

## CHAPTER 16

# Creating and Interpreting the TIMSS 2019 Context Questionnaire Scales

Liqun Yin  
Bethany Fishbein

### Overview

As described in [Chapter 2](#), many of the TIMSS 2019 context questionnaire items were developed and updated to be combined into scales measuring a single underlying latent construct. While some of these scales measuring particular factors or constructs have been of interest for several TIMSS assessment cycles, others were developed in TIMSS 2019 to reflect current research or collect useful information of interest in important areas, such as enhancing the measures of teacher instructional quality. For reporting, the scales were constructed using item response theory (IRT) scaling methods, specifically the Rasch partial credit model (Masters, 1982; Masters & Wright, 1997). For certain scales that maintained many of the same items across TIMSS 2015 and TIMSS 2019, the scales were linked to allow for trend measurement on the background construct.

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 on the scale delimiting the regions were described in terms of combinations of response categories.

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

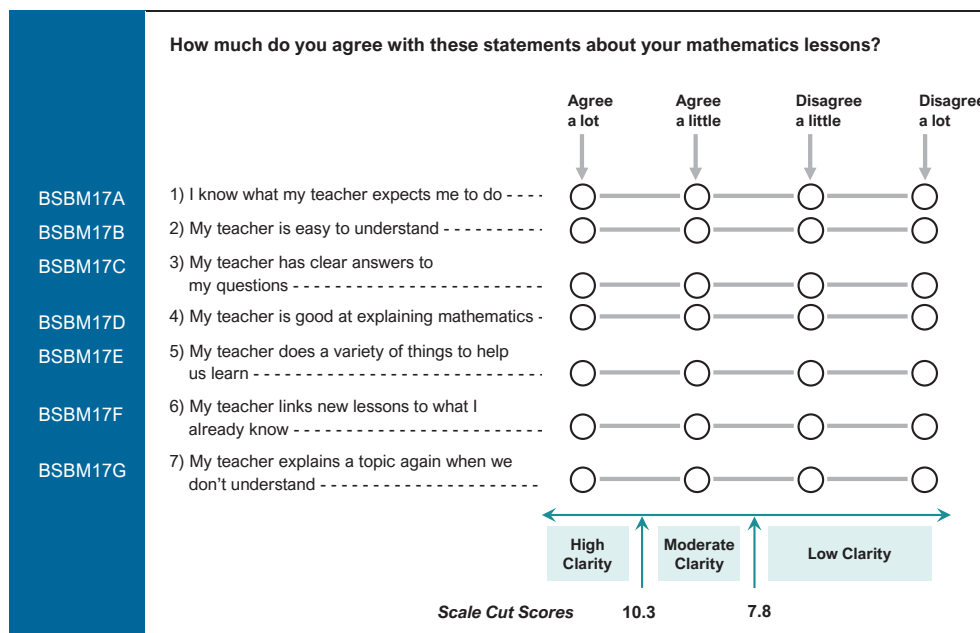
### Reporting TIMSS 2019 Context Questionnaire Scales

As an example illustrating the TIMSS approach to reporting context questionnaire data, Exhibit 16.1 presents the TIMSS 2019 *Instructional Clarity in Mathematics Lessons* scale at the eighth grade, a scale that was reported for the first time for the TIMSS 2019 assessment. As the name suggests, this scale seeks to measure students' perceptions about the clarity of instruction in their mathematics lessons based on

their responses to seven statements. 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 the IRT partial credit model, the data from student responses were placed on a scale constructed so that the scale centerpoint of 10 was located at the mean score of the combined distribution of all TIMSS 2019 eighth grade countries. The units of the scale were chosen so that 2 scale score points corresponded to the standard deviation of the distribution.

Students who were classified as having “high clarity of instruction” in their mathematics lessons are those with a scale score greater than or equal to a cutpoint defined for the scale, 10.3 in this case, corresponding to “agreeing a lot” with four of the seven statements and “agreeing a little” with the other three statements, on average. Students who were classified as having “low clarity of instruction” in their mathematics lessons had a score no higher than a cutpoint of 7.8, corresponding to “disagreeing a little” with four of the statements, and “agreeing a little” with the other three, on average. All other students, i.e., those with scores greater than 7.8 but lower than 10.3, were considered to report “moderate clarity of instruction.”

**Exhibit 16.1: Items in the TIMSS 2019 Instructional Clarity in Mathematics Lessons Scale—Grade 8**



## Scaling Procedure for Context Questionnaire Scales

Partial credit IRT scaling is based on a latent variable 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.

The partial credit model (Masters, 1982) is shown below:

$$P_i(x|\theta_n) = \frac{e^{\sum_{j=0}^x (\theta_n - \delta_i + \tau_{ij})}}{\sum_{h=0}^{m_i} e^{\sum_{j=0}^h (\theta_n - \delta_i + \tau_{ij})}} \quad x = 0, 1, \dots, m_i \quad (16.1)$$

where  $P_i(x|\theta_n)$  denotes the probability that person  $n$  with location  $\theta_n$  on the latent construct would choose response category  $x$  on item  $i$  out of the  $(m_i + 1)$  possible response levels for the item. The item parameter  $\delta_i$  gives the location of the item on the latent construct and the  $\tau_{ij}$  denote step parameters for the response levels. Masters (1982) uses a somewhat different parameterization, namely  $b_{ij} = \delta_i - \tau_{ij}$  (see also [Chapter 11](#) in this volume). For each scale, the scaling procedure involves first estimating the  $\delta_i$  and  $\tau_{ij}$  item parameters at the international level, and then using the model with these parameters to estimate  $\theta_n$ , 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.

In the TIMSS 2019 eighth grade *Instructional Clarity in Mathematics Lessons* scale, the underlying construct is students' perceptions about the clarity of instruction in their mathematics lessons, and students who agree in general with the seven statements are assumed to perceive more instructional clarity, and students who disagree with the statements are assumed to perceive less clarity.

The TIMSS 2019 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 for calibration of 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, regardless of whether they participated in eTIMSS or paperTIMSS in 2019, with each country contributing equally to the calibration. This was achieved by assigning 'senate weights', i.e., sampling weights that sum to 500 for each country's student data.

Exhibit 16.2 shows the international item parameters for the *Instructional Clarity in Mathematics Lessons* scale at the eighth grade. For each item, the delta parameter  $\delta_i$  shows the estimated overall location of the item on the scale, and the tau parameters  $\tau_{ij}$  show the location of the steps, expressed as deviations

from delta. In ConQuest, there are two options on the constraints, either on items or on cases, to remove scale indeterminacy in calibration. In TIMSS 2019 context scale calibrations, the constraints on items were used to identify the model by setting the mean of the item difficulty parameters to zero. As it is shown in Exhibit 16.2, the sum of all  $\delta_i$  is 0 for the *Instructional Clarity in Mathematics Lessons* scale.

In addition, included in the right column is the Rasch infit item statistic, which is a measure of how accurately the model fits the data, with values ranging from 0 to infinity with a value of 1.0 corresponding to optimal fit. Bond & Fox (2001) provide rules of thumb from a practical perspective and consider a range 0.6 to 1.4 for this measure to support an appropriate level of fit for the measurement of survey data using Likert and other rating scales. As can be seen in this exhibit, the infit values obtained for the scale support appropriate fit of the model for the *Instructional Clarity in Mathematics Lessons* scale.

**Exhibit 16.2: Item Parameters for the TIMSS 2019 *Instructional Clarity in Mathematics Lessons* Scale—Grade 8**

Item	delta	tau_1	tau_2	tau_3	Infit
BSBM17A	0.05459	-1.49723	-0.59435	2.09158	1.43
BSBM17B	0.32080	-1.45404	-0.41713	1.87117	0.92
BSBM17C	0.00334	-1.36560	-0.33731	1.70291	0.81
BSBM17D	-0.11300	-1.01045	-0.39445	1.40490	0.77
BSBM17E	-0.03564	-1.22811	-0.35992	1.58803	0.93
BSBM17F	0.11754	-1.42524	-0.44389	1.86913	1.04
BSBM17G	-0.34763	-0.88348	-0.46134	1.34482	0.99

Once the calibration was completed and international item parameters were estimated, individual scores for each respondent (students, teachers, principals, or parents) were estimated 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 estimated values ranging from approximately -5 to +5. To convert to a more convenient reporting metric for the newly constructed scales, 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. As an example, Exhibit 16.3 presents the scale transformation constants applied to the international distribution of logit scores for the *Instructional Clarity in Mathematics Lessons* scale at the eighth grade to transform them to the (10, 2) reporting metric. Each scale was transformed using a different set of transformation constants (not reported here as they do not carry specific meaning) in order to put the estimates on the reporting scale to match the targets of an average of 10 and standard deviation of 2.

### Exhibit 16.3: Scale Transformation Constants for the TIMSS 2019 *Instructional Clarity in Mathematics Lessons Scale—Grade 8*

#### Scale Transformation Constants

$$A = 8.053331$$

$$B = 1.109981$$

$$\text{Transformed Scale Score} = 8.053331 + 1.109981 \cdot \text{Logit Scale Score}$$

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, as described in [Chapter 15](#), 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 described in terms of identifiable combinations of response categories. The particular response combinations that defined the regions boundaries, or cutpoints, were based on a judgment by TIMSS & PIRLS International Study Center staff of what constituted a high or low region on each individual scale. For example, based on a consideration of the questions making up the *Instructional Clarity in Mathematics Lessons* scale, it was determined that in order to be in the high region of the scale and labeled “high clarity of instruction,” a student would have to “agree a lot,” on average, to at least four of the seven statements and “agree a little” with the other three. Similarly, it was determined that a student who, on average, at most “disagreed a little” with four of the statements and “agreed a little” with the other three would be labeled to have “low clarity of instruction.”

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 *Instructional Clarity in Mathematics Lessons* 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 clarity of instruction” 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 “low clarity of instruction” region. Students with raw scores between 10 and 18 were assigned to the “moderate clarity of instruction” region.

A property of a Rasch scale is that each raw score has a unique scale score associated with it. Exhibit 16.4 presents a raw score-scale score equivalence table for the *Instructional Clarity in Mathematics Lessons* scale at the eighth grade. From this table, it can be seen that, for this particular scale, a raw score of 10 corresponds to a scale score of 7.8 (rounding up) and a raw score of 18 corresponds to a scale score of 10.3 (rounding down) for this particular scale.<sup>1</sup> These scale scores were the cutpoints used to divide the scale into the three regions.

**Exhibit 16.4: Equivalence Table of Raw and Transformed Scale Scores for the TIMSS 2019 Instructional Clarity in Mathematics Lessons Scale—Grade 8**

Raw Score	Transformed Scale Score	Cutpoint
0	3.69567	
1	4.93373	
2	5.53063	
3	5.94336	
4	6.27085	
5	6.55198	
6	6.80608	
7	7.04464	
8	7.27558	
9	7.50516	
10	7.73983	7.8
11	7.98224	
12	8.24029	
13	8.51896	
14	8.82274	
15	9.15605	
16	9.52219	
17	9.92675	
18	10.38390	10.3
19	10.92487	
20	11.65115	
21	13.01885	

<sup>1</sup> 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., 10.38390 for the Instructional Clarity scale) at the cutpoint were included within the highest region. For a similar reason, the lower cutpoint was rounded up.

## Linking Procedures for Trend Context Questionnaire Scales

Using context questionnaire IRT scales to measure contextual constructs started 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. As described in [Chapter 2](#), many of the scales included in the TIMSS 2019 context questionnaires were brought forward from 2015 because they addressed home and school factors that have been of interest for several TIMSS assessments and were relatively stable across successive cycles. These scales were either brought forward in their entirety or modified for the TIMSS 2019 assessment cycle. The scales with no changes or with minor to moderate modifications were considered as trend scales. Linking procedures were then implemented on these trend scales to place the context questionnaire data from the two or three cycles on a common metric, depending on whether the common reporting metric was established in 2011 or in 2015. This section describes the linking procedures for placing data for the TIMSS 2019 context questionnaire scales onto the trend reporting metric and validating this process.

The trend context scales in TIMSS 2019 have items common to both TIMSS 2015 and TIMSS 2019, called trend items, and some new items unique to TIMSS 2019. Generally, a context questionnaire scale was considered as trend in 2019 if it had a sufficient number of items in common with TIMSS 2015: a minimum of 5 common items and more than half of the TIMSS 2019 items being common items. However, all separate science scales at the eighth grade (biology, chemistry, physics, earth sciences) were treated as new scales in 2019 even if most items were common to the TIMSS 2015 versions of those scales. The number of trend countries for separate science scales was relatively small. Linking the scales using limited trend countries across cycles was deemed less beneficial than providing scale cut points that best reflect the distribution of all countries using separate science scales for each cycle separately.

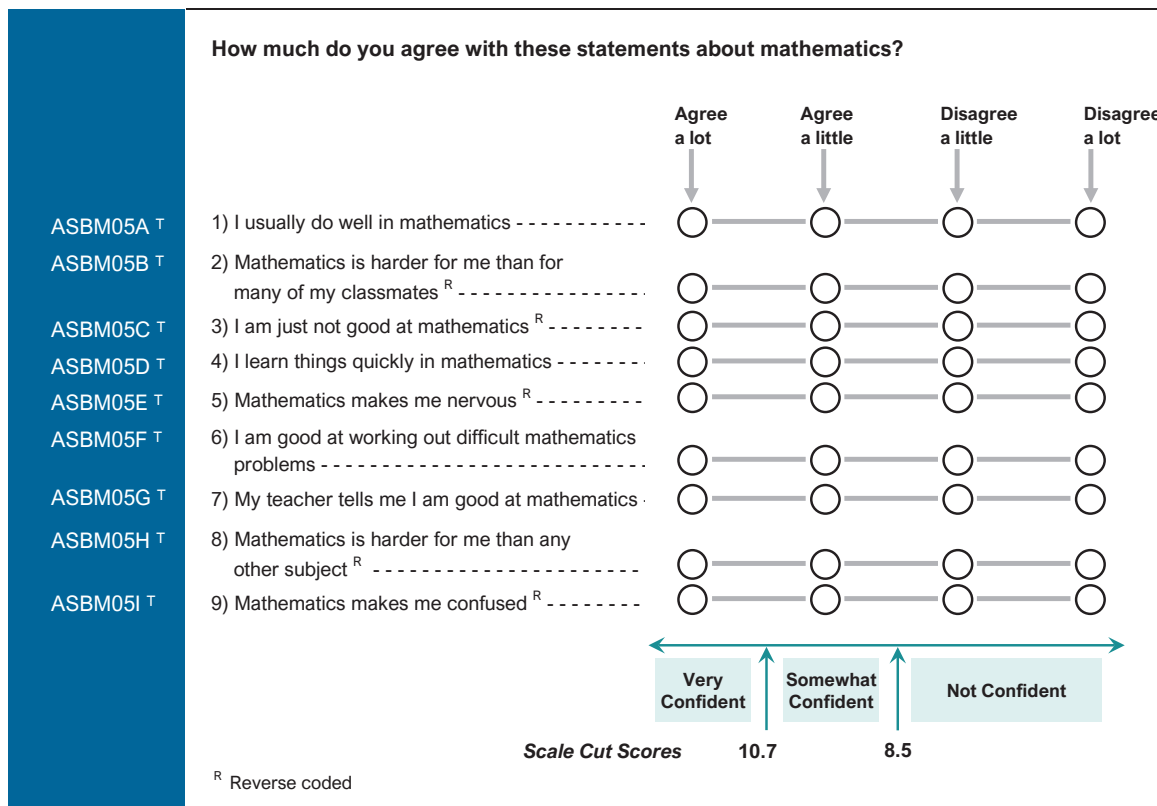
In TIMSS 2019, 18 fourth grade and 16 eighth grade context questionnaire scales were specified as trend scales. Exhibit 16.5 lists the trend context scales in TIMSS 2019 for both the fourth grade and the eighth grade.

**Exhibit 16.5: Trend Context Scales in TIMSS 2019**

Trend Scales	Year of Trend Metric Established	
	Grade 4	Grade 8
Students Confident in Mathematics	2011	2011
Students Confident in Science	2011	2011
Students Like Learning Mathematics	2011	2011
Students Like Learning Science	2011	2011
Students' Sense of School Belonging	2015	2015
Students Value Mathematics	~	2011
Students Value Science	~	2011
Home Educational Resources	~	2011
Home Resources for Learning	2011	~
Home Early Literacy and Numeracy Activities Before Primary School	2011	~
Could Do Literacy and Numeracy Tasks When Beginning Primary School	2015	~
Parents' Perceptions of Their Child's School	2015	~
Instruction Affected by Mathematics Resource Shortages - Principals' Reports	2011	2011
Instruction Affected by Science Resource Shortages - Principals' Reports	2011	2011
School Discipline - Principals' reports	2011	2011
School Emphasis on Academic Success - Principals' Reports	2015	2015
Schools Where Students Enter the Primary Grades with Literacy and Numeracy Skills	2015	~
Classroom Teaching Limited by Students Not Ready for Instruction	2015	2015
Safe and Orderly Schools - Teachers' Reports	2011	2011
Teachers' Emphasis on Science Investigation	2015	2015
Teachers' Job Satisfaction	2015	2015

As an example, Exhibit 16.6 shows the TIMSS 2019 *Students Confident in Mathematics* scale for fourth grade students. This scale was originally established in TIMSS 2011, and 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. All of the nine statements were common to the TIMSS 2015 and TIMSS 2019 versions of this scale.



**Exhibit 16.6: Items in the TIMSS 2019 Students Confident in Mathematics Trend Scale—Grade 4**

The IRT calibration and scoring procedures for trend scales were the same as those used for the newly developed context scales. The data for these nine items were calibrated across all TIMSS 2019 countries using the Rasch partial credit model, and, through this calibration, item parameters were estimated on a logit scale that was unique to the 2019 assessment 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 2019 logit metric. Although similar, the TIMSS 2019 logit metric is not identical to the TIMSS 2015 logit metric, especially for the scales with items modified or new items added, and thus the TIMSS 2019 scores needed to be adjusted to the 2015 metric to allow for trend linking.

This linking was achieved through a two-step transformation process. The first transformation—with linear constants  $A_1$  and  $B_1$ —placed the TIMSS 2019 logit scale scores on the TIMSS 2015 logit metric, and the second transformation—with linear constants  $A_2$  and  $B_2$ —transformed the TIMSS 2015 logit metric to the TIMSS scale reporting metric, which uses the (10, 2) metric established in 2011. 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  $B$ :

$$B = B_2 \cdot B_1 \quad (16.2)$$

$$A = A_2 + B_2 \cdot A_1 \quad (16.3)$$

The first set of transformation parameters,  $A_1$  and  $B_1$ , were obtained by applying the mean/sigma method (Kolen & Brennan, 2004; Marco, 1977) to the two sets of common item parameters: one from the current calibration of TIMSS 2019 context data and the other from the previous calibration of TIMSS 2015 data. The mean and standard deviation of the estimates of the threshold parameters (Masters, 1982), that is, the difference between item location and item step parameter, ( $b_{ij} = \delta_i - \tau_{ij}$ ), 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:

$$B_1 = \frac{SD_{c15}}{SD_{c19}} \quad (16.4)$$

$$A_1 = MN_{c15} - \frac{SD_{c15}}{SD_{c19}} \cdot MN_{c19} \quad (16.5)$$

where  $MN_{c19}$  and  $SD_{c19}$  are the mean and standard deviation of the estimates of ( $b_{ij} = \delta_i - \tau_{ij}$ ) of all common items and categories from the current calibration on TIMSS 2019 data;  $MN_{c15}$  and  $SD_{c15}$  are the mean and standard deviation of the estimates of ( $b_{ij} = \delta_i - \tau_{ij}$ ) of all common items and categories from the previous calibration on TIMSS 2015 data.

The second set of transformation parameters,  $A_2$  and  $B_2$ , were retrieved from the scale transformations produced in 2015. This transformation aimed to place the resulting Rasch scores on the TIMSS reporting metric (10, 2). When the scale started in TIMSS 2015, the second set of transformation parameters were produced in 2015 by simply transforming TIMSS 2015 Rasch logit scores on the (10, 2) scale reporting metric.

The Exhibit 16.7 presents the final trend scale transformation constants applied to the TIMSS 2019 international distribution of logit scale scores for the fourth grade *Students Confident in Mathematics* trend scale to transform them to the (10, 2) reporting metric.

#### **Exhibit 16.7: Scale Transformation Constants for the TIMSS 2019 *Students Confident in Mathematics* Scale—Grade 4**

##### **Scale Transformation Constants**

$$A = 8.556200$$

$$B = 1.689256$$

$$\text{Transformed Scale Score} = 8.556200 + 1.689256 \cdot \text{Logit Scale Score}$$

To validate the trend measurement on the scales, the TIMSS & PIRLS International Study center conducted extensive analysis to examine item behavior in both cycles. 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 2019 item parameter estimates after being transformed to the TIMSS 2015 logit metric, and the TIMSS 2015 item parameter estimates on the 2015 logit scale. The transformation parameters used for transforming item parameters and this evaluation purpose were the same as those for linking the TIMSS 2019 Rasch scale scores to the TIMSS 2015 logit metric,  $A_1$  and  $B_1$ , as described above. Exhibit 16.8 presents the differences between these estimates for the fourth grade *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 16.8: Differences in Parameter Estimates for Common Items on the TIMSS 2015 Logit Metric, *Students Confident in Mathematics* Scale—Grade 4**

TIMSS 2019 Variable	TIMSS 2015 Variable	Difference in delta	Difference in tau_1	Difference in tau_2	Difference in tau_3
ASBM05A	ASBM03A	-0.05448	0.01395	0.02991	-0.04386
ASBM05B <sup>R</sup>	ASBM03B	0.00360	-0.03255	0.04038	-0.00784
ASBM05C <sup>R</sup>	ASBM03C	0.01797	-0.04531	0.05472	-0.00941
ASBM05D	ASBM03D	0.04765	-0.02641	0.07533	-0.04891
ASBM05E <sup>R</sup>	ASBM03E	-0.09879	0.05639	-0.01716	-0.03923
ASBM05F	ASBM03F	0.02092	-0.06191	0.06295	-0.00104
ASBM05G	ASBM03G	0.03794	0.00123	0.01043	-0.01166
ASBM05H <sup>R</sup>	ASBM03H	-0.01459	-0.02508	0.04345	-0.01836
ASBM05I <sup>R</sup>	ASBM03I	0.03978	-0.03662	0.01018	0.02644

<sup>R</sup> Reverse coded

## Analyzing Trends on the TIMSS 2019 Context Questionnaire Scales

The resulting trend scale scores are comparable to the scales scores in previous cycles, TIMSS 2015, or both TIMSS 2015 and TIMSS 2011 if the trend metric was established in TIMSS 2011. However, trend analyses with the TIMSS context questionnaire scales should be conducted with caution, as observed differences in the scale scores across TIMSS cycles may not be meaningful for all countries. The psychometric behavior of the contextual scales may vary when the group of participating countries varies between successive cycles (as it is the case for the eighth grade separate science scales), and the scales may behave differently across cultures. In addition, the psychometric behavior of the scales within any

given country may not remain stable, as linking the TIMSS 2019 scales to TIMSS 2015 did not account for any differences in national translations or adaptations between the two cycles.

Trend results cannot be analyzed using the percentage of students in each benchmark region. For trend scales, the raw cut points were re-defined in each TIMSS assessment cycle because the number of component variables in the scales would likely change when the scales were modified across cycles. 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 2015 or 2019.

## Reliability and Validity of the TIMSS 2019 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 component analysis (Hotelling, 1933) of the scale items was conducted. Exhibit 16.9 presents the results of this analysis for the fourth grade *Students Confident in Mathematics* scale. The Cronbach's Alpha reliability coefficients generally were at an acceptable level (Peterson, 1994; Taber, 2017), 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 component analysis are positive and substantial, indicating a strong correlation between each item and the scale in every country.

