 0.67 | 0.72 | 0.77 | 0.78 | 0.69 |
| Italy | 0.70 | 41 | 0.69 | 0.64 | 0.69 | 0.69 | 0.69 | 0.39 |
| Japan | 0.75 | 44 | 0.76 | 0.21 | 0.72 | 0.68 | 0.80 | 0.65 |
| Jordan | 0.61 | 34 | 0.62 | 0.50 | 0.59 | 0.63 | 0.71 | 0.38 |
| Kazakhstan | 0.80 | 51 | 0.70 | 0.63 | 0.76 | 0.82 | 0.72 | 0.65 |
| Korea, Rep. of | 0.80 | 50 | 0.64 | 0.55 | 0.74 | 0.78 | 0.79 | 0.70 |
| Kuwait | 0.64 | 36 | 0.64 | 0.50 | 0.64 | 0.70 | 0.70 | 0.37 |
| Lebanon | 0.67 | 38 | 0.63 | 0.54 | 0.63 | 0.63 | 0.63 | 0.62 |
| Lithuania | 0.75 | 44 | 0.62 | 0.55 | 0.62 | 0.76 | 0.76 | 0.66 |
| Malaysia | 0.73 | 43 | 0.67 | 0.52 | 0.56 | 0.76 | 0.78 | 0.62 |
| Malta | 0.77 | 47 | 0.65 | 0.59 | 0.65 | 0.77 | 0.78 | 0.65 |
| Morocco | 0.66 | 38 | 0.34 | 0.51 | 0.64 | 0.75 | 0.74 | 0.63 |
| New Zealand | 0.79 | 49 | 0.70 | 0.65 | 0.69 | 0.76 | 0.78 | 0.63 |
| Norway (9) | 0.73 | 43 | 0.58 | 0.72 | 0.73 | 0.60 | 0.64 | 0.64 |
| Oman | 0.76 | 45 | 0.66 | 0.59 | 0.66 | 0.69 | 0.76 | 0.67 |
| Qatar | 0.76 | 47 | 0.65 | 0.65 | 0.65 | 0.80 | 0.79 | 0.49 |
| Russian Federation | 0.78 | 47 | 0.61 | 0.65 | 0.72 | 0.73 | 0.68 | 0.72 |
| Saudi Arabia | 0.66 | 37 | 0.62 | 0.55 | 0.61 | 0.66 | 0.70 | 0.52 |
| Singapore | 0.73 | 43 | 0.64 | 0.55 | 0.68 | 0.71 | 0.72 | 0.61 |
| Slovenia | 0.76 | 45 | 0.67 | 0.42 | 0.68 | 0.78 | 0.81 | 0.61 |
| South Africa (9) | 0.73 | 42 | 0.66 | 0.57 | 0.60 | 0.70 | 0.72 | 0.62 |
| Sweden | 0.77 | 47 | 0.68 | 0.61 | 0.70 | 0.72 | 0.74 | 0.64 |
| Thailand | 0.69 | 40 | 0.50 | 0.49 | 0.55 | 0.75 | 0.76 | 0.67 |
| Turkey | 0.71 | 41 | 0.67 | 0.56 | 0.55 | 0.74 | 0.69 | 0.60 |
| United Arab Emirates | 0.75 | 45 | 0.64 | 0.62 | 0.72 | 0.75 | 0.79 | 0.46 |
| United States | 0.74 | 44 | 0.61 | 0.62 | 0.66 | 0.71 | 0.68 | 0.68 |
| Benchmarking Participants | | | | | | | | |
| Buenos Aires, Argentina | 0.78 | 49 | 0.49 | 0.72 | 0.81 | 0.70 | 0.69 | 0.74 |
| Ontario, Canada | 0.74 | 44 | 0.61 | 0.67 | 0.74 | 0.62 | 0.69 | 0.65 |
| Quebec, Canada | 0.80 | 51 | 0.71 | 0.63 | 0.74 | 0.70 | 0.77 | 0.72 |
| Norway (8) | 0.73 | 43 | 0.54 | 0.66 | 0.68 | 0.63 | 0.74 | 0.64 |
| Abu Dhabi, UAE | 0.74 | 43 | 0.67 | 0.63 | 0.67 | 0.68 | 0.78 | 0.49 |
| Dubai, UAE | 0.76 | 46 | 0.63 | 0.55 | 0.75 | 0.79 | 0.78 | 0.52 |
| Florida, US | 0.81 | 52 | 0.74 | 0.68 | 0.77 | 0.69 | 0.77 | 0.67 |

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Relationship Between the TIMSS 2015 Teaching Limited by Student Needs Scale, Eighth Grade, and TIMSS 2015 Achievement

| Country | Pearson's Correlation with Achievement | | | | Variance in Achievement Accounted for by Difference Between Regions of the Scale (η^2) | |
|----------------------------------|--|-------------|-------------------|-------------|---|-------------|
| | (r) | | (r ²) | | Mathematics | Science |