**Exhibit 16.9: Cronbach’s Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Students Confident in Mathematics* Scale—Grade 4**

Country	Cronbach’s Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item									
			ASBM03A	ASBM03B <sup>R</sup>	ASBM03C <sup>R</sup>	ASBM03D	ASBM03E <sup>R</sup>	ASBM03F	ASBM03G	ASBM03H <sup>R</sup>	ASBM03I <sup>R</sup>	
Albania	0.82	42	0.65	0.68	0.74	0.61	0.58	0.65	0.65	0.69	0.55	
Armenia	0.81	40	0.65	0.60	0.73	0.60	0.57	0.60	0.63	0.69	0.63	
Australia	0.87	51	0.76	0.73	0.79	0.72	0.62	0.76	0.39	0.78	0.77	
Austria	0.89	54	0.77	0.75	0.77	0.76	0.61	0.70	0.69	0.80	0.76	
Azerbaijan	0.81	40	0.57	0.64	0.74	0.59	0.60	0.58	0.63	0.69	0.65	
Bahrain	0.81	39	0.39	0.68	0.71	0.55	0.67	0.54	0.50	0.76	0.70	
Belgium (Flemish)	0.88	52	0.79	0.77	0.82	0.68	0.55	0.73	0.61	0.79	0.70	
Bosnia and Herzegovina	0.86	47	0.72	0.69	0.72	0.67	0.63	0.65	0.68	0.73	0.71	
Bulgaria	0.88	51	0.75	0.72	0.75	0.75	0.61	0.71	0.67	0.76	0.72	
Canada	0.87	50	0.76	0.75	0.77	0.71	0.64	0.71	0.39	0.77	0.77	
Chile	0.82	41	0.63	0.60	0.72	0.63	0.61	0.60	0.47	0.73	0.74	
Chinese Taipei	0.85	46	0.73	0.67	0.64	0.74	0.56	0.69	0.64	0.73	0.72	
Croatia	0.89	52	0.75	0.73	0.72	0.77	0.66	0.69	0.61	0.79	0.77	
Cyprus	0.87	49	0.70	0.74	0.77	0.67	0.65	0.67	0.57	0.74	0.75	
Czech Republic	0.86	48	0.73	0.70	0.78	0.73	0.64	0.57	0.57	0.76	0.72	
Denmark	0.88	50	0.76	0.73	0.81	0.76	0.55	0.66	0.51	0.75	0.75	
England	0.88	52	0.77	0.74	0.81	0.74	0.64	0.76	0.35	0.80	0.76	
Finland	0.86	48	0.76	0.71	0.80	0.75	0.64	0.70	0.48	0.76	0.57	
France	0.88	52	0.77	0.73	0.79	0.74	0.58	0.70	0.55	0.75	0.82	
Georgia	0.81	40	0.63	0.69	0.75	0.58	0.60	0.46	0.49	0.73	0.68	
Germany	0.90	54	0.76	0.77	0.80	0.74	0.64	0.70	0.65	0.78	0.75	
Hong Kong SAR	0.84	45	0.70	0.65	0.78	0.67	0.59	0.70	0.56	0.73	0.63	
Hungary	0.88	51	0.78	0.73	0.78	0.73	0.55	0.70	0.72	0.74	0.69	
Iran, Islamic Rep. of	0.79	38	0.62	0.52	0.52	0.63	0.64	0.63	0.58	0.69	0.68	
Ireland	0.86	50	0.75	0.75	0.78	0.74	0.60	0.75	0.31	0.80	0.73	
Italy	0.85	46	0.71	0.70	0.64	0.72	0.65	0.59	0.55	0.75	0.73	
Japan	0.87	49	0.72	0.67	0.83	0.70	0.65	0.76	0.43	0.72	0.75	
Kazakhstan	0.86	47	0.68	0.71	0.79	0.73	0.58	0.69	0.58	0.73	0.67	
Korea, Rep. of	0.88	53	0.84	0.76	0.76	0.75	0.46	0.80	0.53	0.80	0.75	
Kosovo	0.74	33	0.53	0.69	0.71	0.41	0.64	0.34	0.49	0.73	0.51	
Kuwait	0.76	34	0.29	0.70	0.72	0.41	0.71	0.35	0.38	0.74	0.69	

<sup>R</sup> Reverse coded

**Exhibit 16.9: Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 Students Confident in Mathematics Scale—Grade 4 (continued)**

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item								
			ASBM03A	ASBM03B <sup>R</sup>	ASBM03C <sup>R</sup>	ASBM03D	ASBM03E <sup>R</sup>	ASBM03F	ASBM03G	ASBM03H <sup>R</sup>	ASBM03I <sup>R</sup>
Latvia	0.89	53	0.79	0.73	0.79	0.77	0.61	0.71	0.66	0.77	0.68
Lithuania	0.87	50	0.78	0.70	0.70	0.73	0.62	0.73	0.66	0.76	0.64
Malta	0.87	49	0.71	0.73	0.78	0.69	0.67	0.64	0.51	0.77	0.75
Montenegro	0.84	44	0.66	0.69	0.70	0.61	0.66	0.57	0.60	0.74	0.72
Morocco	0.74	32	0.39	0.67	0.69	0.39	0.67	0.33	0.37	0.72	0.68
Netherlands	0.88	53	0.78	0.74	0.84	0.71	0.49	0.75	0.51	0.79	0.83
New Zealand	0.83	43	0.71	0.64	0.75	0.66	0.55	0.70	0.38	0.74	0.69
North Macedonia	0.82	41	0.59	0.72	0.72	0.55	0.65	0.50	0.58	0.74	0.70
Northern Ireland	0.87	51	0.77	0.73	0.80	0.74	0.63	0.74	0.34	0.78	0.77
Norway (5)	0.87	50	0.75	0.73	0.79	0.74	0.54	0.76	0.43	0.76	0.74
Oman	0.71	31	0.16	0.73	0.65	0.34	0.73	0.19	0.25	0.76	0.72
Pakistan	0.70	30	0.21	0.66	0.71	0.19	0.72	0.21	0.20	0.73	0.74
Philippines	0.54	26	-0.31	0.67	0.60	-0.25	0.57	-0.32	-0.34	0.67	0.61
Poland	0.87	49	0.75	0.71	0.71	0.75	0.58	0.72	0.57	0.77	0.71
Portugal	0.85	46	0.70	0.62	0.77	0.65	0.62	0.68	0.60	0.71	0.73
Qatar	0.79	37	0.37	0.72	0.75	0.43	0.71	0.43	0.39	0.77	0.74
Russian Federation	0.88	52	0.75	0.71	0.79	0.79	0.61	0.71	0.62	0.75	0.73
Saudi Arabia	0.76	36	0.12	0.75	0.74	0.37	0.76	0.24	0.33	0.79	0.76
Serbia	0.90	55	0.77	0.76	0.81	0.72	0.66	0.71	0.68	0.77	0.76
Singapore	0.87	51	0.77	0.75	0.79	0.70	0.63	0.70	0.47	0.78	0.75
Slovak Republic	0.88	50	0.76	0.69	0.80	0.68	0.65	0.65	0.58	0.76	0.75
South Africa (5)	0.68	28	0.20	0.69	0.70	0.21	0.66	0.16	0.12	0.74	0.69
Spain	0.84	44	0.66	0.69	0.73	0.61	0.64	0.61	0.54	0.72	0.75
Sweden	0.87	50	0.76	0.70	0.77	0.76	0.58	0.73	0.43	0.80	0.74
Turkey (5)	0.84	45	0.71	0.69	0.76	0.64	0.50	0.67	0.61	0.75	0.70
United Arab Emirates	0.80	39	0.50	0.70	0.73	0.51	0.66	0.48	0.46	0.75	0.71
United States	0.86	48	0.69	0.75	0.77	0.68	0.63	0.65	0.37	0.80	0.76
<b>Benchmarking Participants</b>											
Ontario, Canada	0.87	50	0.76	0.77	0.79	0.69	0.63	0.71	0.39	0.77	0.78
Quebec, Canada	0.87	50	0.78	0.73	0.71	0.74	0.66	0.74	0.39	0.75	0.78
Moscow City, Russian Fed.	0.90	56	0.76	0.77	0.82	0.81	0.65	0.74	0.60	0.78	0.77

<sup>R</sup> Reverse coded

**Exhibit 16.9: Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Students Confident in Mathematics* Scale—Grade 4 (continued)**

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item								
			ASBM03A	ASBM03B <sup>R</sup>	ASBM03C <sup>R</sup>	ASBM03D	ASBM03E <sup>R</sup>	ASBM03F	ASBM03G	ASBM03H <sup>R</sup>	ASBM03I <sup>R</sup>
Madrid, Spain	0.84	44	0.68	0.66	0.71	0.62	0.65	0.61	0.54	0.70	0.78
Abu Dhabi, UAE	0.78	36	0.42	0.71	0.74	0.45	0.66	0.42	0.39	0.75	0.70
Dubai, UAE	0.82	42	0.62	0.68	0.75	0.59	0.62	0.58	0.51	0.73	0.70

<sup>R</sup> 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 fourth grade *Students Confident in Mathematics* scale, Exhibit 16.10 presents the Pearson correlation with mathematics achievement in TIMSS 2019 for each country, together with  $r$ -squared—the proportion of variance in mathematics achievement attributable to the 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 in Mathematics* 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 16.10: Relationship Between the TIMSS 2019 *Students Confident in Mathematics* Scale—Grade 4 and TIMSS 2019 Mathematics Achievement**

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
Albania	0.39	0.15	0.16
Armenia	0.37	0.14	0.14
Australia	0.44	0.20	0.19
Austria	0.48	0.23	0.22
Azerbaijan	0.38	0.15	0.15
Bahrain	0.26	0.07	0.06
Belgium (Flemish)	0.46	0.21	0.21
Bosnia and Herzegovina	0.40	0.16	0.16
Bulgaria	0.42	0.18	0.19

**Exhibit 16.10: Relationship Between the TIMSS 2019 *Students Confident in Mathematics* Scale—Grade 4 and TIMSS 2019 Mathematics Achievement (continued)**

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
Canada	0.44	0.20	0.20
Chile	0.41	0.17	0.17
Chinese Taipei	0.44	0.19	0.18
Croatia	0.44	0.20	0.19
Cyprus	0.48	0.24	0.22
Czech Republic	0.41	0.17	0.17
Denmark	0.47	0.22	0.20
England	0.45	0.20	0.19
Finland	0.42	0.18	0.18
France	0.43	0.18	0.18
Georgia	0.34	0.12	0.12
Germany	0.47	0.22	0.22
Hong Kong SAR	0.39	0.15	0.17
Hungary	0.50	0.25	0.25
Iran, Islamic Rep. of	0.30	0.09	0.09
Ireland	0.41	0.17	0.15
Italy	0.29	0.09	0.08
Japan	0.44	0.19	0.19
Kazakhstan	0.26	0.07	0.06
Korea, Rep. of	0.48	0.23	0.22
Kosovo	0.37	0.13	0.15
Kuwait	0.28	0.08	0.09
Latvia	0.51	0.26	0.25
Lithuania	0.48	0.23	0.21
Malta	0.39	0.16	0.16
Montenegro	0.42	0.17	0.17
Morocco	0.33	0.11	0.10
Netherlands	0.54	0.29	0.28
New Zealand	0.40	0.16	0.15
North Macedonia	0.43	0.19	0.18



**Exhibit 16.10: Relationship Between the TIMSS 2019 *Students Confident in Mathematics* Scale—Grade 4 and TIMSS 2019 Mathematics Achievement (continued)**

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
Northern Ireland	0.43	0.19	0.19
Norway (5)	0.41	0.17	0.18
Oman	0.37	0.13	0.14
Pakistan	0.24	0.06	0.05
Philippines	0.33	0.11	0.10
Poland	0.45	0.20	0.20
Portugal	0.48	0.23	0.22
Qatar	0.30	0.09	0.09
Russian Federation	0.38	0.15	0.14
Saudi Arabia	0.35	0.12	0.14
Serbia	0.47	0.22	0.21
Singapore	0.49	0.24	0.25
Slovak Republic	0.43	0.18	0.17
South Africa (5)	0.41	0.17	0.15
Spain	0.46	0.21	0.21
Sweden	0.37	0.13	0.12
Turkey (5)	0.41	0.17	0.17
United Arab Emirates	0.24	0.06	0.06
United States	0.46	0.21	0.23
<b>International Median</b>	<b>0.42</b>	<b>0.17</b>	<b>0.17</b>
<b>Benchmarking Participants</b>			
Ontario, Canada	0.43	0.19	0.18
Quebec, Canada	0.48	0.23	0.24
Moscow City, Russian Fed.	0.48	0.23	0.23
Madrid, Spain	0.48	0.23	0.23
Abu Dhabi, UAE	0.27	0.08	0.08
Dubai, UAE	0.19	0.04	0.04

Item parameter estimates and item and scale statistics similar to those above are available in Appendix 16A for each of the fourth grade TIMSS 2019 context questionnaire scales and in Appendix 16B for each of the eighth grade context questionnaire scales. In both Appendices, scales based on students' reports are listed first, followed by principals' reports, then teachers' reports.

## References

- Adams, R. J., Wu, M. L., & Wilson, M. (2012). The Rasch rating model and the disordered threshold controversy. *Educational and Psychological Measurement, 72*(4), 547–573. Retrieved from <http://epm.sagepub.com/content/72/4/547>
- Bond, T. J. & Fox, C. M. (2001). *Applying the Rasch Model: Fundamental measurement in the human sciences* (1st Edition). Mahwah, NJ: Lawrence Erlbaum Assoc.
- Hotelling, H. (1933). Analysis of a complex of statistical variables into principal components. *Journal of Educational Psychology, 24*, 417–441, 498–520.
- Kolen. M. J. & Brennan, R. L. (2004). *Test equating, scaling, and linking* (2nd Edition). New York: Springer Science + Business media, Inc.
- Marco, G. L. (1977). Item characteristic curves solutions to three intractable testing problems. *Journal of Educational Measurement, 14*, 139–160.
- Masters, G. N. (1982). A Rasch Model for Partial Credit Scoring. *Psychometrika, 47*(2), 149-174.
- Masters, G. N., & Wright, B. D. (1997). The partial credit model. In: W. J. van der Linden & R. K. Hambleton (Eds.), *Handbook of modern item response theory*. Berlin: Springer.
- Peterson, A. R. (1994). A meta-analysis of Cronbach's coefficient alpha. *Journal of Consumer Research, 21*(2), 381-391.
- Taber, K. (2017). The use of Cronbach's alpha when developing and reporting research instruments in science education. *Research in Science Education, 48*, 1273-1296. <https://doi.org/10.1007/s11165-016-9602-2>
- 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.

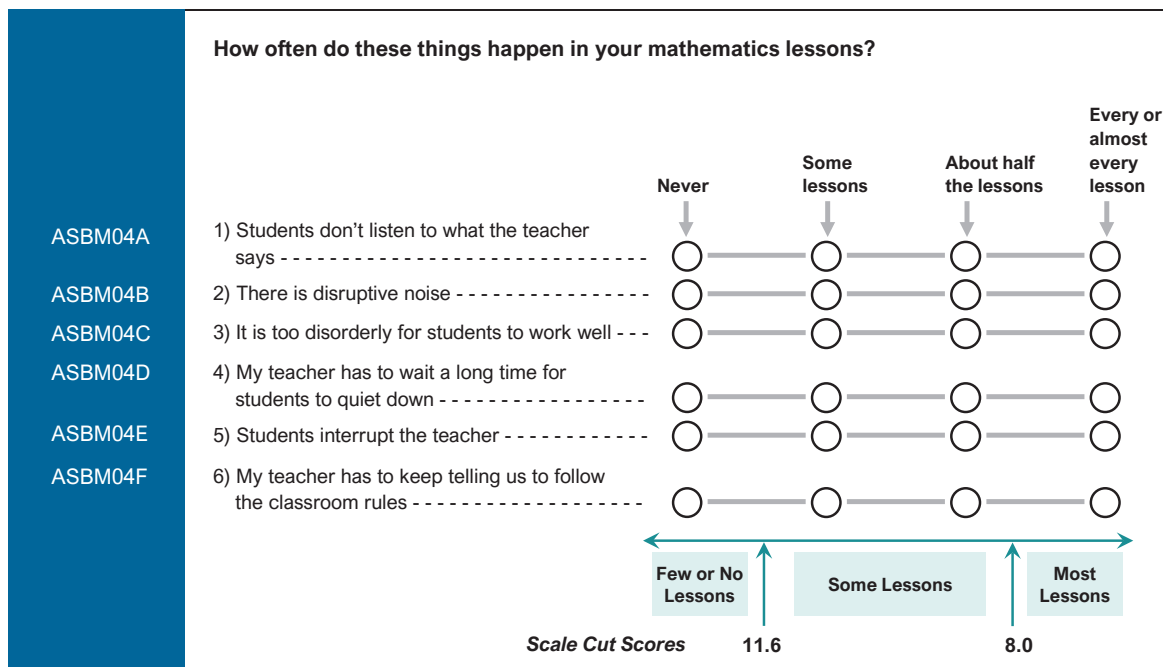
## Appendix 16A: TIMSS 2019 Context Questionnaire Scales—Grade 4

### Scales Based on Students' and Parents' Reports

## Disorderly Behavior During Mathematics Lessons – Grade 4

### About the Scale

The *Disorderly Behavior During Mathematics Lessons* scale was created based on students' responses to six items listed below.



### Item Parameters for the TIMSS 2019 *Disorderly Behavior During Mathematics Lessons* Scale – Grade 4

Item	delta	tau_1	tau_2	tau_3	Infit
ASBM04A	0.06260	-0.67190	-0.64661	1.31851	1.06
ASBM04B	0.15853	-0.46978	-0.54643	1.01621	0.94
ASBM04C	-0.43410	-0.26438	-0.23380	0.49818	1.01
ASBM04D	0.06350	-0.10998	-0.60607	0.71605	0.91
ASBM04E	-0.09436	-0.22110	-0.59219	0.81329	0.90
ASBM04F	0.24383	0.10650	-0.79706	0.69056	1.29

### Scale Transformation Constants for the TIMSS 2019 *Disorderly Behavior During Mathematics Lessons* Scale – Grade 4

#### Scale Transformation Constants

$$A = 9.816113$$

$$B = 1.569359$$

$$\text{Transformed Scale Score} = 9.816113 + 1.569359 \cdot \text{Logit Scale Score}$$

### Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019 *Disorderly Behavior During Mathematics Lessons* Scale – Grade 4

Raw Score	Transformed Scale Score	Cutpoint
0	5.44760	
1	6.85775	
2	7.51217	
3	7.96009	8.0
4	8.31475	
5	8.61844	
6	8.89281	
7	9.15042	
8	9.40001	
9	9.65042	
10	9.90339	
11	10.17203	
12	10.46699	
13	10.79976	
14	11.19445	
15	11.68787	11.6
16	12.34583	
17	13.31363	
18	15.22889	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Disorderly Behavior During Mathematics Lessons* Scale – Grade 4

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item					
			ASBM04A	ASBM04B	ASBM04C	ASBM04D	ASBM04E	ASBM04F
Albania	0.79	51	0.72	0.80	0.80	0.70	0.76	0.42
Armenia	0.84	55	0.75	0.78	0.66	0.77	0.76	0.73
Australia	0.86	58	0.71	0.77	0.71	0.81	0.81	0.75
Austria	0.85	57	0.67	0.78	0.76	0.82	0.79	0.70
Azerbaijan	0.80	50	0.70	0.79	0.75	0.71	0.72	0.54
Bahrain	0.79	49	0.69	0.74	0.67	0.75	0.76	0.59
Belgium (Flemish)	0.78	48	0.66	0.66	0.56	0.76	0.77	0.71
Bosnia and Herzegovina	0.84	55	0.67	0.75	0.62	0.81	0.80	0.76
Bulgaria	0.85	57	0.57	0.80	0.81	0.83	0.74	0.72
Canada	0.84	56	0.71	0.74	0.71	0.80	0.79	0.73
Chile	0.84	55	0.64	0.72	0.77	0.79	0.81	0.72
Chinese Taipei	0.84	56	0.72	0.78	0.81	0.76	0.78	0.60
Croatia	0.87	61	0.69	0.81	0.77	0.84	0.82	0.75
Cyprus	0.79	50	0.67	0.74	0.53	0.80	0.79	0.66
Czech Republic	0.89	64	0.74	0.82	0.78	0.83	0.84	0.80
Denmark	0.85	58	0.67	0.82	0.81	0.79	0.77	0.68
England	0.85	58	0.73	0.77	0.71	0.81	0.82	0.72
Finland	0.88	62	0.73	0.80	0.82	0.83	0.80	0.75
France	0.82	52	0.61	0.75	0.76	0.78	0.72	0.72
Georgia	0.84	55	0.67	0.77	0.62	0.81	0.81	0.74
Germany	0.85	58	0.68	0.79	0.79	0.80	0.78	0.70
Hong Kong SAR	0.88	63	0.78	0.81	0.82	0.82	0.82	0.71
Hungary	0.86	58	0.66	0.79	0.71	0.82	0.81	0.80
Iran, Islamic Rep. of	0.84	55	0.65	0.77	0.77	0.80	0.78	0.68
Ireland	0.83	54	0.71	0.74	0.69	0.78	0.77	0.70
Italy	0.81	52	0.61	0.77	0.76	0.74	0.76	0.67
Japan	0.86	58	0.73	0.76	0.78	0.75	0.78	0.77
Kazakhstan	0.77	50	0.69	0.79	0.76	0.73	0.80	0.35
Korea, Rep. of	0.83	55	0.77	0.80	0.75	0.73	0.81	0.54
Kosovo	0.80	52	0.71	0.79	0.76	0.76	0.79	0.45
Kuwait	0.76	45	0.69	0.76	0.67	0.73	0.75	0.37
Latvia	0.86	58	0.73	0.79	0.72	0.81	0.80	0.72
Lithuania	0.85	58	0.76	0.82	0.78	0.82	0.74	0.63
Malta	0.79	49	0.66	0.73	0.65	0.76	0.78	0.62
Montenegro	0.82	52	0.70	0.76	0.57	0.78	0.79	0.71
Morocco	0.75	45	0.64	0.72	0.72	0.71	0.72	0.47
Netherlands	0.84	55	0.60	0.79	0.79	0.81	0.78	0.67
New Zealand	0.84	56	0.67	0.75	0.76	0.79	0.80	0.70
North Macedonia	0.84	56	0.73	0.78	0.75	0.80	0.79	0.60

**Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 Disorderly Behavior During Mathematics Lessons Scale – Grade 4**

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item					
			ASBM04A	ASBM04B	ASBM04C	ASBM04D	ASBM04E	ASBM04F
Northern Ireland	0.81	52	0.64	0.68	0.76	0.78	0.76	0.68
Norway (5)	0.87	60	0.70	0.81	0.78	0.83	0.80	0.74
Oman	0.80	49	0.64	0.74	0.74	0.74	0.73	0.61
Pakistan	0.77	47	0.68	0.66	0.69	0.74	0.69	0.65
Philippines	0.64	36	0.58	0.60	0.63	0.60	0.67	0.49
Poland	0.89	63	0.67	0.82	0.83	0.84	0.80	0.81
Portugal	0.86	58	0.64	0.78	0.77	0.79	0.81	0.79
Qatar	0.83	54	0.71	0.77	0.72	0.77	0.79	0.62
Russian Federation	0.88	63	0.73	0.82	0.82	0.82	0.79	0.77
Saudi Arabia	0.80	51	0.69	0.78	0.77	0.75	0.76	0.50
Serbia	0.83	53	0.68	0.75	0.66	0.76	0.80	0.72
Singapore	-	-	-	-	-	-	-	-
Slovak Republic	0.87	61	0.67	0.80	0.77	0.82	0.82	0.78
South Africa (5)	0.74	43	0.59	0.67	0.68	0.72	0.72	0.55
Spain	0.77	48	0.67	0.76	0.65	0.79	0.79	0.45
Sweden	0.87	61	0.71	0.80	0.81	0.84	0.81	0.71
Turkey (5)	0.83	54	0.72	0.78	0.66	0.76	0.77	0.70
United Arab Emirates	0.86	59	0.76	0.80	0.76	0.80	0.81	0.67
United States	0.87	60	0.74	0.79	0.71	0.81	0.82	0.76
<b>Benchmarking Participants</b>								
Ontario, Canada	0.84	56	0.71	0.74	0.68	0.80	0.82	0.73
Quebec, Canada	0.84	55	0.71	0.72	0.75	0.79	0.75	0.72
Moscow City, Russian Fed.	0.87	61	0.72	0.81	0.83	0.83	0.78	0.73
Madrid, Spain	0.77	48	0.67	0.74	0.65	0.79	0.79	0.46
Abu Dhabi, UAE	0.84	56	0.72	0.78	0.75	0.76	0.79	0.65
Dubai, UAE	0.87	62	0.78	0.79	0.73	0.82	0.83	0.74

A dash (–) indicates comparable data not available.

### Relationship Between the TIMSS 2019 *Disorderly Behavior During Mathematics Lessons* Scale and TIMSS 2019 Achievement – Grade 4

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
Albania	0.11	0.01	0.02
Armenia	0.06	0.00	0.01
Australia	0.24	0.06	0.04
Austria	0.21	0.04	0.03
Azerbaijan	0.04	0.00	0.00
Bahrain	0.10	0.01	0.01
Belgium (Flemish)	0.15	0.02	0.01
Bosnia and Herzegovina	0.09	0.01	0.02
Bulgaria	0.21	0.04	0.06
Canada	0.16	0.03	0.02
Chile	0.12	0.01	0.01
Chinese Taipei	0.01	0.00	0.00
Croatia	0.10	0.01	0.01
Cyprus	0.19	0.04	0.02
Czech Republic	0.18	0.03	0.03
Denmark	0.08	0.01	0.01
England	0.22	0.05	0.03
Finland	0.07	0.00	0.00
France	0.22	0.05	0.03
Georgia	0.14	0.02	0.02
Germany	0.11	0.01	0.01
Hong Kong SAR	0.07	0.01	0.00
Hungary	0.15	0.02	0.02
Iran, Islamic Rep. of	-0.06	0.00	0.01
Ireland	0.19	0.04	0.02
Italy	0.09	0.01	0.00
Japan	0.06	0.00	0.01
Kazakhstan	0.15	0.02	0.02
Korea, Rep. of	0.01	0.00	0.00
Kosovo	0.10	0.01	0.04
Kuwait	0.06	0.00	0.00
Latvia	0.16	0.02	0.02
Lithuania	0.12	0.01	0.01
Malta	0.12	0.01	0.01
Montenegro	0.10	0.01	0.02
Morocco	0.02	0.00	0.01
Netherlands	0.08	0.01	0.00
New Zealand	0.25	0.06	0.04

### Relationship Between the TIMSS 2019 *Disorderly Behavior During Mathematics Lessons* Scale and TIMSS 2019 Achievement – Grade 4

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
North Macedonia	0.16	0.03	0.04
Northern Ireland	0.22	0.05	0.03
Norway (5)	0.10	0.01	0.00
Oman	0.13	0.02	0.01
Pakistan	0.19	0.04	0.03
Philippines	0.11	0.01	0.01
Poland	0.11	0.01	0.01
Portugal	0.16	0.02	0.02
Qatar	0.11	0.01	0.01
Russian Federation	0.14	0.02	0.02
Saudi Arabia	0.16	0.03	0.02
Serbia	0.06	0.00	0.01
Singapore	-	-	-
Slovak Republic	0.17	0.03	0.02
South Africa (5)	0.03	0.00	0.00
Spain	0.19	0.03	0.02
Sweden	0.12	0.01	0.01
Turkey (5)	0.14	0.02	0.01
United Arab Emirates	0.12	0.01	0.01
United States	0.19	0.03	0.03
<b>International Median</b>	<b>0.12</b>	<b>0.01</b>	<b>0.01</b>
<b>Benchmarking Participants</b>			
Ontario, Canada	0.17	0.03	0.02
Quebec, Canada	0.15	0.02	0.01
Moscow City, Russian Fed.	0.18	0.03	0.04
Madrid, Spain	0.18	0.03	0.02
Abu Dhabi, UAE	0.13	0.02	0.01
Dubai, UAE	0.07	0.01	0.00

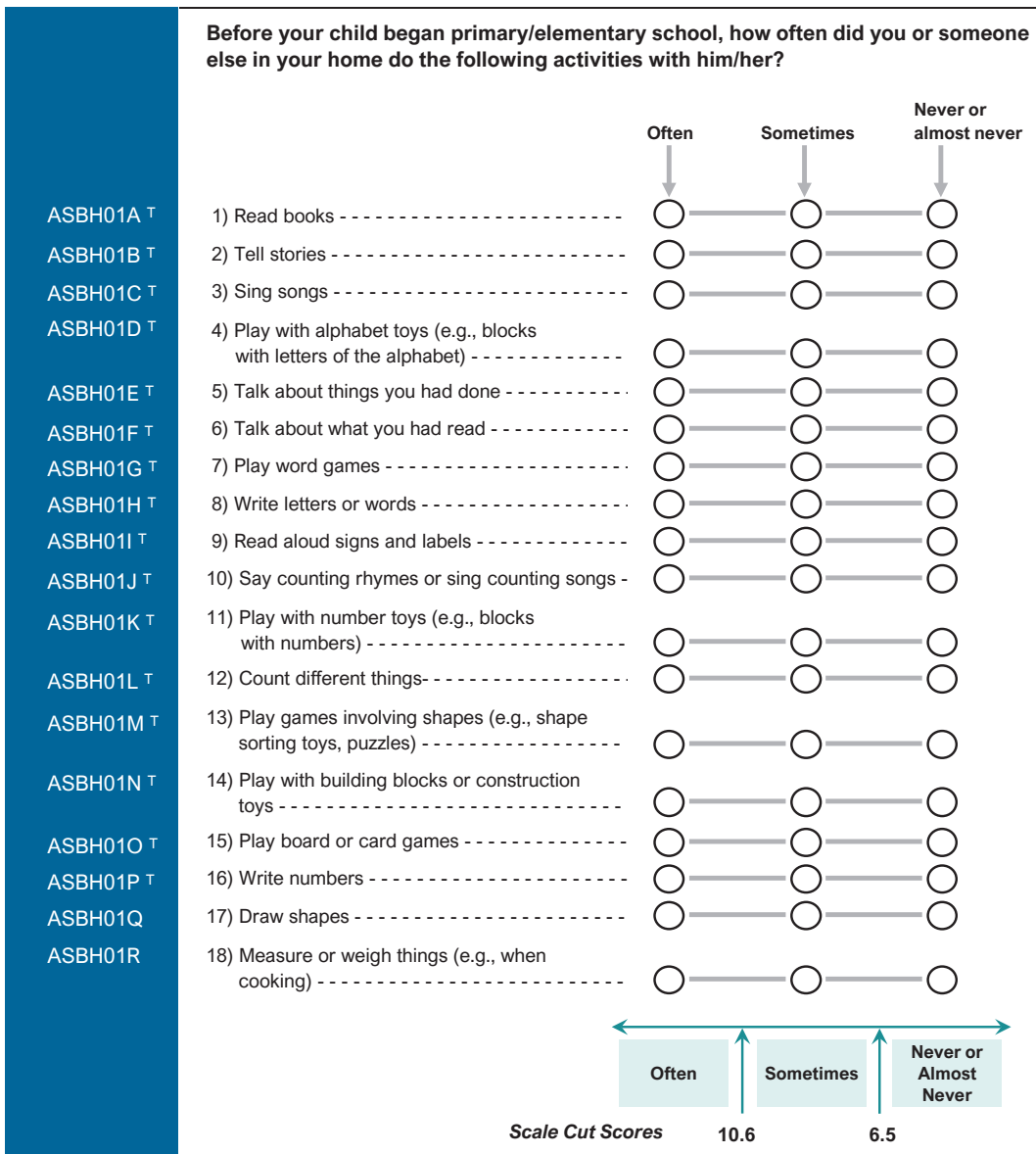
A dash (–) indicates comparable data not available.



## Early Literacy and Numeracy Activities – Grade 4

### About the Scale

The *Early Literacy and Numeracy Activities* scale was created based on parents' responses to eighteen items listed below.



<sup>T</sup> Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.

### Item Parameters for the TIMSS 2019 *Early Literacy and Numeracy Activities* Scale – Grade 4

Item	delta	tau_1	tau_2	Infit
ASBH01A	-0.34476	-1.40303	1.40303	1.05
ASBH01B	-0.32936	-1.33519	1.33519	1.01
ASBH01C	-0.07756	-0.92757	0.92757	1.18
ASBH01D	0.18438	-0.96013	0.96013	0.95
ASBH01E	-0.72634	-1.12221	1.12221	1.08
ASBH01F	0.22725	-1.30680	1.30680	1.02
ASBH01G	0.31745	-1.17398	1.17398	0.94
ASBH01H	-0.10842	-1.07733	1.07733	0.97
ASBH01I	0.14535	-0.96132	0.96132	1.00
ASBH01J	0.41173	-0.98655	0.98655	1.01
ASBH01K	0.26656	-0.99356	0.99356	0.90
ASBH01L	-0.68847	-1.15621	1.15621	0.90
ASBH01M	-0.38096	-0.97230	0.97230	0.94
ASBH01N	-0.36931	-0.70955	0.70955	1.02
ASBH01O	0.20194	-1.08281	1.08281	1.08
ASBH01P	-0.25815	-1.11519	1.11519	0.96
ASBH01Q	-0.17558	-1.16158	1.16158	0.97
ASBH01R	1.70425	-1.11057	1.11057	1.15

### Scale Transformation Constants for the TIMSS 2019 *Early Literacy and Numeracy Activities* Scale – Grade 4

#### Scale Transformation Constants

A = 8.584625

B = 1.556418

Transformed Scale Score = 8.584625 + 1.556418 • Logit Scale Score

**Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS  
2019 Early Literacy and Numeracy Activities Scale – Grade 4**

Raw Score	Transformed Scale Score	Cutpoint
0	1.07265	
1	2.86711	
2	3.74829	
3	4.36060	
4	4.84206	
5	5.24617	
6	5.60111	
7	5.92077	
8	6.21476	
9	6.48948	6.5
10	6.74944	
11	6.99730	
12	7.23716	
13	7.46992	
14	7.69717	
15	7.92028	
16	8.14041	
17	8.35859	
18	8.57563	
19	8.79290	
20	9.01090	
21	9.23074	
22	9.45351	
23	9.68045	
24	9.91301	
25	10.15289	
26	10.40107	
27	10.66194	10.6
28	10.93840	
29	11.23530	
30	11.55952	
31	11.92129	
32	12.33545	
33	12.83153	
34	13.46485	
35	14.37589	
36	16.21238	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 Early Literacy and Numeracy Activities Scale – Grade 4

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item																	
			ASBH01A	ASBH01B	ASBH01C	ASBH01D	ASBH01E	ASBH01F	ASBH01G	ASBH01H	ASBH01I	ASBH01J	ASBH01K	ASBH01L	ASBH01M	ASBH01N	ASBH01O	ASBH01P	ASBH01Q	ASBH01R
Albania	0.88	34	0.55	0.53	0.40	0.64	0.50	0.57	0.60	0.63	0.58	0.59	0.66	0.64	0.65	0.59	0.51	0.62	0.59	0.50
Armenia	0.85	28	0.47	0.51	0.39	0.60	0.39	0.48	0.58	0.56	0.57	0.58	0.64	0.58	0.60	0.44	0.46	0.57	0.60	0.50
Australia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Austria	0.84	28	0.44	0.50	0.43	0.53	0.45	0.55	0.57	0.52	0.55	0.61	0.62	0.61	0.51	0.48	0.41	0.54	0.60	0.48
Azerbaijan	0.85	28	0.48	0.49	0.36	0.59	0.36	0.53	0.56	0.59	0.59	0.54	0.63	0.53	0.60	0.55	0.42	0.59	0.60	0.48
Bahrain	0.84	28	0.42	0.46	0.35	0.58	0.40	0.43	0.59	0.58	0.53	0.56	0.65	0.60	0.60	0.57	0.55	0.60	0.58	0.36
Belgium (Flemish)	0.85	29	0.48	0.48	0.42	0.58	0.40	0.49	0.63	0.56	0.59	0.62	0.65	0.64	0.50	0.41	0.50	0.56	0.57	0.47
Bosnia and Herzegovina	0.84	28	0.45	0.47	0.45	0.60	0.38	0.50	0.54	0.54	0.53	0.61	0.65	0.58	0.57	0.48	0.48	0.53	0.57	0.46
Bulgaria	0.92	43	0.62	0.59	0.46	0.73	0.63	0.69	0.70	0.74	0.66	0.65	0.74	0.71	0.72	0.68	0.59	0.74	0.64	0.49
Canada	0.89	36	0.55	0.55	0.47	0.65	0.47	0.62	0.68	0.67	0.64	0.60	0.69	0.65	0.63	0.51	0.50	0.67	0.63	0.53
Chile	0.87	31	0.47	0.52	0.44	0.62	0.37	0.49	0.63	0.64	0.52	0.63	0.69	0.59	0.62	0.61	0.47	0.62	0.60	0.43
Chinese Taipei	0.90	39	0.59	0.58	0.51	0.63	0.51	0.58	0.62	0.55	0.65	0.70	0.73	0.73	0.69	0.65	0.52	0.67	0.69	0.50
Croatia	0.87	31	0.51	0.55	0.40	0.62	0.41	0.55	0.61	0.62	0.58	0.55	0.68	0.62	0.61	0.51	0.45	0.63	0.61	0.39
Cyprus	0.88	34	0.53	0.54	0.45	0.67	0.45	0.58	0.63	0.62	0.57	0.61	0.71	0.65	0.64	0.56	0.51	0.63	0.64	0.48
Czech Republic	0.84	27	0.35	0.41	0.38	0.59	0.42	0.54	0.55	0.63	0.53	0.52	0.67	0.58	0.53	0.42	0.45	0.65	0.59	0.48
Denmark	0.86	30	0.47	0.52	0.43	0.59	0.43	0.58	0.66	0.65	0.57	0.59	0.61	0.60	0.51	0.40	0.45	0.62	0.51	0.54
England	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Finland	0.86	30	0.42	0.49	0.40	0.63	0.41	0.58	0.60	0.66	0.58	0.54	0.64	0.62	0.53	0.41	0.45	0.66	0.59	0.53
France	0.84	28	0.49	0.49	0.40	0.59	0.37	0.47	0.59	0.61	0.53	0.55	0.64	0.61	0.56	0.49	0.47	0.57	0.55	0.47
Georgia	0.85	29	0.53	0.43	0.37	0.66	0.42	0.50	0.58	0.58	0.59	0.55	0.68	0.52	0.56	0.57	0.36	0.59	0.59	0.44
Germany	0.84	27	0.36	0.44	0.37	0.59	0.40	0.50	0.62	0.61	0.60	0.58	0.63	0.56	0.49	0.38	0.43	0.61	0.61	0.49
Hong Kong SAR	0.89	35	0.52	0.55	0.52	0.65	0.43	0.49	0.65	0.57	0.57	0.67	0.73	0.71	0.72	0.65	0.48	0.62	0.60	0.42
Hungary	0.85	28	0.43	0.45	0.37	0.63	0.36	0.46	0.60	0.59	0.58	0.58	0.65	0.57	0.52	0.42	0.47	0.61	0.58	0.56
Iran, Islamic Rep. of	0.88	34	0.53	0.52	0.52	0.62	0.47	0.55	0.64	0.60	0.59	0.61	0.66	0.60	0.63	0.61	0.60	0.58	0.59	0.43
Ireland	0.89	35	0.53	0.55	0.48	0.64	0.44	0.55	0.65	0.62	0.63	0.64	0.70	0.66	0.65	0.55	0.49	0.65	0.65	0.52
Italy	0.83	26	0.40	0.44	0.37	0.62	0.35	0.49	0.56	0.61	0.54	0.59	0.65	0.59	0.49	0.43	0.34	0.58	0.54	0.41
Japan	0.88	33	0.47	0.51	0.49	0.59	0.49	0.56	0.63	0.66	0.61	0.61	0.63	0.68	0.58	0.50	0.47	0.68	0.65	0.49
Kazakhstan	0.84	28	0.48	0.35	0.37	0.55	0.43	0.52	0.56	0.56	0.53	0.56	0.64	0.51	0.58	0.54	0.58	0.56	0.60	0.45
Korea, Rep. of	0.90	39	0.49	0.43	0.45	0.64	0.47	0.55	0.72	0.68	0.69	0.72	0.74	0.74	0.68	0.56	0.51	0.72	0.68	0.56
Kosovo	0.82	26	0.42	0.41	0.38	0.59	0.34	0.41	0.52	0.56	0.54	0.55	0.62	0.53	0.59	0.53	0.48	0.52	0.54	0.47
Kuwait	0.85	29	0.43	0.46	0.31	0.60	0.39	0.40	0.58	0.60	0.55	0.58	0.69	0.60	0.64	0.58	0.53	0.63	0.59	0.34
Latvia	0.86	30	0.51	0.52	0.40	0.63	0.43	0.57	0.59	0.62	0.51	0.59	0.65	0.61	0.56	0.48	0.48	0.63	0.59	0.47
Lithuania	0.86	30	0.51	0.48	0.42	0.63	0.46	0.59	0.62	0.61	0.49	0.57	0.65	0.60	0.57	0.52	0.44	0.62	0.56	0.47
Malta	0.88	34	0.54	0.54	0.45	0.62	0.46	0.58	0.63	0.62	0.63	0.59	0.69	0.65	0.66	0.55	0.49	0.58	0.63	0.48
Montenegro	0.86	30	0.50	0.50	0.47	0.61	0.47	0.54	0.57	0.54	0.55	0.59	0.66	0.59	0.61	0.53	0.53	0.54	0.57	0.49
Morocco	0.93	43	0.61	0.62	0.54	0.70	0.59	0.65	0.69	0.74	0.70	0.64	0.73	0.61	0.70	0.67	0.69	0.73	0.71	0.46
Netherlands	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
New Zealand	0.90	38	0.53	0.60	0.53	0.61	0.51	0.64	0.67	0.67	0.67	0.62	0.68	0.67	0.68	0.52	0.55	0.66	0.66	0.60
North Macedonia	0.88	33	0.55	0.54	0.44	0.64	0.45	0.58	0.63	0.62	0.57	0.64	0.66	0.62	0.62	0.55	0.51	0.59	0.61	0.54
Northern Ireland	0.90	37	0.50	0.58	0.47	0.67	0.46	0.59	0.67	0.64	0.64	0.62	0.70	0.67	0.67	0.58	0.54	0.63	0.64	0.54

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 Early Literacy and Numeracy Activities Scale – Grade 4

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item																	
			ASBH01A	ASBH01B	ASBH01C	ASBH01D	ASBH01E	ASBH01F	ASBH01G	ASBH01H	ASBH01I	ASBH01J	ASBH01K	ASBH01L	ASBH01M	ASBH01N	ASBH01O	ASBH01P	ASBH01Q	ASBH01R
Norway (5)	0.87	31	0.46	0.47	0.40	0.64	0.43	0.61	0.71	0.64	0.61	0.63	0.69	0.59	0.50	0.33	0.43	0.65	0.54	0.54
Oman	0.83	27	0.47	0.45	0.23	0.57	0.38	0.49	0.58	0.59	0.59	0.48	0.62	0.52	0.57	0.49	0.58	0.57	0.55	0.41
Pakistan	0.86	31	0.53	0.53	0.27	0.56	0.53	0.61	0.53	0.68	0.60	0.62	0.47	0.59	0.57	0.61	0.42	0.65	0.56	0.49
Philippines	0.88	32	0.54	0.53	0.44	0.61	0.46	0.56	0.53	0.60	0.62	0.62	0.66	0.62	0.64	0.58	0.50	0.59	0.63	0.44
Poland	0.86	30	0.42	0.45	0.47	0.62	0.49	0.57	0.58	0.61	0.57	0.59	0.66	0.57	0.47	0.40	0.44	0.65	0.64	0.50
Portugal	0.86	30	0.52	0.53	0.40	0.61	0.41	0.49	0.61	0.57	0.51	0.58	0.69	0.64	0.62	0.55	0.48	0.59	0.58	0.45
Qatar	0.86	31	0.45	0.46	0.41	0.61	0.44	0.47	0.59	0.58	0.60	0.62	0.68	0.63	0.64	0.59	0.52	0.60	0.61	0.39
Russian Federation	0.88	33	0.56	0.49	0.47	0.61	0.54	0.57	0.60	0.63	0.52	0.57	0.66	0.58	0.63	0.58	0.59	0.64	0.63	0.49
Saudi Arabia	0.86	30	0.42	0.47	0.35	0.62	0.46	0.45	0.62	0.61	0.57	0.57	0.68	0.55	0.59	0.56	0.57	0.63	0.61	0.36
Serbia	0.86	30	0.53	0.54	0.51	0.61	0.43	0.53	0.57	0.58	0.58	0.59	0.64	0.60	0.59	0.49	0.49	0.55	0.58	0.47
Singapore	0.91	40	0.56	0.58	0.52	0.70	0.50	0.59	0.63	0.65	0.68	0.71	0.75	0.74	0.73	0.63	0.50	0.70	0.69	0.50
Slovak Republic	0.88	34	0.48	0.47	0.32	0.64	0.52	0.59	0.63	0.63	0.62	0.59	0.70	0.65	0.60	0.54	0.49	0.67	0.62	0.54
South Africa (5)	0.88	32	0.57	0.50	0.41	0.61	0.47	0.54	0.56	0.60	0.60	0.57	0.65	0.61	0.64	0.59	0.53	0.58	0.61	0.46
Spain	0.85	29	0.48	0.49	0.41	0.64	0.34	0.46	0.63	0.60	0.53	0.57	0.68	0.55	0.60	0.52	0.43	0.62	0.56	0.41
Sweden	0.87	32	0.41	0.46	0.44	0.67	0.37	0.58	0.69	0.64	0.57	0.63	0.67	0.61	0.57	0.44	0.44	0.65	0.60	0.53
Turkey (5)	0.94	50	0.69	0.68	0.54	0.71	0.72	0.74	0.75	0.72	0.75	0.69	0.75	0.73	0.77	0.68	0.61	0.74	0.75	0.65
United Arab Emirates	0.88	34	0.48	0.48	0.39	0.61	0.49	0.54	0.60	0.60	0.60	0.62	0.69	0.67	0.69	0.62	0.56	0.64	0.64	0.47
United States	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Benchmarking Participants</b>																				
Ontario, Canada	0.90	38	0.54	0.57	0.50	0.65	0.50	0.65	0.69	0.69	0.68	0.61	0.70	0.68	0.67	0.54	0.53	0.68	0.65	0.52
Quebec, Canada	0.87	32	0.53	0.51	0.40	0.63	0.45	0.57	0.66	0.65	0.58	0.57	0.68	0.61	0.59	0.43	0.47	0.64	0.58	0.52
Moscow City, Russian Fed.	0.88	34	0.52	0.49	0.49	0.60	0.59	0.62	0.64	0.65	0.52	0.58	0.67	0.60	0.58	0.53	0.56	0.64	0.64	0.54
Madrid, Spain	0.85	29	0.43	0.46	0.38	0.65	0.39	0.45	0.61	0.61	0.52	0.60	0.69	0.55	0.59	0.52	0.42	0.61	0.59	0.44
Abu Dhabi, UAE	0.89	35	0.48	0.50	0.42	0.61	0.48	0.53	0.62	0.62	0.59	0.62	0.70	0.69	0.70	0.63	0.59	0.67	0.66	0.45
Dubai, UAE	0.88	33	0.50	0.48	0.40	0.61	0.47	0.52	0.58	0.59	0.61	0.61	0.70	0.67	0.68	0.59	0.50	0.63	0.62	0.46

A dash (-) indicates comparable data not available.

### Relationship Between the TIMSS 2019 *Early Literacy and Numeracy Activities* Scale and TIMSS 2019 Achievement – Grade 4

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
Albania	0.23	0.05	0.05	0.22	0.05	0.05
Armenia	0.09	0.01	0.01	0.11	0.01	0.01
Australia	-	-	-	-	-	-
Austria	0.15	0.02	0.01	0.16	0.03	0.02
Azerbaijan	0.12	0.02	0.02	0.14	0.02	0.03
Bahrain	0.11	0.01	0.01	0.19	0.04	0.03
Belgium (Flemish)	0.15	0.02	0.01	0.14	0.02	0.01
Bosnia and Herzegovina	0.13	0.02	0.01	0.14	0.02	0.02
Bulgaria	0.40	0.16	0.14	0.44	0.19	0.18
Canada	0.09	0.01	0.01	0.15	0.02	0.02
Chile	0.22	0.05	0.03	0.23	0.05	0.03
Chinese Taipei	0.22	0.05	0.03	0.22	0.05	0.03
Croatia	0.20	0.04	0.03	0.22	0.05	0.03
Cyprus	0.19	0.04	0.03	0.22	0.05	0.04
Czech Republic	0.09	0.01	0.01	0.07	0.00	0.00
Denmark	0.12	0.01	0.01	0.17	0.03	0.03
England	-	-	-	-	-	-
Finland	0.14	0.02	0.01	0.12	0.01	0.01
France	0.21	0.05	0.03	0.22	0.05	0.04
Georgia	-0.02	0.00	0.00	-0.04	0.00	0.00
Germany	0.12	0.01	0.01	0.11	0.01	0.01
Hong Kong SAR	0.18	0.03	0.03	0.19	0.03	0.03
Hungary	0.12	0.02	0.02	0.11	0.01	0.02
Iran, Islamic Rep. of	0.16	0.03	0.02	0.22	0.05	0.04
Ireland	0.21	0.04	0.03	0.22	0.05	0.03
Italy	0.15	0.02	0.01	0.17	0.03	0.01
Japan	0.17	0.03	0.03	0.16	0.03	0.02
Kazakhstan	0.12	0.02	0.01	0.17	0.03	0.03
Korea, Rep. of	0.21	0.04	0.03	0.19	0.04	0.03
Kosovo	0.12	0.01	0.01	0.16	0.03	0.03
Kuwait	0.12	0.01	0.02	0.14	0.02	0.02
Latvia	0.11	0.01	0.01	0.13	0.02	0.01
Lithuania	0.09	0.01	0.01	0.09	0.01	0.01
Malta	0.19	0.04	0.03	0.16	0.03	0.02
Montenegro	0.18	0.03	0.03	0.20	0.04	0.04
Morocco	0.20	0.04	0.04	0.20	0.04	0.04
Netherlands	-	-	-	-	-	-

### Relationship Between the TIMSS 2019 *Early Literacy and Numeracy Activities* Scale and TIMSS 2019 Achievement – Grade 4

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
New Zealand	0.12	0.01	0.01	0.16	0.03	0.02
North Macedonia	0.20	0.04	0.03	0.23	0.05	0.05
Northern Ireland	0.15	0.02	0.01	0.16	0.02	0.02
Norway (5)	0.13	0.02	0.01	0.16	0.03	0.02
Oman	0.22	0.05	0.03	0.25	0.06	0.04
Pakistan	0.11	0.01	0.02	0.08	0.01	0.01
Philippines	0.18	0.03	0.03	0.20	0.04	0.04
Poland	0.10	0.01	0.00	0.11	0.01	0.00
Portugal	0.17	0.03	0.02	0.17	0.03	0.03
Qatar	0.19	0.04	0.03	0.21	0.04	0.03
Russian Federation	0.08	0.01	0.00	0.11	0.01	0.01
Saudi Arabia	0.12	0.02	0.01	0.15	0.02	0.02
Serbia	0.25	0.06	0.05	0.26	0.07	0.06
Singapore	0.15	0.02	0.02	0.18	0.03	0.03
Slovak Republic	0.12	0.01	0.02	0.17	0.03	0.04
South Africa (5)	0.20	0.04	0.03	0.20	0.04	0.04
Spain	0.18	0.03	0.02	0.18	0.03	0.02
Sweden	0.10	0.01	0.01	0.08	0.01	0.00
Turkey (5)	0.41	0.17	0.15	0.46	0.21	0.19
United Arab Emirates	0.14	0.02	0.02	0.16	0.02	0.02
United States	-	-	-	-	-	-
<b>International Median</b>	<b>0.15</b>	<b>0.02</b>	<b>0.02</b>	<b>0.17</b>	<b>0.03</b>	<b>0.03</b>
<b>Benchmarking Participants</b>						
Ontario, Canada	0.09	0.01	0.01	0.12	0.01	0.01
Quebec, Canada	0.13	0.02	0.02	0.17	0.03	0.02
Moscow City, Russian Fed.	0.07	0.00	0.01	0.08	0.01	0.01
Madrid, Spain	0.14	0.02	0.01	0.14	0.02	0.01
Abu Dhabi, UAE	0.16	0.03	0.02	0.16	0.03	0.02
Dubai, UAE	0.12	0.02	0.01	0.15	0.02	0.02

A dash (–) indicates comparable data not available.

# Early Literacy and Numeracy Tasks – Grade 4

## About the Scale

The *Early Literacy and Numeracy Tasks* scale was created based on parents' responses to twelve items listed below.

		Very well	Moderately well	Not very well	Not at all
<b>How well could your child do the following when he/she began the first grade of primary/elementary school?</b>					
ASBH06A <sup>T</sup>	1) Recognize most of the letters of the alphabet -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ASBH06B <sup>T</sup>	2) Read some words - - - - -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ASBH06C <sup>T</sup>	3) Read sentences - - - - -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ASBH06D <sup>T</sup>	4) Read a story - - - - -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ASBH06E <sup>T</sup>	5) Write letters of the alphabet - - - - -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ASBH06F	6) Write his/her name - - - - -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ASBH06G	7) Write words other than his/her name - - - - -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Could your child do the following when he/she began the first grade of primary/elementary school?</b>					
		Up to 100 or higher	Up to 20	Up to 10	Not at all
ASBH07A <sup>T</sup>	1) Count by himself/herself - - - - -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ASBH07B <sup>T</sup>	2) Recognize written numbers - - - - -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ASBH07C <sup>T</sup>	3) Write numbers - - - - -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Could your child do the following when he/she began the first grade of primary/elementary school?</b>					
		Yes	No		
ASBH07D <sup>T</sup>	1) Do simple addition - - - - -	<input type="radio"/>	<input type="radio"/>		
ASBH07E <sup>T</sup>	2) Do simple subtraction - - - - -	<input type="radio"/>	<input type="radio"/>		
		<b>Scale Cut Scores</b> 11.2      8.6			

<sup>T</sup> Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.



### Item Parameters for the TIMSS 2019 *Early Literacy and Numeracy Tasks* Scale – Grade 4

Item	delta	tau_1	tau_2	tau_3	Infit
ASBH06A	-0.89706	-1.55492	-0.05316	1.60808	0.91
ASBH06B	0.10783	-1.38397	-0.17270	1.55667	0.82
ASBH06C	0.99903	-1.17817	-0.18774	1.36591	0.87
ASBH06D	1.56339	-1.15006	-0.22907	1.37913	1.04
ASBH06E	-0.47596	-1.49821	-0.13281	1.63102	0.86
ASBH06F	-1.14427	-0.70993	-0.32096	1.03089	1.07
ASBH06G	0.18193	-1.37169	-0.14906	1.52075	0.87
ASBH07A	-0.21367	-1.91023	0.10567	1.80456	1.46
ASBH07B	0.20174	-2.00916	0.29670	1.71246	1.17
ASBH07C	0.41193	-1.91406	0.33064	1.58342	1.11
ASBH07D	-0.76002				1.00
ASBH07E	0.02513				1.03

### Scale Transformation Constants for the TIMSS 2019 *Early Literacy and Numeracy Tasks* Scale – Grade 4

#### Scale Transformation Constants

A = 8.738315

B = 1.194342

Transformed Scale Score = 8.738315 + 1.194342 • Logit Scale Score

**Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS  
2019 Early Literacy and Numeracy Tasks Scale – Grade 4**

Raw Score	Transformed Scale Score	Cutpoint
0	3.06734	
1	4.45634	
2	5.14320	
3	5.62117	
4	5.99829	
5	6.31846	
6	6.60154	
7	6.85988	
8	7.10112	
9	7.33022	
10	7.55012	
11	7.76411	
12	7.97308	
13	8.17826	
14	8.38068	
15	8.58119	8.6
16	8.78057	
17	8.97964	
18	9.17925	
19	9.38042	
20	9.58432	
21	9.79237	
22	10.00637	
23	10.22851	
24	10.46028	
25	10.70746	
26	10.97468	
27	11.26987	11.2
28	11.60550	
29	12.00147	
30	12.50191	
31	13.21514	
32	14.63421	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Early Literacy and Numeracy Tasks Scale – Grade 4*