| | Mathematics | Science | Mathematics | Science | | |
| Australia | 0.45 | 0.27 | 0.20 | 0.07 | 0.18 | 0.06 |
| Bahrain | 0.16 | 0.18 | 0.03 | 0.03 | 0.02 | 0.03 |
| Botswana (9) | 0.11 | 0.09 | 0.01 | 0.01 | 0.00 | 0.00 |
| Canada | 0.26 | 0.18 | 0.07 | 0.03 | 0.05 | 0.02 |
| Chile | 0.32 | 0.38 | 0.10 | 0.15 | 0.09 | 0.11 |
| Chinese Taipei | 0.20 | 0.19 | 0.04 | 0.04 | 0.03 | 0.04 |
| Egypt | 0.11 | 0.10 | 0.01 | 0.01 | 0.01 | 0.01 |
| England | 0.51 | 0.44 | 0.26 | 0.19 | 0.18 | 0.17 |
| Georgia | 0.07 | 0.06 | 0.00 | 0.00 | 0.01 | 0.00 |
| Hong Kong SAR | 0.37 | 0.28 | 0.14 | 0.08 | 0.06 | 0.04 |
| Hungary | 0.37 | 0.31 | 0.14 | 0.10 | 0.12 | 0.07 |
| Iran, Islamic Rep. of | 0.16 | 0.17 | 0.02 | 0.03 | 0.04 | 0.03 |
| Ireland | 0.40 | 0.20 | 0.16 | 0.04 | 0.11 | 0.03 |
| Israel | 0.40 | 0.29 | 0.16 | 0.09 | 0.14 | 0.08 |
| Italy | 0.13 | 0.09 | 0.02 | 0.01 | 0.01 | 0.01 |
| Japan | 0.16 | 0.12 | 0.03 | 0.02 | 0.01 | 0.01 |
| Jordan | 0.11 | 0.17 | 0.01 | 0.03 | 0.01 | 0.03 |
| Kazakhstan | 0.08 | 0.10 | 0.01 | 0.01 | 0.00 | 0.01 |
| Korea, Rep. of | 0.11 | 0.05 | 0.01 | 0.00 | 0.01 | 0.00 |
| Kuwait | 0.20 | 0.09 | 0.04 | 0.01 | 0.04 | 0.01 |
| Lebanon | 0.02 | -0.01 | 0.00 | 0.00 | 0.01 | 0.00 |
| Lithuania | 0.20 | 0.17 | 0.04 | 0.03 | 0.03 | 0.02 |
| Malaysia | 0.37 | 0.39 | 0.14 | 0.15 | 0.11 | 0.10 |
| Malta | 0.40 | 0.28 | 0.16 | 0.08 | 0.14 | 0.05 |
| Morocco | 0.04 | 0.12 | 0.00 | 0.01 | 0.00 | 0.01 |
| New Zealand | 0.45 | 0.41 | 0.21 | 0.17 | 0.13 | 0.13 |
| Norway (9) | 0.12 | 0.15 | 0.01 | 0.02 | 0.01 | 0.02 |
| Oman | 0.11 | 0.08 | 0.01 | 0.01 | 0.02 | 0.01 |
| Qatar | 0.33 | 0.33 | 0.11 | 0.11 | 0.12 | 0.09 |
| Russian Federation | 0.07 | 0.08 | 0.00 | 0.01 | 0.01 | 0.01 |
| Saudi Arabia | 0.25 | 0.09 | 0.06 | 0.01 | 0.06 | 0.01 |
| Singapore | 0.32 | 0.38 | 0.10 | 0.15 | 0.07 | 0.12 |
| Slovenia | 0.17 | 0.09 | 0.03 | 0.01 | 0.03 | 0.01 |
| South Africa (9) | 0.10 | 0.12 | 0.01 | 0.01 | 0.01 | 0.03 |
| Sweden | 0.25 | 0.17 | 0.06 | 0.03 | 0.05 | 0.02 |
| Thailand | 0.25 | 0.20 | 0.06 | 0.04 | 0.06 | 0.04 |
| Turkey | 0.22 | 0.27 | 0.05 | 0.07 | 0.04 | 0.06 |
| United Arab Emirates | 0.30 | 0.30 | 0.09 | 0.09 | 0.08 | 0.08 |
| United States | 0.30 | 0.21 | 0.09 | 0.04 | 0.08 | 0.03 |
| International Median | 0.20 | 0.17 | 0.04 | 0.03 | 0.04 | 0.03 |
| Benchmarking Participants | | | | | | |
| Buenos Aires, Argentina | 0.17 | 0.22 | 0.03 | 0.05 | 0.04 | 0.04 |
| Ontario, Canada | 0.21 | 0.17 | 0.04 | 0.03 | 0.04 | 0.03 |
| Quebec, Canada | 0.34 | 0.19 | 0.12 | 0.04 | 0.09 | 0.02 |
| Norway (8) | 0.19 | 0.13 | 0.04 | 0.02 | 0.03 | 0.02 |
| Abu Dhabi, UAE | 0.28 | 0.21 | 0.08 | 0.04 | 0.06 | 0.05 |
| Dubai, UAE | 0.29 | 0.27 | 0.08 | 0.07 | 0.08 | 0.07 |
| Florida, US | 0.41 | 0.15 | 0.16 | 0.02 | 0.16 | 0.02 |