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item												
			ASBH06A	ASBH06B	ASBH06C	ASBH06D	ASBH06E	ASBH06F	ASBH06G	ASBH07A	ASBH07B	ASBH07C	ASBH07D	ASBH07E	
Albania	0.91	52	0.78	0.81	0.79	0.67	0.79	0.73	0.80	0.62	0.67	0.65	0.61	0.65	
Armenia	0.89	47	0.76	0.85	0.83	0.74	0.83	0.81	0.83	0.37	0.49	0.55	0.43	0.44	
Australia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Austria	0.89	44	0.76	0.81	0.78	0.70	0.75	0.45	0.76	0.48	0.67	0.71	0.49	0.51	
Azerbaijan	0.91	52	0.76	0.81	0.80	0.72	0.82	0.80	0.82	0.51	0.61	0.65	0.60	0.63	
Bahrain	0.88	45	0.71	0.79	0.80	0.71	0.73	0.65	0.76	0.57	0.62	0.62	0.52	0.54	
Belgium (Flemish)	0.89	46	0.75	0.79	0.77	0.73	0.78	0.53	0.79	0.49	0.65	0.70	0.50	0.55	
Bosnia and Herzegovina	0.90	49	0.73	0.82	0.81	0.76	0.77	0.65	0.81	0.52	0.62	0.66	0.59	0.60	
Bulgaria	0.93	59	0.83	0.85	0.81	0.74	0.83	0.81	0.84	0.67	0.69	0.72	0.68	0.68	
Canada	0.92	53	0.71	0.81	0.81	0.77	0.76	0.68	0.81	0.67	0.74	0.75	0.58	0.58	
Chile	0.91	50	0.77	0.83	0.83	0.78	0.79	0.70	0.80	0.57	0.61	0.62	0.55	0.53	
Chinese Taipei	0.86	43	0.78	0.83	0.82	0.78	0.80	0.73	0.79	0.24	0.30	0.31	0.49	0.51	
Croatia	0.90	49	0.73	0.81	0.81	0.74	0.76	0.58	0.78	0.59	0.69	0.70	0.58	0.59	
Cyprus	0.90	48	0.74	0.82	0.82	0.74	0.78	0.64	0.81	0.53	0.60	0.63	0.57	0.59	
Czech Republic	0.90	49	0.80	0.84	0.81	0.75	0.79	0.58	0.83	0.51	0.66	0.69	0.46	0.52	
Denmark	0.88	44	0.75	0.78	0.71	0.61	0.75	0.61	0.75	0.57	0.67	0.71	0.48	0.42	
England	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Finland	0.91	52	0.76	0.84	0.82	0.77	0.78	0.63	0.82	0.67	0.70	0.73	0.52	0.56	
France	0.88	44	0.67	0.76	0.74	0.68	0.73	0.60	0.73	0.60	0.66	0.68	0.55	0.51	
Georgia	0.89	46	0.77	0.83	0.82	0.72	0.79	0.76	0.80	0.36	0.49	0.57	0.51	0.53	
Germany	0.88	44	0.74	0.79	0.76	0.67	0.75	0.49	0.72	0.50	0.66	0.73	0.50	0.51	
Hong Kong SAR	0.82	38	0.76	0.83	0.83	0.71	0.80	0.75	0.76	0.15	0.17	0.16	0.37	0.36	
Hungary	0.90	48	0.78	0.84	0.79	0.70	0.81	0.64	0.81	0.48	0.65	0.70	0.46	0.47	
Iran, Islamic Rep. of	0.91	51	0.77	0.82	0.80	0.74	0.81	0.74	0.78	0.48	0.66	0.68	0.60	0.57	
Ireland	0.89	49	0.75	0.81	0.82	0.79	0.81	0.75	0.82	0.52	0.55	0.57	0.53	0.56	
Italy	0.90	49	0.73	0.80	0.78	0.71	0.77	0.62	0.79	0.57	0.69	0.72	0.57	0.57	
Japan	0.86	47	0.84	0.85	0.87	0.82	0.87	0.77	0.86	0.19	0.28	0.33	0.52	0.51	
Kazakhstan	0.89	47	0.70	0.80	0.82	0.77	0.74	0.73	0.79	0.53	0.59	0.61	0.49	0.51	
Korea, Rep. of	0.85	47	0.87	0.89	0.92	0.90	0.89	0.70	0.89	0.13	0.12	0.16	0.42	0.43	
Kosovo	0.87	43	0.72	0.76	0.75	0.64	0.74	0.64	0.75	0.52	0.60	0.60	0.52	0.54	
Kuwait	0.88	44	0.74	0.82	0.80	0.72	0.77	0.67	0.77	0.48	0.54	0.56	0.46	0.49	
Latvia	0.88	44	0.69	0.79	0.81	0.75	0.72	0.64	0.76	0.58	0.61	0.62	0.42	0.44	
Lithuania	0.90	48	0.74	0.81	0.81	0.78	0.75	0.62	0.79	0.58	0.65	0.64	0.51	0.52	
Malta	0.91	51	0.71	0.80	0.79	0.75	0.78	0.74	0.80	0.60	0.67	0.70	0.59	0.58	
Montenegro	0.90	49	0.77	0.82	0.81	0.74	0.80	0.68	0.81	0.49	0.59	0.64	0.57	0.58	
Morocco	0.93	56	0.77	0.86	0.84	0.73	0.81	0.82	0.83	0.62	0.70	0.71	0.68	0.56	
Netherlands	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
New Zealand	0.91	50	0.72	0.80	0.80	0.76	0.76	0.62	0.80	0.61	0.68	0.75	0.56	0.54	
North Macedonia	0.91	51	0.78	0.83	0.77	0.70	0.79	0.70	0.80	0.56	0.65	0.65	0.63	0.65	
Northern Ireland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Early Literacy and Numeracy Tasks Scale – Grade 4*

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item												
			ASBH06A	ASBH06B	ASBH06C	ASBH06D	ASBH06E	ASBH06F	ASBH06G	ASBH07A	ASBH07B	ASBH07C	ASBH07D	ASBH07E	
Norway (5)	0.90	48	0.78	0.82	0.77	0.66	0.79	0.62	0.78	0.54	0.70	0.72	0.57	0.51	
Oman	0.90	48	0.73	0.81	0.80	0.73	0.75	0.66	0.78	0.59	0.63	0.63	0.57	0.59	
Pakistan	0.88	44	0.65	0.71	0.70	0.65	0.74	0.79	0.78	0.45	0.63	0.65	0.54	0.56	
Philippines	0.87	42	0.70	0.75	0.77	0.73	0.75	0.67	0.73	0.51	0.55	0.55	0.42	0.49	
Poland	0.91	52	0.76	0.82	0.82	0.76	0.79	0.69	0.80	0.59	0.69	0.71	0.55	0.57	
Portugal	0.89	46	0.73	0.79	0.76	0.70	0.77	0.63	0.77	0.53	0.63	0.66	0.52	0.53	
Qatar	0.89	46	0.70	0.80	0.79	0.73	0.76	0.68	0.77	0.54	0.58	0.61	0.53	0.56	
Russian Federation	0.91	52	0.76	0.82	0.83	0.76	0.77	0.76	0.80	0.66	0.70	0.71	0.50	0.51	
Saudi Arabia	0.90	49	0.71	0.83	0.80	0.71	0.77	0.72	0.78	0.56	0.64	0.65	0.57	0.60	
Serbia	0.91	52	0.77	0.82	0.80	0.73	0.80	0.71	0.82	0.56	0.65	0.68	0.62	0.61	
Singapore	0.89	47	0.75	0.81	0.82	0.77	0.77	0.72	0.79	0.56	0.59	0.59	0.45	0.47	
Slovak Republic	0.90	47	0.76	0.80	0.75	0.65	0.79	0.60	0.79	0.52	0.68	0.70	0.55	0.56	
South Africa (5)	0.85	39	0.66	0.74	0.76	0.73	0.71	0.60	0.71	0.43	0.50	0.52	0.48	0.49	
Spain	0.91	50	0.75	0.81	0.83	0.78	0.76	0.68	0.79	0.62	0.66	0.67	0.55	0.52	
Sweden	0.91	52	0.79	0.82	0.82	0.74	0.80	0.68	0.81	0.62	0.69	0.71	0.55	0.57	
Turkey (5)	0.95	64	0.84	0.87	0.85	0.81	0.87	0.83	0.88	0.67	0.75	0.78	0.71	0.71	
United Arab Emirates	0.90	48	0.68	0.78	0.80	0.74	0.74	0.69	0.77	0.66	0.69	0.71	0.50	0.53	
United States	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>Benchmarking Participants</b>															
Ontario, Canada	0.92	54	0.70	0.81	0.83	0.79	0.77	0.71	0.81	0.69	0.72	0.75	0.57	0.58	
Quebec, Canada	0.90	48	0.70	0.79	0.74	0.70	0.76	0.66	0.78	0.63	0.72	0.73	0.55	0.53	
Moscow City, Russian Fed.	0.90	50	0.74	0.81	0.81	0.75	0.77	0.75	0.81	0.61	0.66	0.69	0.46	0.48	
Madrid, Spain	0.90	49	0.71	0.79	0.81	0.77	0.77	0.68	0.79	0.61	0.64	0.65	0.58	0.51	
Abu Dhabi, UAE	0.91	51	0.72	0.81	0.81	0.74	0.77	0.72	0.79	0.67	0.70	0.71	0.51	0.55	
Dubai, UAE	0.90	49	0.65	0.77	0.79	0.74	0.76	0.71	0.78	0.67	0.70	0.73	0.52	0.55	

A dash (-) indicates comparable data not available.

### Relationship Between the TIMSS 2019 *Early Literacy and Numeracy Tasks* Scale and TIMSS 2019 Achievement – Grade 4

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
Albania	0.31	0.09	0.08	0.27	0.07	0.06
Armenia	0.12	0.01	0.01	0.13	0.02	0.01
Australia	-	-	-	-	-	-
Austria	0.13	0.02	0.01	0.03	0.00	0.00
Azerbaijan	0.24	0.06	0.04	0.19	0.04	0.03
Bahrain	0.17	0.03	0.02	0.28	0.08	0.06
Belgium (Flemish)	0.11	0.01	0.01	0.03	0.00	0.00
Bosnia and Herzegovina	0.27	0.07	0.06	0.22	0.05	0.04
Bulgaria	0.46	0.21	0.17	0.48	0.23	0.18
Canada	0.32	0.11	0.09	0.28	0.08	0.06
Chile	0.37	0.14	0.12	0.33	0.11	0.10
Chinese Taipei	0.29	0.09	0.07	0.27	0.07	0.06
Croatia	0.35	0.13	0.10	0.30	0.09	0.07
Cyprus	0.26	0.07	0.06	0.24	0.06	0.06
Czech Republic	0.24	0.06	0.05	0.19	0.04	0.03
Denmark	0.28	0.08	0.06	0.21	0.05	0.04
England	-	-	-	-	-	-
Finland	0.46	0.21	0.17	0.34	0.11	0.09
France	0.30	0.09	0.07	0.20	0.04	0.04
Georgia	0.14	0.02	0.02	0.15	0.02	0.02
Germany	0.15	0.02	0.02	0.06	0.00	0.00
Hong Kong SAR	0.34	0.11	0.09	0.31	0.10	0.08
Hungary	0.25	0.06	0.04	0.19	0.04	0.02
Iran, Islamic Rep. of	0.15	0.02	0.02	0.14	0.02	0.01
Ireland	0.37	0.14	0.11	0.34	0.12	0.09
Italy	0.16	0.03	0.03	0.12	0.01	0.02
Japan	0.36	0.13	0.11	0.30	0.09	0.08
Kazakhstan	0.19	0.04	0.03	0.18	0.03	0.03
Korea, Rep. of	0.33	0.11	0.09	0.30	0.09	0.07
Kosovo	0.21	0.05	0.04	0.20	0.04	0.04
Kuwait	0.30	0.09	0.09	0.28	0.08	0.08
Latvia	0.41	0.17	0.14	0.36	0.13	0.11
Lithuania	0.44	0.19	0.16	0.40	0.16	0.13
Malta	0.30	0.09	0.08	0.24	0.06	0.05
Montenegro	0.28	0.08	0.06	0.25	0.06	0.05
Morocco	0.30	0.09	0.10	0.29	0.08	0.09
Netherlands	-	-	-	-	-	-

### Relationship Between the TIMSS 2019 *Early Literacy and Numeracy Tasks* Scale and TIMSS 2019 Achievement – Grade 4

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	<i>r</i>	<i>r</i> <sup>2</sup>		<i>r</i>	<i>r</i> <sup>2</sup>	
New Zealand	0.24	0.06	0.05	0.16	0.03	0.02
North Macedonia	0.25	0.06	0.04	0.23	0.05	0.04
Northern Ireland	-	-	-	-	-	-
Norway (5)	0.31	0.10	0.08	0.24	0.06	0.05
Oman	0.31	0.09	0.08	0.38	0.14	0.12
Pakistan	0.11	0.01	0.02	0.08	0.01	0.01
Philippines	0.37	0.13	0.11	0.32	0.10	0.09
Poland	0.33	0.11	0.09	0.27	0.07	0.06
Portugal	0.22	0.05	0.04	0.19	0.04	0.03
Qatar	0.27	0.07	0.07	0.28	0.08	0.07
Russian Federation	0.32	0.10	0.09	0.30	0.09	0.08
Saudi Arabia	0.21	0.05	0.04	0.23	0.05	0.05
Serbia	0.43	0.18	0.15	0.40	0.16	0.13
Singapore	0.43	0.19	0.17	0.42	0.17	0.14
Slovak Republic	0.23	0.05	0.04	0.22	0.05	0.02
South Africa (5)	0.25	0.06	0.06	0.24	0.06	0.05
Spain	0.37	0.13	0.11	0.33	0.11	0.10
Sweden	0.36	0.13	0.12	0.26	0.07	0.06
Turkey (5)	0.32	0.10	0.07	0.35	0.12	0.09
United Arab Emirates	0.16	0.03	0.02	0.17	0.03	0.03
United States	-	-	-	-	-	-
<b>International Median</b>	<b>0.29</b>	<b>0.09</b>	<b>0.07</b>	<b>0.25</b>	<b>0.06</b>	<b>0.06</b>
<b>Benchmarking Participants</b>						
Ontario, Canada	0.42	0.18	0.14	0.32	0.10	0.08
Quebec, Canada	0.27	0.07	0.06	0.20	0.04	0.03
Moscow City, Russian Fed.	0.38	0.14	0.13	0.33	0.11	0.09
Madrid, Spain	0.33	0.11	0.08	0.30	0.09	0.07
Abu Dhabi, UAE	0.22	0.05	0.05	0.21	0.04	0.05
Dubai, UAE	0.16	0.03	0.02	0.15	0.02	0.02

A dash (–) indicates comparable data not available.

## Home Resources for Learning – Grade 4

### About the Scale

The *Home Resources for Learning* scale was created based on students' and parents' reports regarding the availability of five resources listed below.

ASBG04 <sup>T</sup>	<b>Number of books in the home (students):</b> 1) 0-10 2) 11-25 3) 26-100 4) 101-200 5) More than 200	<b>Number of children's books in the home (parents):</b> 1) 0-10 2) 11-25 3) 26-50 4) 51-100 5) More than 100	ASBH11 <sup>T</sup>
ASDG05S <sup>T1</sup>	<b>Number of home study supports (students):</b> 1) None 2) Internet connection or own room 3) Both internet connection and own room	<b>Highest level of education of either parent (parents):</b> 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	ASDHEDUP <sup>T1</sup>
ASDHOCCP <sup>T1</sup>	<b>Highest level of occupation of either parent (parents):</b> 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 style="text-align: center;">←—————↑————— —————↑—————→</p> <p style="text-align: center;">Many Resources      Some Resources      Few Resources</p> <p style="text-align: center;">Scale Cut Scores      11.8      7.4</p>			

<sup>T</sup> Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.

<sup>1</sup> Derived variable. For details, see Supplement 3 of the *TIMSS 2019 User Guide for the International Database*.

### Item Parameters for the TIMSS 2019 *Home Resources for Learning* Scale – Grade 4

Item	delta	tau_1	tau_2	tau_3	tau_4	Infit
ASBG04	0.66771	-1.10357	-0.44084	0.87876	0.66565	1.00
ASBH11	0.73132	-0.67187	-0.46465	0.41378	0.72274	0.95
ASDG05S	-0.95838	-0.70755	0.70755			1.09
ASDHEDUP	-0.48782	-0.47629	-0.91551	0.96162	0.43018	0.94
ASDHOCPP	0.04717	-0.19695	0.76018	-0.56323		1.04

### Scale Transformation Constants for the TIMSS 2019 *Home Resources for Learning* Scale – Grade 4

#### Scale Transformation Constants

A = 9.451157

B = 1.787338

Transformed Scale Score = 9.451157 + 1.787338 • Logit Scale Score

### Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019 *Home Resources for Learning* Scale – Grade 4

Raw Score	Transformed Scale Score	Cutpoint
0	3.81993	
1	5.75677	
2	6.70211	
3	7.39134	7.4
4	7.95508	
5	8.43520	
6	8.85649	
7	9.23298	
8	9.58052	
9	9.91481	
10	10.25828	
11	10.61050	
12	10.98891	
13	11.40836	
14	11.89316	11.8
15	12.47492	
16	13.27846	
17	14.87955	



### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Home Resources for Learning* Scale – Grade 4

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item				
			ASBG04	ASBH11	ASDG05S	ASDHEDUP	ASDHOCPP
Albania	0.77	53	0.78	0.80	0.38	0.79	0.78
Armenia	0.59	39	0.53	0.70	0.24	0.77	0.74
Australia	-	-	-	-	-	-	-
Austria	0.73	49	0.73	0.80	0.28	0.79	0.75
Azerbaijan	0.57	36	0.55	0.57	0.41	0.71	0.72
Bahrain	0.56	36	0.60	0.69	0.23	0.72	0.63
Belgium (Flemish)	0.72	48	0.70	0.73	0.42	0.77	0.77
Bosnia and Herzegovina	0.69	46	0.64	0.75	0.18	0.81	0.79
Bulgaria	0.82	58	0.79	0.83	0.39	0.88	0.82
Canada	0.59	39	0.67	0.69	0.29	0.66	0.69
Chile	0.65	42	0.53	0.66	0.34	0.81	0.79
Chinese Taipei	0.71	48	0.77	0.79	0.25	0.78	0.71
Croatia	0.69	46	0.69	0.74	0.14	0.80	0.78
Cyprus	0.68	45	0.67	0.77	0.24	0.77	0.75
Czech Republic	0.64	43	0.69	0.72	0.03	0.78	0.74
Denmark	0.63	42	0.68	0.70	0.26	0.74	0.73
England	-	-	-	-	-	-	-
Finland	0.63	41	0.65	0.68	0.23	0.77	0.74
France	0.75	51	0.76	0.79	0.36	0.81	0.76
Georgia	0.68	45	0.70	0.75	0.37	0.75	0.71
Germany	0.69	45	0.71	0.75	0.28	0.76	0.72
Hong Kong SAR	0.76	51	0.73	0.80	0.36	0.81	0.78
Hungary	0.78	54	0.76	0.82	0.22	0.86	0.82
Iran, Islamic Rep. of	0.71	46	0.69	0.71	0.51	0.77	0.66
Ireland	0.69	46	0.74	0.78	0.06	0.76	0.74
Italy	0.68	45	0.69	0.76	0.11	0.79	0.74
Japan	0.61	40	0.71	0.76	0.20	0.69	0.63
Kazakhstan	0.54	36	0.63	0.63	0.47	0.65	0.61
Korea, Rep. of	0.62	41	0.66	0.73	0.32	0.75	0.64
Kosovo	0.62	39	0.69	0.69	0.30	0.71	0.66
Kuwait	0.41	31	0.46	0.56	0.05	0.74	0.68
Latvia	0.66	44	0.69	0.75	0.15	0.79	0.71
Lithuania	0.72	48	0.72	0.77	0.31	0.79	0.78
Malta	0.64	42	0.57	0.70	0.01	0.82	0.77
Montenegro	0.66	43	0.69	0.75	0.22	0.77	0.70
Morocco	0.68	44	0.72	0.71	0.55	0.73	0.59
Netherlands	-	-	-	-	-	-	-
New Zealand	0.66	43	0.69	0.69	0.38	0.74	0.71
North Macedonia	0.72	48	0.64	0.79	0.15	0.83	0.79

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Home Resources for Learning* Scale – Grade 4

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item				
			ASBG04	ASBH11	ASDG05S	ASDHEDUP	ASDHOCPP
Northern Ireland	0.70	46	0.73	0.75	0.08	0.81	0.75
Norway (5)	0.63	48	0.76	0.81	0.43	0.71	-
Oman	0.58	38	0.47	0.62	0.29	0.79	0.76
Pakistan	0.41	31	0.56	0.58	0.58	0.64	0.36
Philippines	0.47	33	0.27	0.51	0.47	0.74	0.74
Poland	0.71	47	0.70	0.74	0.22	0.80	0.78
Portugal	0.72	48	0.69	0.76	0.12	0.81	0.81
Qatar	0.50	34	0.48	0.65	0.32	0.71	0.67
Russian Federation	0.67	44	0.68	0.74	0.34	0.74	0.70
Saudi Arabia	0.47	32	0.35	0.50	0.22	0.79	0.77
Serbia	0.73	49	0.71	0.77	0.27	0.82	0.76
Singapore	0.65	43	0.70	0.73	0.23	0.76	0.71
Slovak Republic	0.78	54	0.79	0.81	0.32	0.82	0.79
South Africa (5)	0.59	36	0.52	0.54	0.54	0.70	0.69
Spain	0.69	46	0.68	0.76	-0.02	0.81	0.77
Sweden	0.70	48	0.72	0.76	0.41	0.78	0.72
Turkey (5)	0.75	50	0.68	0.77	0.55	0.80	0.70
United Arab Emirates	0.48	33	0.52	0.63	0.23	0.67	0.69
United States	-	-	-	-	-	-	-
<b>Benchmarking Participants</b>							
Ontario, Canada	0.58	38	0.67	0.68	0.32	0.64	0.69
Quebec, Canada	0.62	41	0.68	0.71	0.21	0.73	0.69
Moscow City, Russian Fed.	0.59	39	0.65	0.72	0.27	0.70	0.68
Madrid, Spain	0.71	47	0.69	0.76	0.05	0.82	0.80
Abu Dhabi, UAE	0.51	34	0.58	0.63	0.21	0.68	0.68
Dubai, UAE	0.46	33	0.50	0.65	0.24	0.68	0.67

A dash (-) indicates comparable data not available.

### Relationship Between the TIMSS 2019 *Home Resources for Learning* Scale and TIMSS 2019 Achievement – Grade 4

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
Albania	0.39	0.15	0.09	0.38	0.15	0.09
Armenia	0.26	0.07	0.03	0.27	0.08	0.03
Australia	-	-	-	-	-	-
Austria	0.46	0.21	0.14	0.53	0.29	0.17
Azerbaijan	0.28	0.08	0.03	0.27	0.08	0.03
Bahrain	0.19	0.04	0.02	0.31	0.09	0.04
Belgium (Flemish)	0.42	0.18	0.10	0.48	0.23	0.13
Bosnia and Herzegovina	0.35	0.12	0.06	0.31	0.10	0.04
Bulgaria	0.56	0.31	0.22	0.61	0.38	0.28
Canada	0.27	0.07	0.05	0.32	0.10	0.07
Chile	0.39	0.15	0.07	0.42	0.18	0.08
Chinese Taipei	0.40	0.16	0.11	0.44	0.19	0.13
Croatia	0.36	0.13	0.06	0.37	0.14	0.07
Cyprus	0.35	0.12	0.09	0.38	0.14	0.11
Czech Republic	0.41	0.17	0.11	0.42	0.18	0.11
Denmark	0.32	0.10	0.08	0.37	0.14	0.10
England	-	-	-	-	-	-
Finland	0.37	0.13	0.09	0.38	0.15	0.09
France	0.49	0.24	0.16	0.52	0.27	0.18
Georgia	0.23	0.05	0.03	0.20	0.04	0.03
Germany	0.47	0.22	0.13	0.49	0.24	0.15
Hong Kong SAR	0.37	0.14	0.09	0.38	0.14	0.11
Hungary	0.53	0.28	0.19	0.52	0.27	0.18
Iran, Islamic Rep. of	0.38	0.15	0.10	0.43	0.19	0.12
Ireland	0.43	0.19	0.12	0.45	0.20	0.13
Italy	0.31	0.09	0.04	0.35	0.12	0.06
Japan	0.35	0.12	0.06	0.36	0.13	0.06
Kazakhstan	0.22	0.05	0.02	0.27	0.07	0.05
Korea, Rep. of	0.40	0.16	0.13	0.40	0.16	0.12
Kosovo	0.29	0.08	0.04	0.29	0.09	0.04
Kuwait	0.20	0.04	0.02	0.19	0.03	0.01
Latvia	0.36	0.13	0.07	0.34	0.12	0.07
Lithuania	0.48	0.23	0.10	0.48	0.23	0.10
Malta	0.40	0.16	0.09	0.44	0.19	0.11
Montenegro	0.36	0.13	0.06	0.37	0.14	0.07
Morocco	0.26	0.07	0.05	0.21	0.05	0.04
Netherlands	-	-	-	-	-	-

### Relationship Between the TIMSS 2019 *Home Resources for Learning* Scale and TIMSS 2019 Achievement – Grade 4

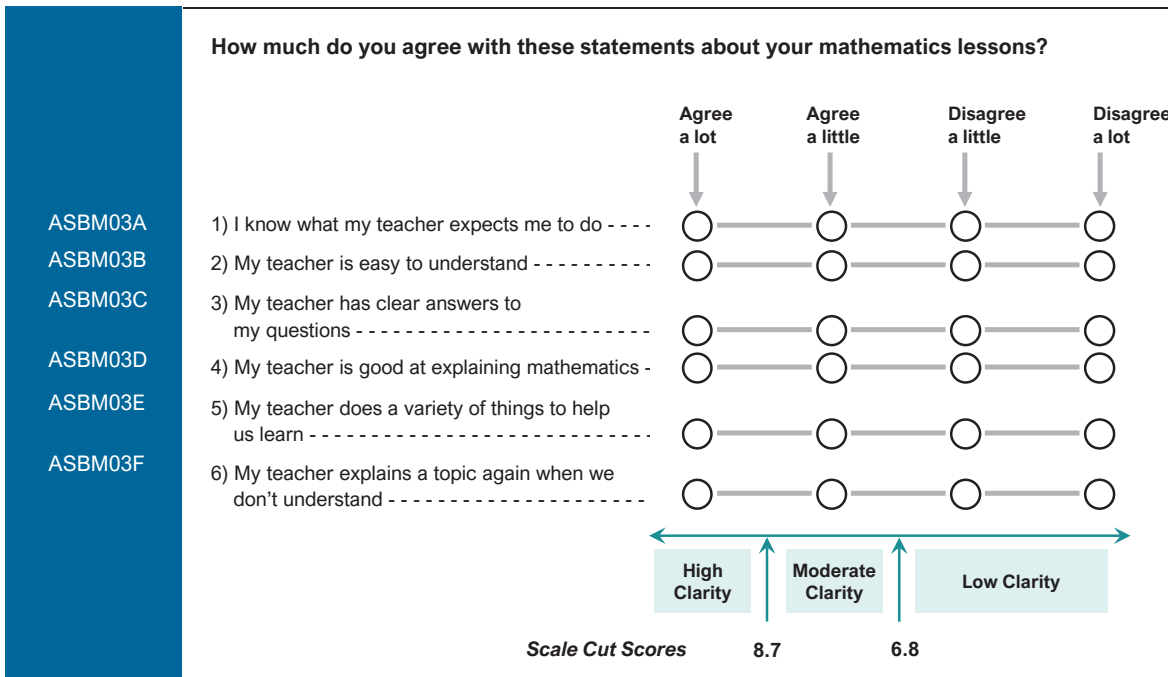
Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	<i>r</i>	<i>r</i> <sup>2</sup>		<i>r</i>	<i>r</i> <sup>2</sup>	
New Zealand	0.45	0.20	0.14	0.49	0.24	0.16
North Macedonia	0.47	0.22	0.13	0.49	0.24	0.14
Northern Ireland	0.44	0.19	0.14	0.44	0.19	0.14
Norway (5)	0.36	0.13	0.09	0.43	0.19	0.11
Oman	0.29	0.08	0.04	0.34	0.11	0.05
Pakistan	0.09	0.01	0.00	0.07	0.01	0.00
Philippines	0.26	0.07	0.03	0.31	0.10	0.05
Poland	0.42	0.18	0.11	0.42	0.18	0.12
Portugal	0.42	0.18	0.11	0.41	0.17	0.11
Qatar	0.38	0.15	0.06	0.35	0.12	0.04
Russian Federation	0.28	0.08	0.03	0.33	0.11	0.05
Saudi Arabia	0.17	0.03	0.01	0.18	0.03	0.02
Serbia	0.51	0.26	0.17	0.51	0.26	0.18
Singapore	0.45	0.20	0.13	0.50	0.25	0.16
Slovak Republic	0.51	0.26	0.18	0.57	0.32	0.25
South Africa (5)	0.36	0.13	0.09	0.39	0.15	0.10
Spain	0.40	0.16	0.10	0.40	0.16	0.10
Sweden	0.43	0.19	0.13	0.48	0.23	0.16
Turkey (5)	0.56	0.32	0.22	0.55	0.30	0.22
United Arab Emirates	0.32	0.10	0.05	0.30	0.09	0.04
United States	-	-	-	-	-	-
<b>International Median</b>	<b>0.37</b>	<b>0.14</b>	<b>0.09</b>	<b>0.39</b>	<b>0.15</b>	<b>0.10</b>
<b>Benchmarking Participants</b>						
Ontario, Canada	0.26	0.07	0.05	0.30	0.09	0.06
Quebec, Canada	0.33	0.11	0.07	0.37	0.14	0.09
Moscow City, Russian Fed.	0.31	0.10	0.06	0.34	0.12	0.07
Madrid, Spain	0.39	0.15	0.11	0.38	0.15	0.10
Abu Dhabi, UAE	0.35	0.12	0.07	0.33	0.11	0.06
Dubai, UAE	0.30	0.09	0.05	0.30	0.09	0.04

A dash (–) indicates comparable data not available.

# Instructional Clarity in Mathematics Lessons – Grade 4

## About the Scale

The *Instructional Clarity in Mathematics Lessons* scale was created based on students’ responses to six items listed below.



### Item Parameters for the TIMSS 2019 *Instructional Clarity in Mathematics Lessons* Scale – Grade 4

Item	delta	tau_1	tau_2	tau_3	Infit
ASBM03A	0.55669	-0.41814	-0.67074	1.08888	1.35
ASBM03B	0.16551	-0.64001	-0.56532	1.20533	0.99
ASBM03C	-0.01951	-0.59199	-0.40578	0.99777	0.90
ASBM03D	-0.32365	-0.23962	-0.42717	0.66679	0.84
ASBM03E	-0.25206	-0.14221	-0.49347	0.63568	0.95
ASBM03F	-0.12698	-0.03204	-0.45776	0.48980	1.02

### Scale Transformation Constants for the TIMSS 2019 *Instructional Clarity in Mathematics Lessons* Scale – Grade 4

#### Scale Transformation Constants

A = 6.877313

B = 1.528419

Transformed Scale Score = 6.877313 + 1.528419 • Logit Scale Score

### Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019 *Instructional Clarity in Mathematics Lessons* Scale – Grade 4

Raw Score	Transformed Scale Score	Cutpoint
0	2.55279	
1	3.94739	
2	4.59152	
3	5.03338	
4	5.37899	
5	5.67743	
6	5.94784	
7	6.20271	
8	6.45082	
9	6.70099	6.8
10	6.95523	
11	7.22643	
12	7.52472	
13	7.86085	
14	8.25838	
15	8.75219	8.7
16	9.40649	
17	10.36648	
18	12.25706	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Instructional Clarity in Mathematics Lessons* Scale – Grade 4

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item					
			ASBM03A	ASBM03B	ASBM03C	ASBM03D	ASBM03E	ASBM03F
Albania	0.46	40	0.21	0.75	0.65	0.80	0.54	0.65
Armenia	0.77	53	0.36	0.73	0.75	0.84	0.85	0.73
Australia	0.82	53	0.61	0.78	0.79	0.80	0.75	0.62
Austria	0.75	48	0.45	0.64	0.77	0.79	0.76	0.69
Azerbaijan	0.67	43	0.38	0.59	0.69	0.78	0.70	0.73
Bahrain	0.75	47	0.47	0.72	0.77	0.78	0.74	0.58
Belgium (Flemish)	0.76	47	0.52	0.69	0.74	0.77	0.67	0.68
Bosnia and Herzegovina	0.80	52	0.56	0.72	0.78	0.81	0.70	0.74
Bulgaria	0.75	47	0.48	0.64	0.77	0.74	0.72	0.72
Canada	0.78	49	0.54	0.76	0.77	0.78	0.72	0.60
Chile	0.77	49	0.49	0.71	0.77	0.79	0.67	0.72
Chinese Taipei	0.86	60	0.72	0.77	0.78	0.80	0.80	0.76
Croatia	0.82	55	0.53	0.74	0.82	0.81	0.74	0.76
Cyprus	0.80	53	0.56	0.63	0.77	0.81	0.79	0.76
Czech Republic	0.85	59	0.59	0.82	0.80	0.82	0.80	0.75
Denmark	0.79	50	0.48	0.76	0.74	0.82	0.75	0.66
England	0.77	48	0.53	0.76	0.78	0.79	0.70	0.56
Finland	0.82	55	0.44	0.81	0.75	0.84	0.81	0.72
France	0.77	47	0.51	0.73	0.75	0.75	0.68	0.68
Georgia	0.66	47	0.34	0.75	0.75	0.80	0.70	0.66
Germany	0.80	52	0.49	0.80	0.76	0.80	0.71	0.72
Hong Kong SAR	0.89	65	0.72	0.81	0.85	0.84	0.84	0.77
Hungary	0.81	52	0.58	0.69	0.79	0.81	0.75	0.70
Iran, Islamic Rep. of	0.80	53	0.51	0.67	0.78	0.83	0.76	0.78
Ireland	0.77	48	0.47	0.75	0.78	0.80	0.72	0.59
Italy	0.64	39	0.34	0.60	0.72	0.76	0.62	0.62
Japan	0.84	58	0.48	0.80	0.82	0.84	0.82	0.76
Kazakhstan	0.69	47	0.39	0.62	0.75	0.80	0.75	0.72
Korea, Rep. of	0.83	57	0.46	0.76	0.80	0.86	0.82	0.76
Kosovo	0.51	42	0.22	0.73	0.69	0.73	0.73	0.64
Kuwait	0.80	51	0.52	0.72	0.79	0.78	0.76	0.69
Latvia	0.77	50	0.46	0.71	0.75	0.80	0.75	0.70
Lithuania	0.72	44	0.51	0.68	0.73	0.74	0.65	0.63
Malta	0.73	44	0.49	0.70	0.75	0.75	0.69	0.59
Montenegro	0.71	43	0.50	0.69	0.72	0.76	0.58	0.66
Morocco	0.62	40	0.32	0.52	0.70	0.74	0.73	0.67
Netherlands	0.79	50	0.57	0.76	0.78	0.75	0.69	0.66
New Zealand	0.81	52	0.57	0.76	0.79	0.80	0.73	0.64
North Macedonia	0.65	41	0.41	0.65	0.74	0.70	0.64	0.64

**Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Instructional Clarity in Mathematics Lessons* Scale – Grade 4**

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item					
			ASBM03A	ASBM03B	ASBM03C	ASBM03D	ASBM03E	ASBM03F
Northern Ireland	0.77	48	0.53	0.78	0.78	0.79	0.68	0.57
Norway (5)	0.80	52	0.48	0.75	0.78	0.81	0.74	0.71
Oman	0.72	45	0.43	0.67	0.72	0.75	0.69	0.70
Pakistan	0.82	54	0.57	0.77	0.77	0.78	0.70	0.78
Philippines	0.70	41	0.42	0.67	0.65	0.71	0.68	0.66
Poland	0.83	55	0.59	0.68	0.79	0.82	0.77	0.78
Portugal	0.68	41	0.45	0.65	0.68	0.75	0.64	0.65
Qatar	0.81	51	0.51	0.74	0.79	0.79	0.76	0.68
Russian Federation	0.76	50	0.49	0.68	0.77	0.79	0.75	0.69
Saudi Arabia	0.75	47	0.46	0.69	0.77	0.77	0.74	0.63
Serbia	0.81	52	0.60	0.73	0.78	0.80	0.67	0.73
Singapore	0.83	54	0.59	0.79	0.80	0.81	0.74	0.66
Slovak Republic	0.77	48	0.52	0.75	0.72	0.78	0.76	0.61
South Africa (5)	0.78	48	0.58	0.70	0.70	0.76	0.68	0.72
Spain	0.73	47	0.34	0.66	0.77	0.79	0.73	0.71
Sweden	0.81	54	0.45	0.77	0.81	0.82	0.79	0.68
Turkey (5)	0.70	44	0.37	0.63	0.70	0.76	0.73	0.72
United Arab Emirates	0.81	53	0.55	0.75	0.79	0.80	0.77	0.69
United States	0.79	50	0.58	0.75	0.77	0.78	0.72	0.61
<b>Benchmarking Participants</b>								
Ontario, Canada	0.79	49	0.55	0.76	0.78	0.78	0.72	0.58
Quebec, Canada	0.78	50	0.52	0.76	0.76	0.77	0.72	0.66
Moscow City, Russian Fed.	0.78	52	0.46	0.70	0.81	0.80	0.77	0.72
Madrid, Spain	0.67	42	0.31	0.67	0.74	0.75	0.67	0.66
Abu Dhabi, UAE	0.84	55	0.58	0.76	0.80	0.80	0.79	0.72
Dubai, UAE	0.76	47	0.50	0.71	0.75	0.78	0.71	0.61



**Relationship Between the TIMSS 2019 *Instructional Clarity in Mathematics Lessons* Scale and TIMSS 2019 Achievement – Grade 4**

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
Albania	0.10	0.01	0.01
Armenia	0.12	0.01	0.02
Australia	0.13	0.02	0.02
Austria	0.10	0.01	0.01
Azerbaijan	0.17	0.03	0.03
Bahrain	0.12	0.01	0.02
Belgium (Flemish)	0.07	0.01	0.01
Bosnia and Herzegovina	0.16	0.03	0.04
Bulgaria	0.08	0.01	0.01
Canada	0.09	0.01	0.01
Chile	0.15	0.02	0.04
Chinese Taipei	0.21	0.04	0.04
Croatia	0.10	0.01	0.00
Cyprus	0.10	0.01	0.01
Czech Republic	0.06	0.00	0.01
Denmark	0.16	0.03	0.02
England	0.11	0.01	0.01
Finland	0.10	0.01	0.01
France	0.02	0.00	0.00
Georgia	0.09	0.01	0.01
Germany	0.10	0.01	0.01
Hong Kong SAR	0.20	0.04	0.04
Hungary	0.17	0.03	0.02
Iran, Islamic Rep. of	0.13	0.02	0.03
Ireland	0.07	0.00	0.00
Italy	0.09	0.01	0.02
Japan	0.02	0.00	0.00
Kazakhstan	0.11	0.01	0.01
Korea, Rep. of	0.19	0.04	0.04
Kosovo	0.09	0.01	0.03
Kuwait	0.17	0.03	0.04
Latvia	0.12	0.01	0.01
Lithuania	0.03	0.00	0.00
Malta	0.14	0.02	0.02
Montenegro	0.12	0.02	0.02
Morocco	0.15	0.02	0.03
Netherlands	0.04	0.00	0.01
New Zealand	0.03	0.00	0.00

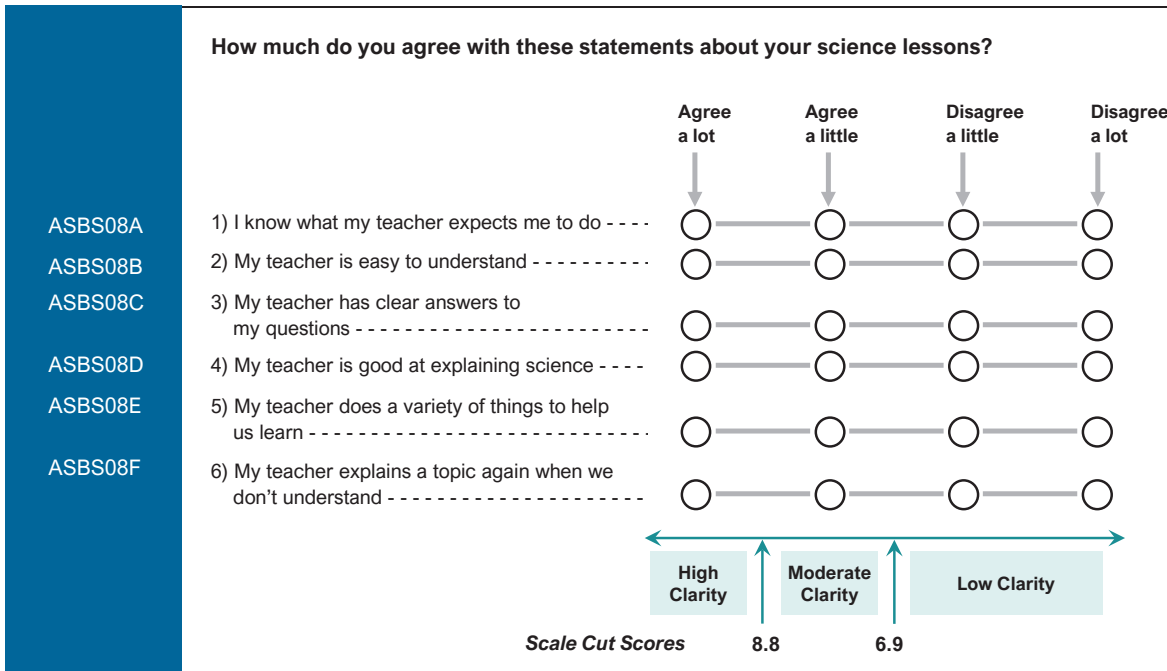
**Relationship Between the TIMSS 2019 *Instructional Clarity in Mathematics Lessons* Scale and TIMSS 2019 Achievement – Grade 4**

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
North Macedonia	0.20	0.04	0.03
Northern Ireland	0.10	0.01	0.01
Norway (5)	0.07	0.01	0.01
Oman	0.16	0.03	0.04
Pakistan	0.18	0.03	0.05
Philippines	0.30	0.09	0.09
Poland	0.10	0.01	0.01
Portugal	0.06	0.00	0.01
Qatar	0.18	0.03	0.05
Russian Federation	0.06	0.00	0.01
Saudi Arabia	0.17	0.03	0.04
Serbia	0.10	0.01	0.01
Singapore	0.24	0.06	0.05
Slovak Republic	-0.02	0.00	0.00
South Africa (5)	0.28	0.08	0.09
Spain	0.09	0.01	0.02
Sweden	0.03	0.00	0.01
Turkey (5)	0.29	0.08	0.07
United Arab Emirates	0.18	0.03	0.04
United States	0.14	0.02	0.02
<b>International Median</b>	<b>0.11</b>	<b>0.01</b>	<b>0.02</b>
<b>Benchmarking Participants</b>			
Ontario, Canada	0.11	0.01	0.01
Quebec, Canada	0.09	0.01	0.01
Moscow City, Russian Fed.	0.10	0.01	0.01
Madrid, Spain	0.05	0.00	0.01
Abu Dhabi, UAE	0.18	0.03	0.04
Dubai, UAE	0.09	0.01	0.01

# Instructional Clarity in Science Lessons – Grade 4

## About the Scale

The *Instructional Clarity in Science Lessons* scale was created based on students’ responses to six items listed below.



### Item Parameters for the TIMSS 2019 *Instructional Clarity in Science Lessons* Scale – Grade 4

Item	delta	tau_1	tau_2	tau_3	Infit
ASBS08A	0.64445	-0.65910	-0.54914	1.20824	1.43
ASBS08B	0.05025	-0.67012	-0.52376	1.19388	0.96
ASBS08C	-0.14200	-0.73473	-0.33617	1.07090	0.86
ASBS08D	-0.32015	-0.44293	-0.45339	0.89632	0.86
ASBS08E	-0.21665	-0.52139	-0.40110	0.92249	0.93
ASBS08F	-0.01590	-0.31434	-0.42998	0.74432	1.05

### Scale Transformation Constants for the TIMSS 2019 *Instructional Clarity in Science Lessons* Scale – Grade 4

#### Scale Transformation Constants

$$A = 6.991185$$

$$B = 1.413250$$

$$\text{Transformed Scale Score} = 6.991185 + 1.413250 \cdot \text{Logit Scale Score}$$

### Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019 *Instructional Clarity in Science Lessons* Scale – Grade 4

Raw Score	Transformed Scale Score	Cutpoint
0	2.65952	
1	4.04481	
2	4.69156	
3	5.13557	
4	5.48896	
5	5.79290	
6	6.06900	
7	6.32969	
8	6.58700	
9	6.83933	6.9
10	7.10005	
11	7.37696	
12	7.67947	
13	8.01729	
14	8.41140	
15	8.89130	8.8
16	9.51083	
17	10.40151	
18	12.14438	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Instructional Clarity in Science Lessons* Scale – Grade 4

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item					
			ASBS08A	ASBS08B	ASBS08C	ASBS08D	ASBS08E	ASBS08F
Albania	0.62	48	0.29	0.81	0.71	0.86	0.69	0.67
Armenia	0.82	59	0.47	0.79	0.80	0.83	0.85	0.80
Australia	0.86	59	0.62	0.83	0.85	0.82	0.79	0.68
Austria	0.78	51	0.50	0.63	0.81	0.80	0.78	0.74
Azerbaijan	0.75	50	0.40	0.65	0.79	0.79	0.76	0.77
Bahrain	0.76	49	0.47	0.74	0.81	0.78	0.76	0.59
Belgium (Flemish)	0.80	51	0.59	0.74	0.78	0.75	0.68	0.72
Bosnia and Herzegovina	0.78	51	0.54	0.74	0.79	0.78	0.69	0.71
Bulgaria	0.77	49	0.50	0.70	0.81	0.74	0.70	0.71
Canada	0.83	55	0.58	0.80	0.82	0.81	0.76	0.64
Chile	0.80	52	0.51	0.69	0.79	0.81	0.73	0.74
Chinese Taipei	0.89	65	0.76	0.83	0.81	0.82	0.83	0.79
Croatia	0.86	60	0.62	0.79	0.85	0.84	0.76	0.76
Cyprus	0.87	61	0.63	0.71	0.84	0.85	0.84	0.81
Czech Republic	0.88	64	0.61	0.87	0.82	0.86	0.83	0.79
Denmark	0.84	58	0.52	0.81	0.81	0.85	0.81	0.72
England	0.83	56	0.57	0.82	0.82	0.82	0.77	0.65
Finland	0.85	61	0.49	0.85	0.80	0.87	0.83	0.77
France	0.82	53	0.57	0.78	0.79	0.78	0.72	0.72
Georgia	0.72	50	0.34	0.77	0.79	0.80	0.74	0.67
Germany	0.84	57	0.51	0.84	0.82	0.83	0.75	0.76
Hong Kong SAR	0.94	76	0.80	0.89	0.90	0.89	0.90	0.84
Hungary	0.84	57	0.58	0.75	0.84	0.84	0.76	0.73
Iran, Islamic Rep. of	0.80	53	0.46	0.74	0.78	0.82	0.76	0.77
Ireland	0.83	55	0.55	0.82	0.81	0.83	0.76	0.66
Italy	0.70	43	0.37	0.63	0.77	0.77	0.67	0.63
Japan	0.87	63	0.56	0.82	0.84	0.85	0.85	0.79
Kazakhstan	0.75	51	0.44	0.67	0.76	0.81	0.81	0.72
Korea, Rep. of	0.87	63	0.52	0.80	0.84	0.88	0.85	0.82
Kosovo	0.62	49	0.25	0.79	0.80	0.79	0.72	0.69
Kuwait	0.80	52	0.50	0.72	0.79	0.80	0.76	0.72
Latvia	0.81	54	0.53	0.77	0.79	0.76	0.78	0.73
Lithuania	0.76	47	0.57	0.70	0.74	0.73	0.71	0.68
Malta	0.82	54	0.58	0.78	0.80	0.78	0.74	0.68
Montenegro	0.80	52	0.55	0.75	0.79	0.78	0.68	0.75
Morocco	0.68	42	0.37	0.55	0.74	0.74	0.74	0.68
Netherlands	0.83	55	0.64	0.81	0.83	0.72	0.73	0.70
New Zealand	0.87	61	0.68	0.82	0.84	0.80	0.80	0.73
North Macedonia	0.71	47	0.39	0.69	0.78	0.81	0.69	0.67

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Instructional Clarity in Science Lessons* Scale – Grade 4

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item					
			ASBS08A	ASBS08B	ASBS08C	ASBS08D	ASBS08E	ASBS08F
Northern Ireland	0.82	54	0.59	0.80	0.82	0.77	0.76	0.64
Norway (5)	0.81	54	0.56	0.78	0.76	0.80	0.76	0.71
Oman	0.76	48	0.37	0.73	0.77	0.78	0.73	0.72
Pakistan	0.81	53	0.51	0.74	0.80	0.77	0.71	0.78
Philippines	0.72	42	0.44	0.68	0.67	0.71	0.70	0.66
Poland	0.89	64	0.70	0.78	0.84	0.86	0.81	0.81
Portugal	0.78	51	0.53	0.67	0.77	0.78	0.74	0.76
Qatar	0.82	54	0.51	0.77	0.82	0.81	0.78	0.67
Russian Federation	0.79	54	0.50	0.71	0.81	0.82	0.79	0.72
Saudi Arabia	0.76	49	0.43	0.74	0.77	0.77	0.77	0.65
Serbia	0.84	56	0.65	0.77	0.80	0.80	0.72	0.74
Singapore	0.87	61	0.65	0.82	0.83	0.84	0.80	0.73
Slovak Republic	0.81	53	0.55	0.79	0.74	0.81	0.77	0.69
South Africa (5)	0.80	50	0.59	0.74	0.74	0.76	0.70	0.72
Spain	0.76	50	0.34	0.70	0.80	0.80	0.76	0.76
Sweden	0.83	58	0.50	0.80	0.84	0.83	0.82	0.72
Turkey (5)	0.76	50	0.43	0.68	0.74	0.80	0.77	0.75
United Arab Emirates	0.84	57	0.58	0.78	0.82	0.82	0.79	0.71
United States	0.83	56	0.62	0.80	0.81	0.81	0.76	0.66
<b>Benchmarking Participants</b>								
Ontario, Canada	0.82	54	0.59	0.79	0.82	0.79	0.75	0.65
Quebec, Canada	0.84	58	0.56	0.82	0.83	0.83	0.78	0.71
Moscow City, Russian Fed.	0.81	56	0.51	0.74	0.83	0.83	0.81	0.71
Madrid, Spain	0.75	49	0.38	0.70	0.78	0.78	0.74	0.72
Abu Dhabi, UAE	0.86	60	0.62	0.80	0.83	0.82	0.80	0.73
Dubai, UAE	0.82	54	0.56	0.76	0.81	0.81	0.77	0.66

**Relationship Between the TIMSS 2019 *Instructional Clarity in Science Lessons* Scale and TIMSS 2019 Achievement – Grade 4**

Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
Albania	0.12	0.02	0.02
Armenia	0.12	0.02	0.02
Australia	-0.01	0.00	0.00
Austria	0.06	0.00	0.00
Azerbaijan	0.12	0.01	0.02
Bahrain	0.19	0.03	0.04
Belgium (Flemish)	0.04	0.00	0.00
Bosnia and Herzegovina	0.14	0.02	0.03
Bulgaria	0.08	0.01	0.01
Canada	0.04	0.00	0.00
Chile	0.13	0.02	0.03
Chinese Taipei	0.13	0.02	0.02
Croatia	0.07	0.00	0.01
Cyprus	0.07	0.01	0.01
Czech Republic	0.03	0.00	0.01
Denmark	0.04	0.00	0.00
England	-0.02	0.00	0.00
Finland	0.07	0.00	0.01
France	-0.01	0.00	0.00
Georgia	0.07	0.00	0.01
Germany	0.08	0.01	0.01
Hong Kong SAR	0.19	0.04	0.04
Hungary	0.07	0.01	0.01
Iran, Islamic Rep. of	0.17	0.03	0.03
Ireland	0.01	0.00	0.00
Italy	0.07	0.01	0.01
Japan	-0.03	0.00	0.00
Kazakhstan	0.16	0.03	0.02
Korea, Rep. of	0.10	0.01	0.01
Kosovo	0.11	0.01	0.04
Kuwait	0.18	0.03	0.05
Latvia	0.01	0.00	0.00
Lithuania	0.03	0.00	0.00
Malta	0.05	0.00	0.00
Montenegro	0.10	0.01	0.01
Morocco	0.16	0.03	0.04
Netherlands	-0.01	0.00	0.01
New Zealand	-0.06	0.00	0.00

**Relationship Between the TIMSS 2019 *Instructional Clarity in Science Lessons* Scale and TIMSS 2019 Achievement – Grade 4**

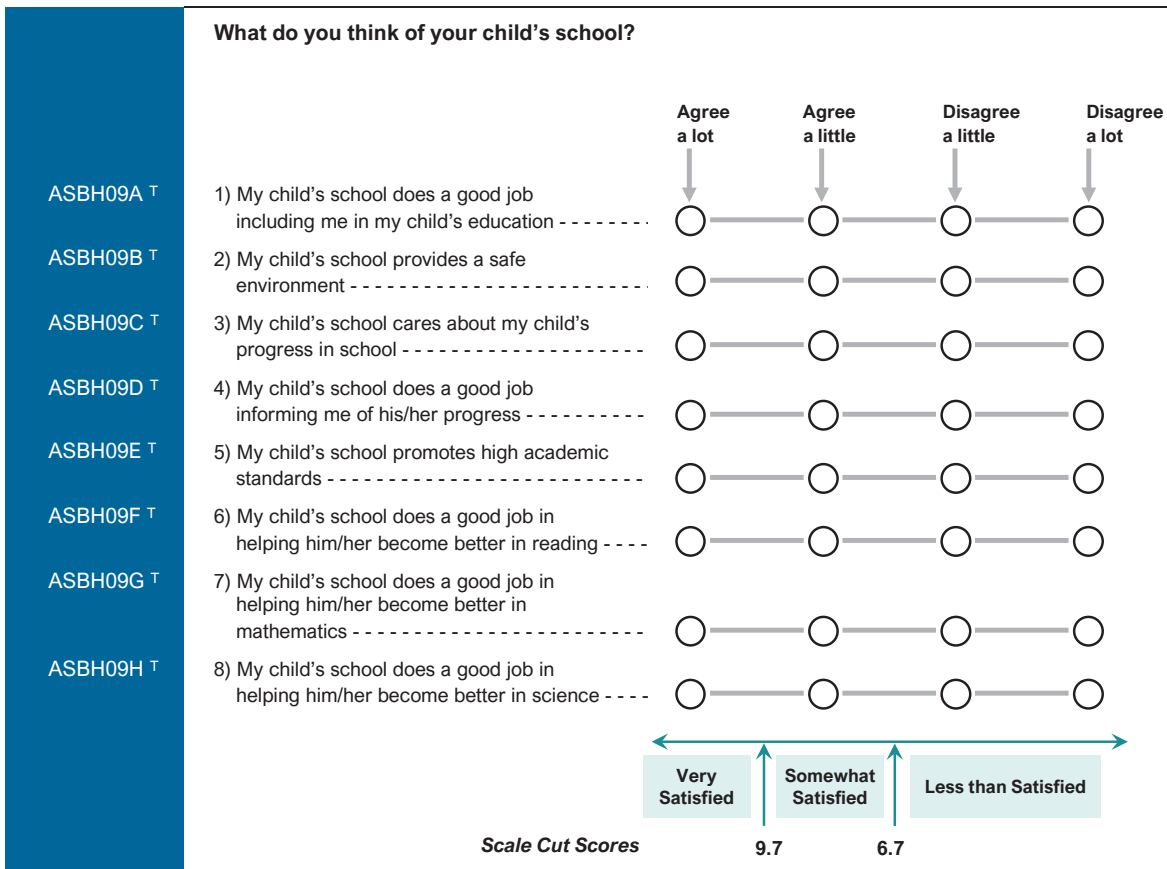
Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
North Macedonia	0.17	0.03	0.04
Northern Ireland	-0.02	0.00	0.00
Norway (5)	-0.04	0.00	0.00
Oman	0.20	0.04	0.05
Pakistan	0.13	0.02	0.02
Philippines	0.28	0.08	0.09
Poland	0.04	0.00	0.01
Portugal	0.08	0.01	0.01
Qatar	0.23	0.05	0.07
Russian Federation	-0.01	0.00	0.00
Saudi Arabia	0.22	0.05	0.06
Serbia	0.06	0.00	0.00
Singapore	0.12	0.01	0.01
Slovak Republic	-0.01	0.00	0.00
South Africa (5)	0.28	0.08	0.08
Spain	0.11	0.01	0.02
Sweden	-0.02	0.00	0.01
Turkey (5)	0.27	0.07	0.07
United Arab Emirates	0.22	0.05	0.05
United States	0.11	0.01	0.02
<b>International Median</b>	<b>0.08</b>	<b>0.01</b>	<b>0.01</b>
<b>Benchmarking Participants</b>			
Ontario, Canada	0.03	0.00	0.00
Quebec, Canada	0.03	0.00	0.00
Moscow City, Russian Fed.	0.05	0.00	0.01
Madrid, Spain	0.06	0.00	0.01
Abu Dhabi, UAE	0.22	0.05	0.05
Dubai, UAE	0.09	0.01	0.01



## Parents' Perceptions of Their Child's School – Grade 4

### About the Scale

The *Parents' Perceptions of Their Child's School* scale was created based on students' responses to eight items listed below.<sup>1</sup>



<sup>1</sup> 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.

<sup>T</sup> Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.

### Item Parameters for the TIMSS 2019 Parents' Perceptions of Their Child's School Scale – Grade 4

Item	delta	tau_1	tau_2	Infit
ASBH09A	0.07406	-1.70344	1.70344	1.10
ASBH09B	-0.56525	-1.69657	1.69657	1.36
ASBH09C	-0.49961	-1.72317	1.72317	0.87
ASBH09D	-0.09816	-1.42520	1.42520	1.00
ASBH09E	1.03037	-1.68923	1.68923	1.19
ASBH09F	-0.18620	-1.52570	1.52570	0.88
ASBH09G	-0.01740	-1.58204	1.58204	0.85
ASBH09H	0.26219	-1.62188	1.62188	0.93

### Scale Transformation Constants for the TIMSS 2019 Parents' Perceptions of Their Child's School Scale – Grade 4

#### Scale Transformation Constants

$$A = 8.205877$$

$$B = 0.941262$$

$$\text{Transformed Scale Score} = 8.205877 + 0.941262 \cdot \text{Logit Scale Score}$$

### Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019 Parents' Perceptions of Their Child's School Scale – Grade 4

Raw Score	Transformed Scale Score	Cutpoint
0	3.91475	
1	5.08120	
2	5.70687	
3	6.18579	
4	6.60143	6.7
5	6.99714	
6	7.39016	
7	7.79429	
8	8.20790	
9	8.61865	
10	9.01615	
11	9.40453	
12	9.79727	9.7
13	10.21729	
14	10.70311	
15	11.34573	
16	12.53666	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 Parents' Perceptions of Their Child's School Scale – Grade 4

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item							
			ASBH09A	ASBH09B	ASBH09C	ASBH09D	ASBH09E	ASBH09F	ASBH09G	ASBH09H
Albania	0.86	54	0.75	0.64	0.78	0.74	0.63	0.75	0.81	0.78
Armenia	0.85	50	0.59	0.64	0.78	0.55	0.74	0.80	0.78	0.75
Australia	-	-	-	-	-	-	-	-	-	-
Austria	0.90	59	0.70	0.58	0.82	0.80	0.70	0.81	0.84	0.83
Azerbaijan	0.87	54	0.74	0.67	0.79	0.72	0.69	0.77	0.76	0.73
Bahrain	0.91	61	0.78	0.68	0.81	0.79	0.79	0.78	0.80	0.80
Belgium (Flemish)	0.89	57	0.78	0.64	0.80	0.81	0.61	0.77	0.81	0.78
Bosnia and Herzegovina	0.91	62	0.77	0.66	0.83	0.78	0.73	0.82	0.84	0.84
Bulgaria	0.92	64	0.73	0.70	0.84	0.79	0.80	0.83	0.85	0.85
Canada	0.91	62	0.77	0.57	0.82	0.79	0.79	0.83	0.85	0.82
Chile	0.92	63	0.77	0.69	0.83	0.81	0.77	0.84	0.82	0.81
Chinese Taipei	0.91	63	0.79	0.69	0.84	0.84	0.71	0.78	0.85	0.82
Croatia	0.92	64	0.75	0.68	0.84	0.76	0.79	0.86	0.85	0.86
Cyprus	0.89	57	0.70	0.63	0.80	0.74	0.77	0.80	0.83	0.77
Czech Republic	0.91	63	0.72	0.58	0.82	0.79	0.76	0.85	0.89	0.88
Denmark	0.92	64	0.77	0.69	0.82	0.81	0.82	0.81	0.85	0.81
England	-	-	-	-	-	-	-	-	-	-
Finland	0.90	58	0.74	0.60	0.80	0.75	0.70	0.83	0.84	0.83
France	0.91	60	0.77	0.65	0.82	0.79	0.75	0.79	0.84	0.78
Georgia	0.88	55	0.62	0.66	0.79	0.74	0.72	0.76	0.82	0.81
Germany	0.89	56	0.78	0.59	0.79	0.80	0.57	0.81	0.83	0.80
Hong Kong SAR	0.89	57	0.77	0.53	0.80	0.82	0.74	0.79	0.79	0.77
Hungary	0.91	62	0.77	0.64	0.81	0.79	0.76	0.83	0.84	0.84
Iran, Islamic Rep. of	0.87	53	0.67	0.62	0.77	0.72	0.65	0.79	0.79	0.78
Ireland	0.88	57	0.79	0.56	0.80	0.80	0.77	0.76	0.81	0.71
Italy	0.89	58	0.76	0.52	0.79	0.78	0.73	0.81	0.84	0.82
Japan	0.88	54	0.65	0.61	0.73	0.73	0.75	0.82	0.81	0.78
Kazakhstan	0.90	59	0.73	0.70	0.81	0.72	0.79	0.83	0.80	0.76
Korea, Rep. of	0.89	57	0.65	0.65	0.78	0.77	0.68	0.80	0.83	0.83
Kosovo	0.86	53	0.72	0.65	0.79	0.71	0.61	0.74	0.79	0.79
Kuwait	0.92	64	0.77	0.69	0.84	0.78	0.83	0.83	0.82	0.81
Latvia	0.90	58	0.66	0.61	0.82	0.70	0.79	0.82	0.84	0.82
Lithuania	0.89	59	0.64	0.66	0.80	0.76	0.70	0.84	0.85	0.86
Malta	0.85	50	0.69	0.50	0.77	0.74	0.69	0.74	0.78	0.72
Montenegro	0.91	63	0.78	0.68	0.84	0.78	0.75	0.83	0.84	0.85
Morocco	0.86	53	0.67	0.61	0.76	0.72	0.59	0.81	0.82	0.79
Netherlands	-	-	-	-	-	-	-	-	-	-
New Zealand	0.90	60	0.78	0.54	0.83	0.81	0.78	0.85	0.83	0.75
North Macedonia	0.87	55	0.62	0.68	0.79	0.74	0.65	0.78	0.83	0.83

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 Parents' Perceptions of Their Child's School Scale – Grade 4

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item							
			ASBH09A	ASBH09B	ASBH09C	ASBH09D	ASBH09E	ASBH09F	ASBH09G	ASBH09H
Northern Ireland	0.88	56	0.80	0.49	0.82	0.80	0.75	0.76	0.84	0.68
Norway (5)	-	-	-	-	-	-	-	-	-	-
Oman	0.89	57	0.76	0.66	0.80	0.74	0.75	0.76	0.79	0.79
Pakistan	0.87	52	0.66	0.68	0.69	0.73	0.73	0.75	0.75	0.77
Philippines	0.89	56	0.69	0.65	0.74	0.74	0.75	0.79	0.81	0.80
Poland	0.89	56	0.67	0.66	0.84	0.70	0.73	0.81	0.78	0.79
Portugal	0.90	59	0.77	0.60	0.82	0.77	0.71	0.82	0.85	0.80
Qatar	0.90	60	0.75	0.65	0.82	0.77	0.80	0.79	0.80	0.81
Russian Federation	0.90	59	0.61	0.68	0.80	0.73	0.69	0.85	0.87	0.88
Saudi Arabia	0.91	62	0.75	0.66	0.83	0.80	0.77	0.82	0.83	0.82
Serbia	0.91	62	0.77	0.66	0.83	0.78	0.72	0.82	0.84	0.85
Singapore	0.89	58	0.75	0.60	0.82	0.79	0.71	0.77	0.81	0.80
Slovak Republic	0.91	60	0.68	0.61	0.82	0.75	0.78	0.82	0.86	0.85
South Africa (5)	0.86	51	0.69	0.63	0.74	0.72	0.68	0.75	0.77	0.75
Spain	0.90	59	0.75	0.60	0.81	0.78	0.72	0.79	0.83	0.84
Sweden	0.92	63	0.76	0.67	0.82	0.80	0.81	0.82	0.85	0.84
Turkey (5)	0.91	61	0.78	0.71	0.80	0.78	0.73	0.82	0.82	0.81
United Arab Emirates	0.92	63	0.79	0.63	0.84	0.80	0.81	0.81	0.82	0.82
United States	-	-	-	-	-	-	-	-	-	-
<b>Benchmarking Participants</b>										
Ontario, Canada	0.91	63	0.80	0.55	0.83	0.80	0.82	0.83	0.85	0.82
Quebec, Canada	0.90	58	0.72	0.57	0.81	0.77	0.73	0.82	0.85	0.79
Moscow City, Russian Fed.	0.90	60	0.50	0.68	0.81	0.70	0.79	0.87	0.88	0.88
Madrid, Spain	0.90	60	0.78	0.59	0.82	0.81	0.72	0.79	0.83	0.82
Abu Dhabi, UAE	0.92	65	0.78	0.69	0.85	0.81	0.82	0.83	0.82	0.81
Dubai, UAE	0.91	61	0.78	0.57	0.83	0.79	0.79	0.80	0.82	0.81

A dash (-) indicates comparable data not available.

### Relationship Between the TIMSS 2019 Parents' Perceptions of Their Child's School Scale and TIMSS 2019 Achievement – Grade 4

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
Albania	0.06	0.00	0.00	0.07	0.00	0.00
Armenia	0.06	0.00	0.00	0.04	0.00	0.00
Australia	-	-	-	-	-	-
Austria	0.08	0.01	0.01	0.01	0.00	0.00
Azerbaijan	0.05	0.00	0.00	0.03	0.00	0.00
Bahrain	0.06	0.00	0.01	0.14	0.02	0.02
Belgium (Flemish)	0.02	0.00	0.00	-0.03	0.00	0.00
Bosnia and Herzegovina	-0.01	0.00	0.00	-0.02	0.00	0.00
Bulgaria	-0.09	0.01	0.01	-0.11	0.01	0.01
Canada	0.03	0.00	0.00	-0.01	0.00	0.00
Chile	0.04	0.00	0.00	0.00	0.00	0.00
Chinese Taipei	-0.04	0.00	0.00	-0.09	0.01	0.00
Croatia	0.03	0.00	0.00	0.02	0.00	0.00
Cyprus	0.03	0.00	0.00	0.02	0.00	0.00
Czech Republic	-0.02	0.00	0.00	-0.03	0.00	0.00
Denmark	0.11	0.01	0.01	0.07	0.00	0.00
England	-	-	-	-	-	-
Finland	0.06	0.00	0.01	0.04	0.00	0.00
France	0.09	0.01	0.01	0.03	0.00	0.00
Georgia	-0.03	0.00	0.00	-0.05	0.00	0.00
Germany	0.10	0.01	0.01	0.04	0.00	0.00
Hong Kong SAR	0.11	0.01	0.01	0.12	0.01	0.02
Hungary	-0.02	0.00	0.00	-0.04	0.00	0.00
Iran, Islamic Rep. of	0.07	0.01	0.00	0.04	0.00	0.00
Ireland	0.02	0.00	0.00	-0.01	0.00	0.00
Italy	0.05	0.00	0.00	0.06	0.00	0.00
Japan	0.05	0.00	0.00	0.07	0.00	0.00
Kazakhstan	0.02	0.00	0.00	-0.03	0.00	0.00
Korea, Rep. of	0.02	0.00	0.00	-0.02	0.00	0.00
Kosovo	0.02	0.00	0.00	0.01	0.00	0.00
Kuwait	0.13	0.02	0.02	0.14	0.02	0.02
Latvia	0.01	0.00	0.00	0.01	0.00	0.00
Lithuania	0.04	0.00	0.00	0.04	0.00	0.00
Malta	0.01	0.00	0.00	-0.05	0.00	0.00
Montenegro	-0.01	0.00	0.00	-0.03	0.00	0.00
Morocco	0.14	0.02	0.01	0.13	0.02	0.02
Netherlands	-	-	-	-	-	-

### Relationship Between the TIMSS 2019 Parents' Perceptions of Their Child's School Scale and TIMSS 2019 Achievement – Grade 4

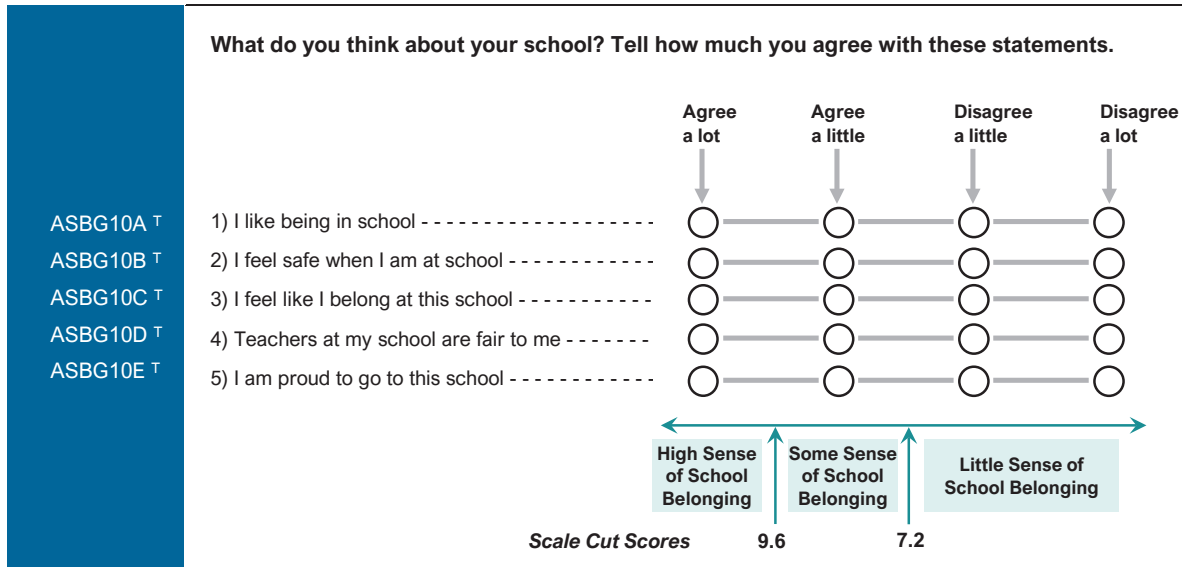
Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
New Zealand	0.03	0.00	0.00	0.01	0.00	0.00
North Macedonia	-0.03	0.00	0.00	-0.03	0.00	0.00
Northern Ireland	0.12	0.01	0.02	0.09	0.01	0.02
Norway (5)	-	-	-	-	-	-
Oman	0.19	0.04	0.03	0.18	0.03	0.03
Pakistan	0.21	0.04	0.03	0.22	0.05	0.03
Philippines	0.19	0.04	0.02	0.20	0.04	0.03
Poland	-0.03	0.00	0.00	-0.06	0.00	0.00
Portugal	0.05	0.00	0.01	0.03	0.00	0.00
Qatar	0.08	0.01	0.01	0.12	0.02	0.02
Russian Federation	-0.02	0.00	0.00	-0.03	0.00	0.00
Saudi Arabia	0.04	0.00	0.00	0.07	0.01	0.01
Serbia	-0.07	0.01	0.01	-0.08	0.01	0.01
Singapore	0.09	0.01	0.01	0.07	0.00	0.01
Slovak Republic	-0.06	0.00	0.00	-0.13	0.02	0.01
South Africa (5)	0.18	0.03	0.02	0.16	0.03	0.02
Spain	0.05	0.00	0.01	0.03	0.00	0.00
Sweden	0.05	0.00	0.00	0.02	0.00	0.00
Turkey (5)	-0.03	0.00	0.00	-0.04	0.00	0.00
United Arab Emirates	0.10	0.01	0.01	0.11	0.01	0.01
United States	-	-	-	-	-	-
<b>International Median</b>	<b>0.04</b>	<b>0.00</b>	<b>0.00</b>	<b>0.02</b>	<b>0.00</b>	<b>0.00</b>
<b>Benchmarking Participants</b>						
Ontario, Canada	0.07	0.01	0.01	-0.02	0.00	0.00
Quebec, Canada	0.03	0.00	0.00	-0.02	0.00	0.00
Moscow City, Russian Fed.	-0.04	0.00	0.00	-0.07	0.00	0.01
Madrid, Spain	0.04	0.00	0.00	0.04	0.00	0.00
Abu Dhabi, UAE	0.12	0.01	0.02	0.12	0.01	0.01
Dubai, UAE	0.13	0.02	0.01	0.13	0.02	0.02

A dash (–) indicates comparable data not available.

## Sense of School Belonging – Grade 4

### About the Scale

The *Sense of School Belonging* scale was created based on students' responses to five items listed below.



<sup>T</sup> Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.

### Item Parameters for the TIMSS 2019 *Sense of School Belonging* Scale – Grade 4

Item	delta	tau_1	tau_2	tau_3	Infit
ASBG10A	0.38967	-0.43337	-0.67867	1.11204	1.06
ASBG10B	-0.10231	-0.48418	-0.45813	0.94231	0.99
ASBG10C	0.06274	-0.30275	-0.38949	0.69224	1.00
ASBG10D	-0.21351	-0.22387	-0.45259	0.67646	1.11
ASBG10E	-0.13659	-0.09719	-0.47752	0.57471	0.92

### Scale Transformation Constants for the TIMSS 2019 *Sense of School Belonging* Scale – Grade 4

#### Scale Transformation Constants

A = 7.434179

B = 1.647177

Transformed Scale Score = 7.434179 + 1.647177 • Logit Scale Score

### Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019 *Sense of School Belonging* Scale – Grade 4

Raw Score	Transformed Scale Score	Cutpoint
0	3.14477	
1	4.60013	
2	5.28784	
3	5.76505	
4	6.15081	
5	6.49005	
6	6.80548	
7	7.11672	7.2
8	7.42069	
9	7.74564	
10	8.10425	
11	8.51746	
12	9.02423	
13	9.69880	9.6
14	10.71074	
15	12.75064	



### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Sense of School Belonging* Scale – Grade 4

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item				
			ASBG10A	ASBG10B	ASBG10C	ASBG10D	ASBG10E
Albania	0.62	40	0.53	0.63	0.63	0.66	0.68
Armenia	0.77	54	0.77	0.73	0.64	0.73	0.78
Australia	0.81	57	0.74	0.73	0.78	0.70	0.83
Austria	0.76	52	0.73	0.78	0.72	0.58	0.77
Azerbaijan	0.72	48	0.70	0.67	0.70	0.63	0.75
Bahrain	0.78	53	0.73	0.73	0.77	0.60	0.79
Belgium (Flemish)	0.76	51	0.70	0.70	0.74	0.67	0.76
Bosnia and Herzegovina	0.76	52	0.71	0.70	0.73	0.65	0.80
Bulgaria	0.77	52	0.69	0.69	0.79	0.63	0.81
Canada	0.80	56	0.73	0.73	0.79	0.68	0.81
Chile	0.75	51	0.67	0.75	0.77	0.62	0.77
Chinese Taipei	0.76	52	0.73	0.74	0.75	0.67	0.70
Croatia	0.77	52	0.70	0.78	0.71	0.64	0.78
Cyprus	0.81	57	0.76	0.72	0.75	0.70	0.83
Czech Republic	0.76	51	0.70	0.76	0.64	0.71	0.77
Denmark	0.80	56	0.74	0.76	0.79	0.64	0.79
England	0.81	57	0.75	0.75	0.77	0.68	0.82
Finland	0.84	61	0.79	0.80	0.78	0.75	0.78
France	0.68	46	0.68	0.69	0.69	0.49	0.79
Georgia	0.63	42	0.66	0.64	0.58	0.61	0.74
Germany	0.78	53	0.70	0.77	0.74	0.65	0.78
Hong Kong SAR	0.84	61	0.80	0.81	0.84	0.69	0.76
Hungary	0.77	53	0.67	0.70	0.75	0.70	0.82
Iran, Islamic Rep. of	0.64	44	0.72	0.70	0.75	0.65	0.46
Ireland	0.79	56	0.70	0.77	0.76	0.69	0.80
Italy	0.75	51	0.69	0.71	0.71	0.66	0.78
Japan	0.80	56	0.78	0.75	0.72	0.68	0.82
Kazakhstan	0.76	52	0.73	0.65	0.74	0.71	0.76
Korea, Rep. of	0.79	55	0.76	0.76	0.72	0.68	0.79
Kosovo	0.59	40	0.58	0.60	0.64	0.61	0.73
Kuwait	0.79	54	0.74	0.73	0.79	0.64	0.77
Latvia	0.76	51	0.72	0.72	0.73	0.63	0.77
Lithuania	0.71	48	0.74	0.66	0.63	0.63	0.78
Malta	0.78	53	0.75	0.73	0.75	0.62	0.79
Montenegro	0.72	48	0.71	0.67	0.68	0.61	0.78
Morocco	0.67	44	0.66	0.65	0.70	0.57	0.73
Netherlands	0.78	54	0.74	0.72	0.76	0.68	0.76
New Zealand	0.80	57	0.73	0.73	0.79	0.67	0.83
North Macedonia	0.62	41	0.58	0.67	0.66	0.60	0.69

**Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Sense of School Belonging* Scale – Grade 4**

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item				
			ASBG10A	ASBG10B	ASBG10C	ASBG10D	ASBG10E
Northern Ireland	0.78	55	0.71	0.75	0.77	0.67	0.80
Norway (5)	0.77	52	0.68	0.70	0.78	0.66	0.79
Oman	0.76	51	0.72	0.73	0.73	0.62	0.76
Pakistan	0.79	54	0.65	0.77	0.75	0.77	0.74
Philippines	0.66	43	0.69	0.66	0.65	0.53	0.73
Poland	0.78	54	0.75	0.71	0.73	0.65	0.81
Portugal	0.75	51	0.74	0.72	0.69	0.58	0.81
Qatar	0.79	54	0.72	0.76	0.78	0.62	0.78
Russian Federation	0.78	54	0.75	0.71	0.73	0.69	0.78
Saudi Arabia	0.75	50	0.68	0.70	0.76	0.63	0.75
Serbia	0.79	55	0.74	0.72	0.78	0.66	0.81
Singapore	0.80	55	0.76	0.74	0.78	0.66	0.79
Slovak Republic	0.76	52	0.70	0.73	0.72	0.66	0.78
South Africa (5)	0.70	46	0.70	0.69	0.71	0.54	0.74
Spain	0.75	51	0.69	0.72	0.71	0.65	0.78
Sweden	0.82	58	0.72	0.74	0.80	0.71	0.83
Turkey (5)	0.66	44	0.64	0.71	0.72	0.47	0.74
United Arab Emirates	0.80	56	0.75	0.75	0.77	0.65	0.80
United States	0.82	58	0.73	0.74	0.81	0.70	0.84
<b>Benchmarking Participants</b>							
Ontario, Canada	0.80	56	0.71	0.73	0.79	0.69	0.81
Quebec, Canada	0.81	56	0.77	0.72	0.78	0.67	0.81
Moscow City, Russian Fed.	0.80	56	0.79	0.73	0.75	0.67	0.79
Madrid, Spain	0.75	52	0.70	0.72	0.71	0.69	0.79
Abu Dhabi, UAE	0.80	55	0.75	0.75	0.77	0.64	0.81
Dubai, UAE	0.78	53	0.74	0.74	0.76	0.64	0.77

### Relationship Between the TIMSS 2019 Sense of School Belonging Scale and TIMSS 2019 Achievement – Grade 4

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
Albania	0.03	0.00	0.00	0.04	0.00	0.00
Armenia	0.05	0.00	0.00	0.06	0.00	0.01
Australia	0.15	0.02	0.02	0.13	0.02	0.01
Austria	0.11	0.01	0.01	0.09	0.01	0.01
Azerbaijan	0.08	0.01	0.01	0.03	0.00	0.00
Bahrain	0.04	0.00	0.00	0.11	0.01	0.01
Belgium (Flemish)	0.11	0.01	0.02	0.13	0.02	0.02
Bosnia and Herzegovina	0.03	0.00	0.00	0.03	0.00	0.00
Bulgaria	-0.14	0.02	0.01	-0.15	0.02	0.01
Canada	0.05	0.00	0.01	0.06	0.00	0.01
Chile	0.12	0.02	0.02	0.11	0.01	0.02
Chinese Taipei	0.07	0.01	0.01	0.07	0.00	0.01
Croatia	0.04	0.00	0.00	0.07	0.00	0.01
Cyprus	0.03	0.00	0.00	0.05	0.00	0.00
Czech Republic	0.02	0.00	0.01	-0.01	0.00	0.01
Denmark	0.14	0.02	0.02	0.14	0.02	0.02
England	0.12	0.01	0.02	0.10	0.01	0.01
Finland	0.08	0.01	0.01	0.04	0.00	0.01
France	0.09	0.01	0.01	0.09	0.01	0.01
Georgia	-0.01	0.00	0.00	-0.04	0.00	0.00
Germany	0.15	0.02	0.02	0.12	0.01	0.02
Hong Kong SAR	0.15	0.02	0.02	0.15	0.02	0.02
Hungary	0.03	0.00	0.00	0.01	0.00	0.00
Iran, Islamic Rep. of	-0.07	0.01	0.01	-0.09	0.01	0.01
Ireland	0.12	0.01	0.02	0.11	0.01	0.02
Italy	0.10	0.01	0.01	0.08	0.01	0.01
Japan	0.12	0.01	0.01	0.08	0.01	0.01
Kazakhstan	0.08	0.01	0.01	0.11	0.01	0.01
Korea, Rep. of	0.14	0.02	0.02	0.12	0.01	0.01
Kosovo	0.06	0.00	0.01	0.10	0.01	0.02
Kuwait	0.06	0.00	0.01	0.11	0.01	0.02
Latvia	0.09	0.01	0.01	0.08	0.01	0.01
Lithuania	0.02	0.00	0.00	0.02	0.00	0.00
Malta	0.06	0.00	0.01	0.02	0.00	0.00
Montenegro	0.02	0.00	0.00	-0.03	0.00	0.00
Morocco	0.12	0.01	0.02	0.15	0.02	0.02
Netherlands	0.10	0.01	0.01	0.10	0.01	0.02

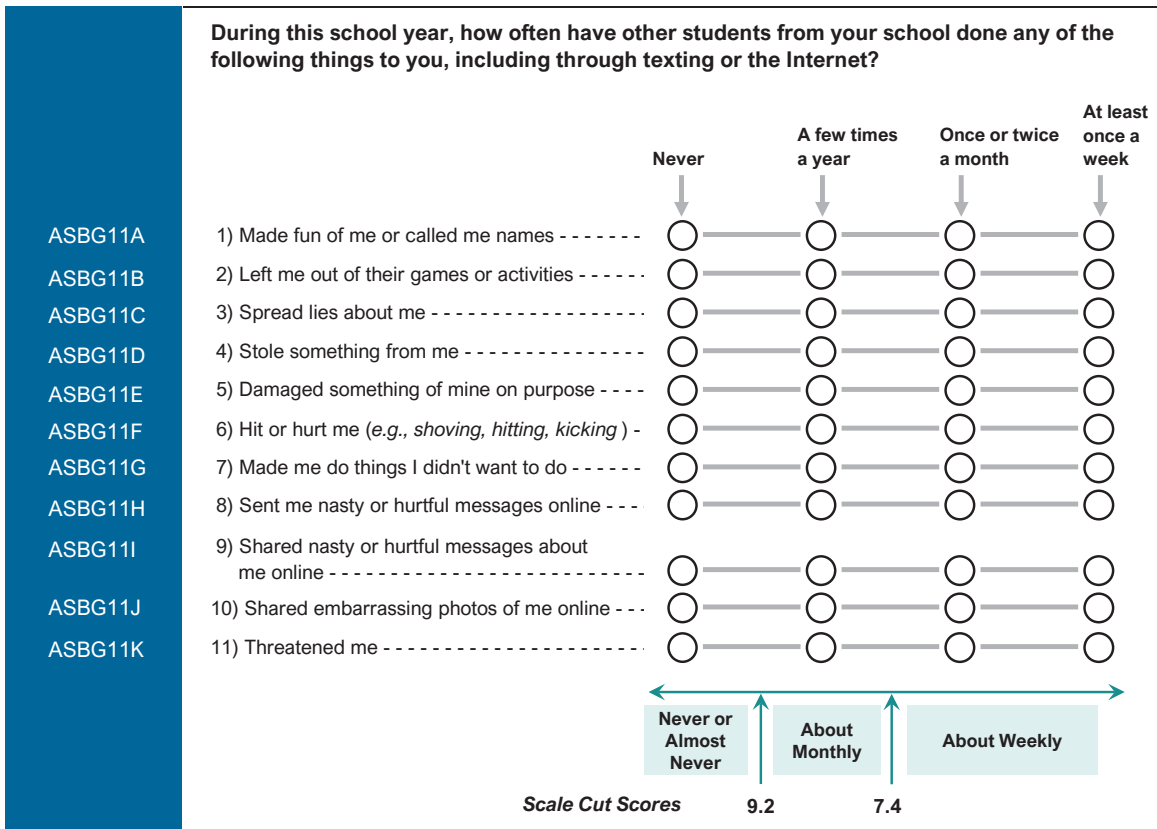
### Relationship Between the TIMSS 2019 Sense of School Belonging Scale and TIMSS 2019 Achievement – Grade 4

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
New Zealand	0.10	0.01	0.01	0.10	0.01	0.01
North Macedonia	0.03	0.00	0.01	0.05	0.00	0.01
Northern Ireland	0.16	0.03	0.03	0.15	0.02	0.02
Norway (5)	0.09	0.01	0.01	0.07	0.00	0.01
Oman	0.11	0.01	0.02	0.11	0.01	0.02
Pakistan	0.07	0.00	0.01	0.02	0.00	0.00
Philippines	0.16	0.03	0.04	0.14	0.02	0.03
Poland	-0.02	0.00	0.00	-0.02	0.00	0.00
Portugal	0.02	0.00	0.00	0.01	0.00	0.00
Qatar	0.10	0.01	0.01	0.15	0.02	0.03
Russian Federation	0.05	0.00	0.00	-0.01	0.00	0.00
Saudi Arabia	0.08	0.01	0.01	0.09	0.01	0.01
Serbia	-0.06	0.00	0.00	-0.07	0.01	0.00
Singapore	0.12	0.01	0.01	0.08	0.01	0.01
Slovak Republic	-0.07	0.00	0.00	-0.13	0.02	0.01
South Africa (5)	0.12	0.01	0.02	0.12	0.01	0.02
Spain	0.08	0.01	0.01	0.09	0.01	0.01
Sweden	0.12	0.02	0.01	0.09	0.01	0.01
Turkey (5)	0.13	0.02	0.02	0.11	0.01	0.02
United Arab Emirates	0.16	0.03	0.02	0.18	0.03	0.03
United States	0.18	0.03	0.04	0.16	0.02	0.03
<b>International Median</b>	<b>0.08</b>	<b>0.01</b>	<b>0.01</b>	<b>0.09</b>	<b>0.01</b>	<b>0.01</b>
<b>Benchmarking Participants</b>						
Ontario, Canada	0.08	0.01	0.01	0.06	0.00	0.00
Quebec, Canada	0.06	0.00	0.01	0.05	0.00	0.01
Moscow City, Russian Fed.	0.07	0.01	0.01	0.03	0.00	0.00
Madrid, Spain	-0.01	0.00	0.00	0.01	0.00	0.00
Abu Dhabi, UAE	0.09	0.01	0.01	0.12	0.01	0.02
Dubai, UAE	0.08	0.01	0.01	0.08	0.01	0.01

# Student Bullying – Grade 4

## About the Scale

The *Student Bullying* scale was created based on students’ responses to eleven items listed below.



### Item Parameters for the TIMSS 2019 *Student Bullying* Scale – Grade 4

Item	delta	tau_1	tau_2	tau_3	Infit
ASBG11A	0.70887	0.25598	-0.31167	0.05569	1.10
ASBG11B	0.49313	0.00135	-0.01632	0.01497	1.19
ASBG11C	0.43075	0.05672	-0.08605	0.02933	1.03
ASBG11D	0.00016	0.34024	-0.14813	-0.19211	1.07
ASBG11E	-0.08448	0.35351	-0.03527	-0.31824	0.96
ASBG11F	0.38543	0.03273	-0.18101	0.14828	1.03
ASBG11G	-0.03872	0.28678	0.08095	-0.36773	0.98
ASBG11H	-0.44333	0.51278	0.34983	-0.86261	0.97
ASBG11I	-0.60515	0.67976	0.53743	-1.21719	0.87
ASBG11J	-0.73072	0.82778	0.68417	-1.51195	0.93
ASBG11K	-0.11594	0.45350	-0.08114	-0.37236	0.96

### Scale Transformation Constants for the TIMSS 2019 *Student Bullying* Scale – Grade 4

#### Scale Transformation Constants

A = 7.495914

B = 1.758100

Transformed Scale Score = 7.495914 + 1.758100 • Logit Scale Score

**Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS  
2019 Student Bullying Scale – Grade 4**

Raw Score	Transformed Scale Score	Cutpoint
0	2.86807	
1	4.32091	
2	4.88934	
3	5.25172	
4	5.52624	
5	5.75084	
6	5.94126	
7	6.11702	
8	6.27822	
9	6.42850	
10	6.57077	
11	6.70718	
12	6.83947	
13	6.96901	
14	7.09688	
15	7.22397	
16	7.35113	7.4
17	7.47839	
18	7.60884	
19	7.74099	
20	7.87654	
21	8.01658	
22	8.16227	
23	8.31512	
24	8.47681	
25	8.64712	
26	8.83393	
27	9.04042	
28	9.27434	9.2
29	9.54836	
30	9.88387	
31	10.33461	
32	11.04030	
33	12.71988	

**Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 Student Bullying Scale – Grade 4**

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item										
			ASBG11A	ASBG11B	ASBG11C	ASBG11D	ASBG11E	ASBG11F	ASBG11G	ASBG11H	ASBG11I	ASBG11J	ASBG11K
Albania	0.85	45	0.59	0.60	0.55	0.63	0.68	0.63	0.69	0.77	0.76	0.77	0.69
Armenia	0.90	55	0.63	0.56	0.66	0.75	0.76	0.74	0.80	0.81	0.82	0.77	0.77
Australia	0.85	41	0.68	0.63	0.70	0.62	0.70	0.69	0.66	0.57	0.57	0.47	0.71
Austria	0.85	41	0.67	0.65	0.71	0.58	0.66	0.67	0.68	0.64	0.62	0.54	0.64
Azerbaijan	0.82	40	0.55	0.52	0.62	0.65	0.65	0.61	0.63	0.68	0.68	0.68	0.66
Bahrain	0.88	45	0.61	0.65	0.68	0.63	0.70	0.67	0.70	0.69	0.70	0.66	0.68
Belgium (Flemish)	0.82	36	0.69	0.66	0.69	0.54	0.62	0.67	0.61	0.49	0.50	0.44	0.65
Bosnia and Herzegovina	0.86	44	0.62	0.60	0.69	0.64	0.73	0.69	0.68	0.71	0.71	0.67	0.58
Bulgaria	0.83	41	0.63	0.44	0.63	0.57	0.67	0.71	0.70	0.68	0.66	0.59	0.70
Canada	0.86	42	0.67	0.62	0.70	0.64	0.71	0.68	0.65	0.63	0.63	0.52	0.70
Chile	0.88	47	0.63	0.66	0.67	0.64	0.71	0.69	0.71	0.71	0.72	0.69	0.72
Chinese Taipei	0.83	39	0.66	0.61	0.66	0.61	0.67	0.66	0.70	0.55	0.54	0.52	0.70
Croatia	0.86	43	0.67	0.66	0.69	0.57	0.71	0.70	0.67	0.68	0.64	0.55	0.66
Cyprus	0.86	42	0.68	0.61	0.70	0.58	0.71	0.69	0.67	0.58	0.65	0.55	0.71
Czech Republic	0.86	44	0.67	0.53	0.70	0.63	0.72	0.66	0.69	0.67	0.69	0.63	0.70
Denmark	0.85	41	0.65	0.64	0.72	0.51	0.65	0.66	0.67	0.65	0.65	0.45	0.71
England	0.86	43	0.70	0.62	0.72	0.63	0.68	0.67	0.66	0.65	0.64	0.48	0.72
Finland	0.85	43	0.70	0.64	0.72	0.59	0.70	0.70	0.66	0.67	0.62	0.49	0.70
France	0.82	37	0.65	0.57	0.68	0.56	0.67	0.66	0.64	0.54	0.58	0.47	0.68
Georgia	0.84	46	0.55	0.45	0.65	0.63	0.69	0.59	0.72	0.77	0.79	0.76	0.73
Germany	0.85	41	0.63	0.60	0.68	0.63	0.68	0.66	0.66	0.64	0.67	0.56	0.66
Hong Kong SAR	0.86	43	0.55	0.62	0.65	0.62	0.73	0.66	0.72	0.68	0.70	0.64	0.69
Hungary	0.82	38	0.63	0.60	0.70	0.59	0.66	0.67	0.66	0.58	0.53	0.45	0.67
Iran, Islamic Rep. of	0.83	39	0.55	0.48	0.62	0.61	0.66	0.63	0.67	0.66	0.67	0.63	0.68
Ireland	0.86	43	0.69	0.65	0.72	0.60	0.69	0.69	0.67	0.63	0.63	0.53	0.67
Italy	0.82	37	0.66	0.60	0.66	0.58	0.65	0.64	0.63	0.54	0.55	0.50	0.69
Japan	0.80	35	0.69	0.65	0.67	0.58	0.60	0.67	0.71	0.43	0.41	0.42	0.60
Kazakhstan	0.83	41	0.57	0.48	0.65	0.59	0.69	0.65	0.68	0.69	0.68	0.65	0.66
Korea, Rep. of	0.81	38	0.64	0.59	0.66	0.51	0.66	0.70	0.68	0.63	0.62	0.39	0.61
Kosovo	0.91	56	0.64	0.67	0.65	0.73	0.79	0.73	0.79	0.79	0.83	0.80	0.79
Kuwait	0.89	49	0.62	0.63	0.67	0.66	0.69	0.69	0.75	0.74	0.75	0.74	0.74
Latvia	0.86	42	0.65	0.57	0.69	0.57	0.72	0.69	0.67	0.65	0.65	0.57	0.69
Lithuania	0.81	36	0.66	0.56	0.67	0.58	0.60	0.68	0.62	0.57	0.52	0.47	0.65
Malta	0.85	41	0.64	0.59	0.69	0.60	0.67	0.67	0.63	0.63	0.63	0.56	0.68
Montenegro	0.86	46	0.60	0.62	0.68	0.69	0.71	0.66	0.71	0.71	0.74	0.70	0.65
Morocco	0.83	38	0.59	0.55	0.60	0.54	0.63	0.64	0.65	0.62	0.65	0.66	0.67
Netherlands	0.85	43	0.68	0.56	0.69	0.63	0.71	0.69	0.68	0.63	0.66	0.56	0.69
New Zealand	0.87	44	0.67	0.61	0.72	0.68	0.73	0.70	0.70	0.63	0.62	0.53	0.71
North Macedonia	0.89	50	0.65	0.62	0.68	0.69	0.74	0.69	0.72	0.74	0.80	0.70	0.75
Northern Ireland	0.85	41	0.71	0.63	0.72	0.57	0.65	0.65	0.64	0.63	0.64	0.48	0.68



### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 Student Bullying Scale – Grade 4

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item										
			ASBG11A	ASBG11B	ASBG11C	ASBG11D	ASBG11E	ASBG11F	ASBG11G	ASBG11H	ASBG11I	ASBG11J	ASBG11K
Norway (5)	0.85	41	0.67	0.67	0.72	0.58	0.63	0.67	0.65	0.64	0.63	0.49	0.70
Oman	0.85	41	0.59	0.55	0.64	0.57	0.64	0.62	0.67	0.69	0.70	0.69	0.68
Pakistan	0.88	46	0.60	0.57	0.68	0.66	0.68	0.72	0.72	0.69	0.71	0.68	0.72
Philippines	0.80	33	0.41	0.50	0.55	0.57	0.57	0.47	0.64	0.67	0.67	0.62	0.58
Poland	0.87	46	0.67	0.62	0.70	0.66	0.72	0.70	0.69	0.69	0.69	0.61	0.72
Portugal	0.86	45	0.62	0.60	0.65	0.66	0.70	0.68	0.70	0.67	0.66	0.67	0.72
Qatar	0.89	48	0.60	0.63	0.67	0.65	0.73	0.69	0.70	0.74	0.75	0.72	0.71
Russian Federation	0.83	39	0.67	0.45	0.67	0.59	0.65	0.70	0.64	0.61	0.65	0.53	0.66
Saudi Arabia	0.88	47	0.63	0.60	0.65	0.65	0.72	0.69	0.72	0.72	0.73	0.71	0.70
Serbia	0.85	43	0.60	0.62	0.68	0.58	0.69	0.64	0.67	0.68	0.71	0.62	0.69
Singapore	0.84	40	0.60	0.59	0.71	0.62	0.69	0.66	0.67	0.61	0.62	0.49	0.67
Slovak Republic	0.84	41	0.64	0.60	0.69	0.64	0.68	0.65	0.65	0.59	0.62	0.51	0.70
South Africa (5)	0.83	37	0.56	0.60	0.59	0.46	0.60	0.61	0.66	0.66	0.66	0.66	0.63
Spain	0.86	43	0.64	0.62	0.69	0.65	0.69	0.70	0.69	0.62	0.64	0.55	0.71
Sweden	0.85	42	0.68	0.61	0.73	0.59	0.68	0.67	0.64	0.67	0.66	0.49	0.66
Turkey (5)	0.83	40	0.56	0.59	0.65	0.50	0.66	0.64	0.63	0.68	0.70	0.63	0.68
United Arab Emirates	0.89	48	0.60	0.64	0.69	0.66	0.72	0.69	0.71	0.73	0.73	0.68	0.71
United States	0.86	44	0.67	0.64	0.69	0.64	0.71	0.69	0.66	0.64	0.65	0.55	0.70
<b>Benchmarking Participants</b>													
Ontario, Canada	0.86	43	0.68	0.62	0.70	0.65	0.72	0.67	0.63	0.64	0.63	0.52	0.68
Quebec, Canada	0.84	41	0.67	0.59	0.69	0.59	0.67	0.68	0.63	0.62	0.63	0.49	0.71
Moscow City, Russian Fed.	0.85	41	0.68	0.52	0.69	0.61	0.68	0.73	0.65	0.62	0.64	0.50	0.68
Madrid, Spain	0.84	40	0.62	0.65	0.68	0.59	0.69	0.69	0.65	0.58	0.59	0.52	0.72
Abu Dhabi, UAE	0.89	47	0.60	0.61	0.68	0.65	0.73	0.69	0.71	0.73	0.74	0.69	0.71
Dubai, UAE	0.87	45	0.61	0.63	0.68	0.66	0.70	0.69	0.69	0.71	0.70	0.66	0.67

### Relationship Between the TIMSS 2019 Student Bullying Scale and TIMSS 2019 Achievement – Grade 4

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
Albania	0.12	0.01	0.04	0.11	0.01	0.04
Armenia	0.10	0.01	0.02	0.14	0.02	0.03
Australia	0.13	0.02	0.03	0.12	0.01	0.03
Austria	0.17	0.03	0.04	0.21	0.04	0.05
Azerbaijan	0.15	0.02	0.03	0.14	0.02	0.03
Bahrain	0.12	0.01	0.02	0.25	0.06	0.09
Belgium (Flemish)	0.09	0.01	0.01	0.11	0.01	0.02
Bosnia and Herzegovina	0.12	0.01	0.03	0.10	0.01	0.03
Bulgaria	0.16	0.03	0.05	0.16	0.03	0.05
Canada	0.12	0.01	0.02	0.13	0.02	0.03
Chile	0.19	0.04	0.07	0.18	0.03	0.07
Chinese Taipei	0.08	0.01	0.01	0.11	0.01	0.02
Croatia	0.05	0.00	0.02	0.03	0.00	0.01
Cyprus	0.14	0.02	0.03	0.14	0.02	0.03
Czech Republic	0.16	0.02	0.05	0.15	0.02	0.05
Denmark	0.12	0.01	0.02	0.10	0.01	0.02
England	0.13	0.02	0.03	0.12	0.01	0.02
Finland	0.12	0.02	0.03	0.12	0.01	0.03
France	0.15	0.02	0.04	0.13	0.02	0.03
Georgia	0.15	0.02	0.03	0.15	0.02	0.04
Germany	0.19	0.04	0.06	0.18	0.03	0.06
Hong Kong SAR	0.09	0.01	0.02	0.06	0.00	0.01
Hungary	0.09	0.01	0.01	0.08	0.01	0.01
Iran, Islamic Rep. of	0.07	0.00	0.01	0.04	0.00	0.01
Ireland	0.12	0.02	0.03	0.13	0.02	0.03
Italy	0.11	0.01	0.02	0.10	0.01	0.03
Japan	0.06	0.00	0.00	0.06	0.00	0.00
Kazakhstan	0.11	0.01	0.01	0.08	0.01	0.01
Korea, Rep. of	0.03	0.00	0.00	0.02	0.00	0.00
Kosovo	0.18	0.03	0.06	0.22	0.05	0.07
Kuwait	0.18	0.03	0.05	0.21	0.04	0.05
Latvia	0.16	0.03	0.04	0.21	0.04	0.05
Lithuania	0.09	0.01	0.03	0.10	0.01	0.03
Malta	0.13	0.02	0.03	0.11	0.01	0.03
Montenegro	0.17	0.03	0.03	0.15	0.02	0.03
Morocco	0.13	0.02	0.03	0.12	0.01	0.03
Netherlands	0.06	0.00	0.01	0.08	0.01	0.02

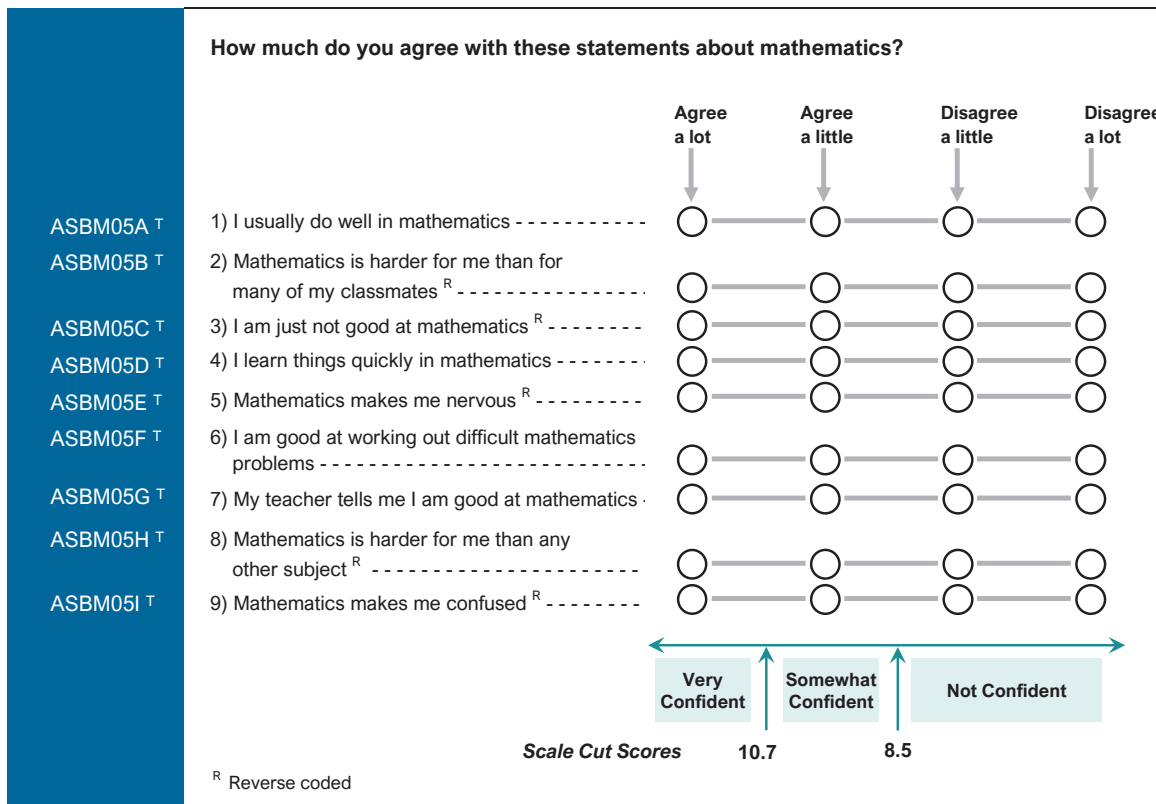
### Relationship Between the TIMSS 2019 Student Bullying Scale and TIMSS 2019 Achievement – Grade 4

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
New Zealand	0.17	0.03	0.05	0.20	0.04	0.06
North Macedonia	0.23	0.05	0.07	0.24	0.06	0.07
Northern Ireland	0.12	0.02	0.03	0.14	0.02	0.04
Norway (5)	0.08	0.01	0.01	0.09	0.01	0.01
Oman	0.20	0.04	0.05	0.19	0.04	0.05
Pakistan	0.12	0.02	0.02	0.15	0.02	0.03
Philippines	0.27	0.07	0.07	0.29	0.09	0.08
Poland	0.12	0.01	0.03	0.13	0.02	0.03
Portugal	0.11	0.01	0.03	0.13	0.02	0.04
Qatar	0.26	0.07	0.10	0.29	0.08	0.12
Russian Federation	0.15	0.02	0.02	0.14	0.02	0.02
Saudi Arabia	0.22	0.05	0.07	0.26	0.07	0.10
Serbia	0.08	0.01	0.02	0.11	0.01	0.02
Singapore	0.18	0.03	0.05	0.17	0.03	0.05
Slovak Republic	0.15	0.02	0.04	0.16	0.02	0.04
South Africa (5)	0.31	0.09	0.11	0.31	0.10	0.12
Spain	0.18	0.03	0.04	0.19	0.04	0.05
Sweden	0.16	0.03	0.03	0.15	0.02	0.03
Turkey (5)	0.20	0.04	0.07	0.19	0.03	0.06
United Arab Emirates	0.21	0.04	0.06	0.23	0.05	0.07
United States	0.15	0.02	0.05	0.15	0.02	0.05
<b>International Median</b>	<b>0.13</b>	<b>0.02</b>	<b>0.03</b>	<b>0.14</b>	<b>0.02</b>	<b>0.03</b>
<b>Benchmarking Participants</b>						
Ontario, Canada	0.13	0.02	0.03	0.13	0.02	0.03
Quebec, Canada	0.14	0.02	0.03	0.12	0.02	0.03
Moscow City, Russian Fed.	0.17	0.03	0.04	0.17	0.03	0.04
Madrid, Spain	0.07	0.00	0.02	0.10	0.01	0.03
Abu Dhabi, UAE	0.21	0.04	0.05	0.23	0.05	0.06
Dubai, UAE	0.11	0.01	0.02	0.12	0.02	0.03

# Students Confident in Mathematics – Grade 4

## About the Scale

The *Students Confident in Mathematics* scale was created based on students’ responses to nine items listed below.



<sup>T</sup> Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.

### Item Parameters for the TIMSS 2019 *Students Confident in Mathematics* Scale – Grade 4

Item	delta	tau_1	tau_2	tau_3	Infit
ASBM05A	-0.56785	-0.51008	-0.52132	1.03140	0.91
ASBM05B <sup>R</sup>	0.26875	-0.54868	0.23636	0.31232	1.00
ASBM05C <sup>R</sup>	0.04819	-0.38143	0.20974	0.17169	0.91
ASBM05D	-0.23147	-0.61721	-0.24060	0.85781	0.98
ASBM05E <sup>R</sup>	0.01818	-0.26390	0.17416	0.08974	1.12
ASBM05F	0.24431	-0.77636	-0.21888	0.99524	1.06
ASBM05G	-0.04911	-0.65149	-0.29073	0.94222	1.18
ASBM05H <sup>R</sup>	0.15465	-0.20402	0.18886	0.01516	0.91
ASBM05I <sup>R</sup>	0.11435	-0.32921	0.17352	0.15569	0.98

<sup>R</sup> Reverse coded

### Scale Transformation Constants for the TIMSS 2019 *Students Confident in Mathematics* Scale – Grade 4

#### Scale Transformation Constants

A = 8.556200

B = 1.689256

Transformed Scale Score = 8.556200 + 1.689256 • Logit Scale Score

**Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS  
2019 Students Confident in Mathematics Scale – Grade 4**

Raw Score	Transformed Scale Score	Cutpoint
0	2.79993	
1	4.55349	
2	5.36447	
3	5.91005	
4	6.32925	
5	6.67668	
6	6.97600	
7	7.24155	
8	7.48123	
9	7.70454	
10	7.91361	
11	8.11184	
12	8.30222	
13	8.48743	8.5
14	8.66992	
15	8.85216	
16	9.03664	
17	9.22621	
18	9.42421	
19	9.63460	
20	9.86233	
21	10.11082	
22	10.39472	
23	10.72977	10.7
24	11.14456	
25	11.70061	
26	12.55225	
27	14.40638	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 Students Confident in Mathematics Scale – Grade 4

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item									
			ASBM05A	ASBM05B <sub>R</sub>	ASBM05C <sub>R</sub>	ASBM05D	ASBM05E <sub>R</sub>	ASBM05F	ASBM05G	ASBM05H <sub>R</sub>	ASBM05I <sub>R</sub>	
Albania	0.82	42	0.65	0.68	0.74	0.61	0.58	0.65	0.65	0.69	0.55	
Armenia	0.81	40	0.65	0.60	0.73	0.60	0.57	0.60	0.63	0.69	0.63	
Australia	0.87	51	0.76	0.73	0.79	0.72	0.62	0.76	0.39	0.78	0.77	
Austria	0.89	54	0.77	0.75	0.77	0.76	0.61	0.70	0.69	0.80	0.76	
Azerbaijan	0.81	40	0.57	0.64	0.74	0.59	0.60	0.58	0.63	0.69	0.65	
Bahrain	0.81	39	0.39	0.68	0.71	0.55	0.67	0.54	0.50	0.76	0.70	
Belgium (Flemish)	0.88	52	0.79	0.77	0.82	0.68	0.55	0.73	0.61	0.79	0.70	
Bosnia and Herzegovina	0.86	47	0.72	0.69	0.72	0.67	0.63	0.65	0.68	0.73	0.71	
Bulgaria	0.88	51	0.75	0.72	0.75	0.75	0.61	0.71	0.67	0.76	0.72	
Canada	0.87	50	0.76	0.75	0.77	0.71	0.64	0.71	0.39	0.77	0.77	
Chile	0.82	41	0.63	0.60	0.72	0.63	0.61	0.60	0.47	0.73	0.74	
Chinese Taipei	0.85	46	0.73	0.67	0.64	0.74	0.56	0.69	0.64	0.73	0.72	
Croatia	0.89	52	0.75	0.73	0.72	0.77	0.66	0.69	0.61	0.79	0.77	
Cyprus	0.87	49	0.70	0.74	0.77	0.67	0.65	0.67	0.57	0.74	0.75	
Czech Republic	0.86	48	0.73	0.70	0.78	0.73	0.64	0.57	0.57	0.76	0.72	
Denmark	0.88	50	0.76	0.73	0.81	0.76	0.55	0.66	0.51	0.75	0.75	
England	0.88	52	0.77	0.74	0.81	0.74	0.64	0.76	0.35	0.80	0.76	
Finland	0.86	48	0.76	0.71	0.80	0.75	0.64	0.70	0.48	0.76	0.57	
France	0.88	52	0.77	0.73	0.79	0.74	0.58	0.70	0.55	0.75	0.82	
Georgia	0.81	40	0.63	0.69	0.75	0.58	0.60	0.46	0.49	0.73	0.68	
Germany	0.90	54	0.76	0.77	0.80	0.74	0.64	0.70	0.65	0.78	0.75	
Hong Kong SAR	0.84	45	0.70	0.65	0.78	0.67	0.59	0.70	0.56	0.73	0.63	
Hungary	0.88	51	0.78	0.73	0.78	0.73	0.55	0.70	0.72	0.74	0.69	
Iran, Islamic Rep. of	0.79	38	0.62	0.52	0.52	0.63	0.64	0.63	0.58	0.69	0.68	
Ireland	0.86	50	0.75	0.75	0.78	0.74	0.60	0.75	0.31	0.80	0.73	
Italy	0.85	46	0.71	0.70	0.64	0.72	0.65	0.59	0.55	0.75	0.73	
Japan	0.87	49	0.72	0.67	0.83	0.70	0.65	0.76	0.43	0.72	0.75	
Kazakhstan	0.86	47	0.68	0.71	0.79	0.73	0.58	0.69	0.58	0.73	0.67	
Korea, Rep. of	0.88	53	0.84	0.76	0.76	0.75	0.46	0.80	0.53	0.80	0.75	
Kosovo	0.74	33	0.53	0.69	0.71	0.41	0.64	0.34	0.49	0.73	0.51	
Kuwait	0.76	34	0.29	0.70	0.72	0.41	0.71	0.35	0.38	0.74	0.69	
Latvia	0.89	53	0.79	0.73	0.79	0.77	0.61	0.71	0.66	0.77	0.68	
Lithuania	0.87	50	0.78	0.70	0.70	0.73	0.62	0.73	0.66	0.76	0.64	
Malta	0.87	49	0.71	0.73	0.78	0.69	0.67	0.64	0.51	0.77	0.75	
Montenegro	0.84	44	0.66	0.69	0.70	0.61	0.66	0.57	0.60	0.74	0.72	
Morocco	0.74	32	0.39	0.67	0.69	0.39	0.67	0.33	0.37	0.72	0.68	
Netherlands	0.88	53	0.78	0.74	0.84	0.71	0.49	0.75	0.51	0.79	0.83	
New Zealand	0.83	43	0.71	0.64	0.75	0.66	0.55	0.70	0.38	0.74	0.69	
North Macedonia	0.82	41	0.59	0.72	0.72	0.55	0.65	0.50	0.58	0.74	0.70	
Northern Ireland	0.87	51	0.77	0.73	0.80	0.74	0.63	0.74	0.34	0.78	0.77	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Students Confident in Mathematics* Scale – Grade 4

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item									
			ASBM05A	ASBM05B <sup>R</sup>	ASBM05C <sup>R</sup>	ASBM05D	ASBM05E <sup>R</sup>	ASBM05F	ASBM05G	ASBM05H <sup>R</sup>	ASBM05I <sup>R</sup>	
Norway (5)	0.87	50	0.75	0.73	0.79	0.74	0.54	0.76	0.43	0.76	0.74	
Oman	0.71	31	0.16	0.73	0.65	0.34	0.73	0.19	0.25	0.76	0.72	
Pakistan	0.70	30	0.21	0.66	0.71	0.19	0.72	0.21	0.20	0.73	0.74	
Philippines	0.54	26	-0.31	0.67	0.60	-0.25	0.57	-0.32	-0.34	0.67	0.61	
Poland	0.87	49	0.75	0.71	0.71	0.75	0.58	0.72	0.57	0.77	0.71	
Portugal	0.85	46	0.70	0.62	0.77	0.65	0.62	0.68	0.60	0.71	0.73	
Qatar	0.79	37	0.37	0.72	0.75	0.43	0.71	0.43	0.39	0.77	0.74	
Russian Federation	0.88	52	0.75	0.71	0.79	0.79	0.61	0.71	0.62	0.75	0.73	
Saudi Arabia	0.76	36	0.12	0.75	0.74	0.37	0.76	0.24	0.33	0.79	0.76	
Serbia	0.90	55	0.77	0.76	0.81	0.72	0.66	0.71	0.68	0.77	0.76	
Singapore	0.87	51	0.77	0.75	0.79	0.70	0.63	0.70	0.47	0.78	0.75	
Slovak Republic	0.88	50	0.76	0.69	0.80	0.68	0.65	0.65	0.58	0.76	0.75	
South Africa (5)	0.68	28	0.20	0.69	0.70	0.21	0.66	0.16	0.12	0.74	0.69	
Spain	0.84	44	0.66	0.69	0.73	0.61	0.64	0.61	0.54	0.72	0.75	
Sweden	0.87	50	0.76	0.70	0.77	0.76	0.58	0.73	0.43	0.80	0.74	
Turkey (5)	0.84	45	0.71	0.69	0.76	0.64	0.50	0.67	0.61	0.75	0.70	
United Arab Emirates	0.80	39	0.50	0.70	0.73	0.51	0.66	0.48	0.46	0.75	0.71	
United States	0.86	48	0.69	0.75	0.77	0.68	0.63	0.65	0.37	0.80	0.76	
<b>Benchmarking Participants</b>												
Ontario, Canada	0.87	50	0.76	0.77	0.79	0.69	0.63	0.71	0.39	0.77	0.78	
Quebec, Canada	0.87	50	0.78	0.73	0.71	0.74	0.66	0.74	0.39	0.75	0.78	
Moscow City, Russian Fed.	0.90	56	0.76	0.77	0.82	0.81	0.65	0.74	0.60	0.78	0.77	
Madrid, Spain	0.84	44	0.68	0.66	0.71	0.62	0.65	0.61	0.54	0.70	0.78	
Abu Dhabi, UAE	0.78	36	0.42	0.71	0.74	0.45	0.66	0.42	0.39	0.75	0.70	
Dubai, UAE	0.82	42	0.62	0.68	0.75	0.59	0.62	0.58	0.51	0.73	0.70	

<sup>R</sup> Reverse coded



**Relationship Between the TIMSS 2019 Students Confident in Mathematics Scale and TIMSS 2019 Achievement – Grade 4**

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
Albania	0.39	0.15	0.16
Armenia	0.37	0.14	0.14
Australia	0.44	0.20	0.19
Austria	0.48	0.23	0.22
Azerbaijan	0.38	0.15	0.15
Bahrain	0.26	0.07	0.06
Belgium (Flemish)	0.46	0.21	0.21
Bosnia and Herzegovina	0.40	0.16	0.16
Bulgaria	0.42	0.18	0.19
Canada	0.44	0.20	0.20
Chile	0.41	0.17	0.17
Chinese Taipei	0.44	0.19	0.18
Croatia	0.44	0.20	0.19
Cyprus	0.48	0.24	0.22
Czech Republic	0.41	0.17	0.17
Denmark	0.47	0.22	0.20
England	0.45	0.20	0.19
Finland	0.42	0.18	0.18
France	0.43	0.18	0.18
Georgia	0.34	0.12	0.12
Germany	0.47	0.22	0.22
Hong Kong SAR	0.39	0.15	0.17
Hungary	0.50	0.25	0.25
Iran, Islamic Rep. of	0.30	0.09	0.09
Ireland	0.41	0.17	0.15
Italy	0.29	0.09	0.08
Japan	0.44	0.19	0.19
Kazakhstan	0.26	0.07	0.06
Korea, Rep. of	0.48	0.23	0.22
Kosovo	0.37	0.13	0.15
Kuwait	0.28	0.08	0.09
Latvia	0.51	0.26	0.25
Lithuania	0.48	0.23	0.21
Malta	0.39	0.16	0.16
Montenegro	0.42	0.17	0.17
Morocco	0.33	0.11	0.10
Netherlands	0.54	0.29	0.28
New Zealand	0.40	0.16	0.15

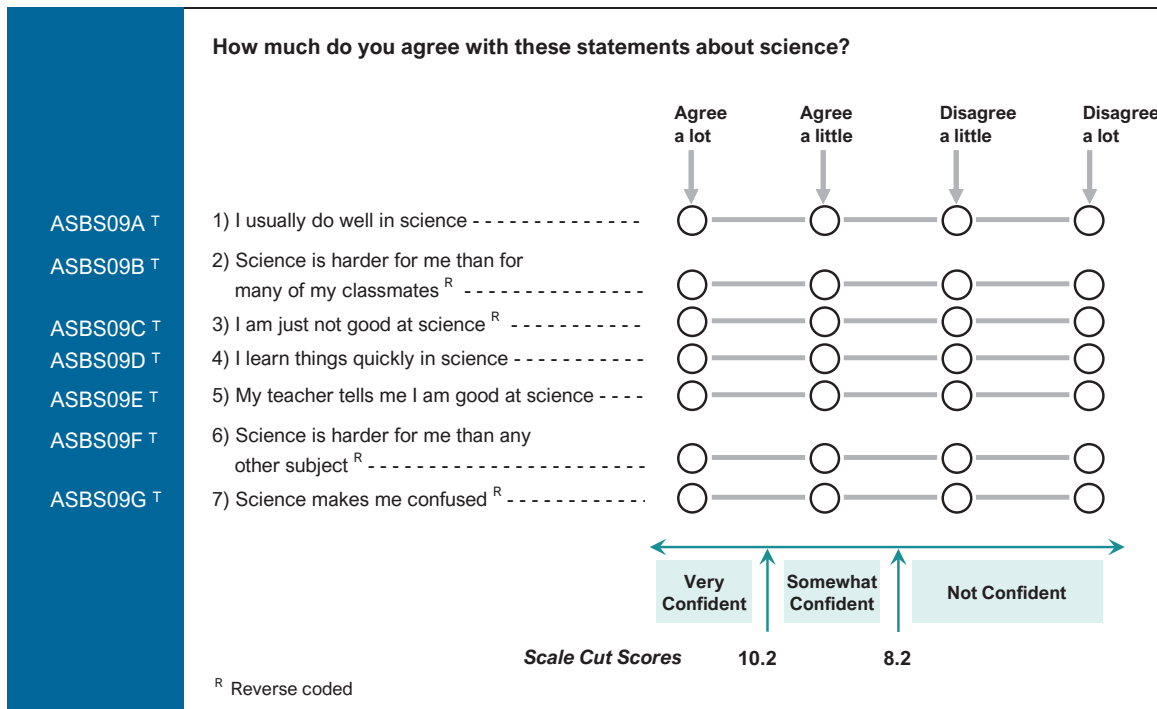
**Relationship Between the TIMSS 2019 Students Confident in Mathematics Scale and TIMSS 2019 Achievement – Grade 4**

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
North Macedonia	0.43	0.19	0.18
Northern Ireland	0.43	0.19	0.19
Norway (5)	0.41	0.17	0.18
Oman	0.37	0.13	0.14
Pakistan	0.24	0.06	0.05
Philippines	0.33	0.11	0.10
Poland	0.45	0.20	0.20
Portugal	0.48	0.23	0.22
Qatar	0.30	0.09	0.09
Russian Federation	0.38	0.15	0.14
Saudi Arabia	0.35	0.12	0.14
Serbia	0.47	0.22	0.21
Singapore	0.49	0.24	0.25
Slovak Republic	0.43	0.18	0.17
South Africa (5)	0.41	0.17	0.15
Spain	0.46	0.21	0.21
Sweden	0.37	0.13	0.12
Turkey (5)	0.41	0.17	0.17
United Arab Emirates	0.24	0.06	0.06
United States	0.46	0.21	0.23
<b>International Median</b>	<b>0.42</b>	<b>0.17</b>	<b>0.17</b>
<b>Benchmarking Participants</b>			
Ontario, Canada	0.43	0.19	0.18
Quebec, Canada	0.48	0.23	0.24
Moscow City, Russian Fed.	0.48	0.23	0.23
Madrid, Spain	0.48	0.23	0.23
Abu Dhabi, UAE	0.27	0.08	0.08
Dubai, UAE	0.19	0.04	0.04

## Students Confident in Science – Grade 4

### About the Scale

The *Students Confident in Science* scale was created based on students’ responses to seven items listed below.



<sup>T</sup> Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.

### Item Parameters for the TIMSS 2019 *Students Confident in Science* Scale – Grade 4

Item	delta	tau_1	tau_2	tau_3	Infit
ASBS09A	-0.44367	-0.49754	-0.58589	1.08343	1.00
ASBS09B <sup>R</sup>	0.20303	-0.59182	0.16393	0.42789	0.98
ASBS09C <sup>R</sup>	0.09612	-0.41547	0.10720	0.30827	0.92
ASBS09D	-0.22028	-0.69208	-0.23794	0.93002	1.01
ASBS09E	0.18927	-0.75182	-0.22051	0.97233	1.25
ASBS09F <sup>R</sup>	0.09940	-0.27149	0.06208	0.20941	0.93
ASBS09G <sup>R</sup>	0.07613	-0.18729	0.10026	0.08703	1.00

<sup>R</sup> Reverse coded

### Scale Transformation Constants for the TIMSS 2019 *Students Confident in Science* Scale – Grade 4

#### Scale Transformation Constants

A = 8.285794

B = 1.534620

Transformed Scale Score = 8.285794 + 1.534620 • Logit Scale Score

### Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019 *Students Confident in Science* Scale – Grade 4

Raw Score	Transformed Scale Score	Cutpoint
0	3.43187	
1	4.99918	
2	5.73357	
3	6.23436	
4	6.62722	
5	6.95609	
6	7.24267	
7	7.50349	
8	7.74367	
9	7.96952	
10	8.18638	8.2
11	8.39905	
12	8.61225	
13	8.83106	
14	9.06148	
15	9.31112	
16	9.58967	
17	9.90692	
18	10.29731	10.2
19	10.81276	
20	11.59621	
21	13.29214	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Students Confident in Science* Scale – Grade 4

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item							
			ASBS09A	ASBS09B <sub>R</sub>	ASBS09C <sub>R</sub>	ASBS09D	ASBS09E	ASBS09F <sub>R</sub>	ASBS09G <sub>R</sub>	
Albania	0.78	44	0.61	0.73	0.76	0.63	0.60	0.72	0.54	
Armenia	0.79	44	0.63	0.67	0.72	0.61	0.62	0.72	0.68	
Australia	0.83	51	0.72	0.73	0.79	0.72	0.49	0.76	0.74	
Austria	0.86	54	0.73	0.75	0.76	0.72	0.65	0.79	0.74	
Azerbaijan	0.77	42	0.44	0.73	0.75	0.51	0.49	0.78	0.72	
Bahrain	0.77	43	0.27	0.78	0.78	0.52	0.45	0.80	0.75	
Belgium (Flemish)	0.85	54	0.78	0.76	0.82	0.69	0.58	0.78	0.70	
Bosnia and Herzegovina	0.82	47	0.65	0.72	0.73	0.63	0.60	0.75	0.72	
Bulgaria	0.83	50	0.65	0.73	0.73	0.70	0.57	0.78	0.74	
Canada	0.84	51	0.74	0.76	0.75	0.74	0.46	0.76	0.76	
Chile	0.75	41	0.47	0.72	0.76	0.53	0.32	0.77	0.76	
Chinese Taipei	0.82	48	0.62	0.73	0.70	0.66	0.49	0.80	0.78	
Croatia	0.85	53	0.71	0.76	0.76	0.70	0.60	0.80	0.75	
Cyprus	0.86	55	0.75	0.74	0.78	0.74	0.65	0.75	0.77	
Czech Republic	0.84	51	0.70	0.73	0.80	0.70	0.55	0.79	0.71	
Denmark	0.84	51	0.73	0.71	0.80	0.75	0.54	0.73	0.71	
England	0.84	53	0.73	0.74	0.81	0.74	0.44	0.80	0.76	
Finland	0.80	47	0.72	0.73	0.80	0.74	0.50	0.73	0.49	
France	0.86	55	0.76	0.75	0.78	0.75	0.53	0.76	0.82	
Georgia	0.80	46	0.62	0.73	0.78	0.62	0.49	0.75	0.69	
Germany	0.85	52	0.72	0.76	0.76	0.71	0.59	0.78	0.75	
Hong Kong SAR	0.76	42	0.49	0.76	0.81	0.47	0.29	0.81	0.71	
Hungary	0.86	55	0.75	0.75	0.80	0.73	0.67	0.79	0.68	
Iran, Islamic Rep. of	0.78	43	0.51	0.65	0.77	0.57	0.47	0.77	0.78	
Ireland	0.83	50	0.73	0.76	0.79	0.71	0.43	0.75	0.71	
Italy	0.80	46	0.68	0.68	0.61	0.72	0.60	0.76	0.70	
Japan	0.83	50	0.69	0.70	0.83	0.71	0.49	0.76	0.73	
Kazakhstan	0.84	52	0.71	0.75	0.79	0.74	0.60	0.75	0.68	
Korea, Rep. of	0.85	53	0.81	0.74	0.76	0.71	0.56	0.75	0.73	
Kosovo	0.73	39	0.53	0.75	0.74	0.50	0.52	0.73	0.52	
Kuwait	0.73	39	0.19	0.80	0.77	0.41	0.37	0.80	0.73	
Latvia	0.85	53	0.76	0.72	0.81	0.72	0.61	0.77	0.69	
Lithuania	0.83	50	0.77	0.75	0.70	0.72	0.65	0.78	0.56	
Malta	0.84	52	0.70	0.73	0.79	0.72	0.55	0.79	0.73	
Montenegro	0.78	43	0.45	0.76	0.77	0.49	0.43	0.79	0.77	
Morocco	0.73	38	0.39	0.72	0.75	0.46	0.37	0.76	0.70	
Netherlands	0.82	49	0.65	0.72	0.77	0.68	0.45	0.76	0.79	
New Zealand	0.75	40	0.55	0.70	0.76	0.56	0.31	0.75	0.70	
North Macedonia	0.78	44	0.56	0.74	0.70	0.58	0.55	0.76	0.69	
Northern Ireland	0.84	52	0.74	0.74	0.82	0.74	0.42	0.77	0.74	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Students Confident in Science* Scale – Grade 4

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item							
			ASBS09A	ASBS09B <sup>R</sup>	ASBS09C <sup>R</sup>	ASBS09D	ASBS09E	ASBS09F <sup>R</sup>	ASBS09G <sup>R</sup>	
Norway (5)	0.80	47	0.70	0.74	0.79	0.70	0.40	0.73	0.70	
Oman	0.72	38	0.19	0.78	0.69	0.41	0.35	0.82	0.75	
Pakistan	0.70	36	0.33	0.73	0.75	0.33	0.30	0.73	0.75	
Philippines	0.48	31	-0.33	0.70	0.66	-0.19	-0.37	0.73	0.64	
Poland	0.84	51	0.74	0.76	0.69	0.74	0.54	0.79	0.73	
Portugal	0.75	41	0.60	0.66	0.71	0.60	0.48	0.64	0.73	
Qatar	0.77	42	0.28	0.81	0.79	0.41	0.35	0.83	0.78	
Russian Federation	0.86	55	0.71	0.78	0.81	0.76	0.61	0.80	0.72	
Saudi Arabia	0.73	40	0.14	0.78	0.79	0.40	0.36	0.81	0.77	
Serbia	0.84	52	0.63	0.74	0.80	0.68	0.60	0.78	0.77	
Singapore	0.85	53	0.74	0.77	0.80	0.67	0.51	0.80	0.75	
Slovak Republic	0.84	51	0.73	0.70	0.80	0.69	0.56	0.75	0.74	
South Africa (5)	0.66	34	0.21	0.77	0.74	0.29	0.14	0.79	0.69	
Spain	0.80	46	0.62	0.75	0.72	0.61	0.48	0.74	0.77	
Sweden	0.85	53	0.74	0.74	0.80	0.76	0.50	0.79	0.73	
Turkey (5)	0.81	47	0.63	0.71	0.78	0.60	0.51	0.77	0.74	
United Arab Emirates	0.78	43	0.46	0.77	0.76	0.54	0.46	0.79	0.73	
United States	0.82	49	0.66	0.76	0.77	0.66	0.39	0.80	0.76	
<b>Benchmarking Participants</b>										
Ontario, Canada	0.84	52	0.73	0.78	0.79	0.72	0.43	0.76	0.76	
Quebec, Canada	0.83	51	0.75	0.73	0.65	0.78	0.51	0.77	0.78	
Moscow City, Russian Fed.	0.87	58	0.73	0.79	0.83	0.78	0.60	0.81	0.74	
Madrid, Spain	0.82	49	0.68	0.73	0.73	0.65	0.52	0.75	0.79	
Abu Dhabi, UAE	0.77	42	0.39	0.78	0.77	0.48	0.40	0.80	0.73	
Dubai, UAE	0.79	45	0.57	0.73	0.74	0.64	0.53	0.75	0.70	

<sup>R</sup> Reverse coded

**Relationship Between the TIMSS 2019 Students Confident in Science Scale and TIMSS 2019 Achievement – Grade 4**

Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
Albania	0.32	0.10	0.09
Armenia	0.27	0.07	0.07
Australia	0.19	0.04	0.04
Austria	0.31	0.10	0.11
Azerbaijan	0.28	0.08	0.07
Bahrain	0.36	0.13	0.13
Belgium (Flemish)	0.27	0.07	0.08
Bosnia and Herzegovina	0.27	0.08	0.08
Bulgaria	0.38	0.14	0.15
Canada	0.19	0.04	0.04
Chile	0.31	0.09	0.11
Chinese Taipei	0.31	0.10	0.10
Croatia	0.26	0.07	0.06
Cyprus	0.26	0.07	0.07
Czech Republic	0.25	0.06	0.07
Denmark	0.26	0.07	0.07
England	0.21	0.04	0.05
Finland	0.20	0.04	0.05
France	0.30	0.09	0.09
Georgia	0.20	0.04	0.05
Germany	0.35	0.12	0.13
Hong Kong SAR	0.27	0.07	0.08
Hungary	0.31	0.10	0.10
Iran, Islamic Rep. of	0.36	0.13	0.14
Ireland	0.17	0.03	0.03
Italy	0.17	0.03	0.04
Japan	0.20	0.04	0.04
Kazakhstan	0.20	0.04	0.03
Korea, Rep. of	0.28	0.08	0.07
Kosovo	0.33	0.11	0.12
Kuwait	0.30	0.09	0.09
Latvia	0.20	0.04	0.04
Lithuania	0.24	0.06	0.06
Malta	0.27	0.07	0.09
Montenegro	0.34	0.11	0.12
Morocco	0.33	0.11	0.12
Netherlands	0.27	0.08	0.09
New Zealand	0.22	0.05	0.05

**Relationship Between the TIMSS 2019 Students Confident in Science Scale and TIMSS 2019 Achievement – Grade 4**

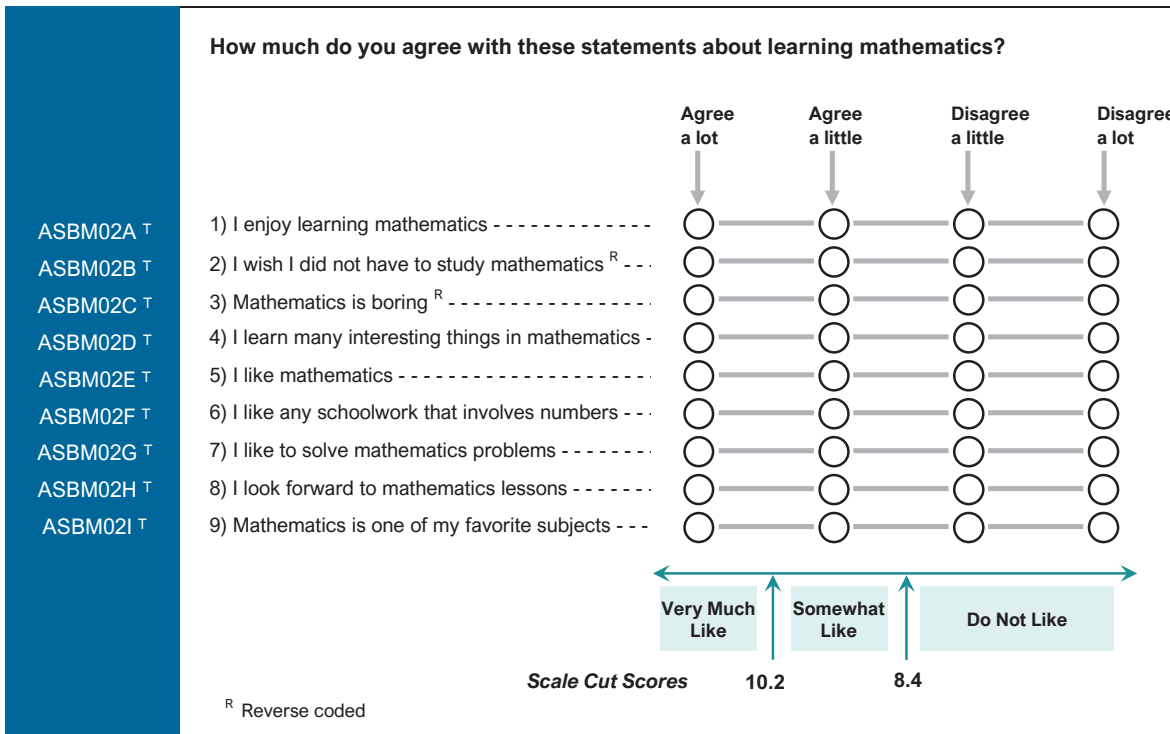
Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
North Macedonia	0.42	0.18	0.18
Northern Ireland	0.23	0.05	0.06
Norway (5)	0.22	0.05	0.05
Oman	0.38	0.14	0.15
Pakistan	0.21	0.04	0.04
Philippines	0.39	0.16	0.14
Poland	0.23	0.05	0.06
Portugal	0.28	0.08	0.09
Qatar	0.33	0.11	0.12
Russian Federation	0.19	0.03	0.04
Saudi Arabia	0.35	0.12	0.13
Serbia	0.25	0.06	0.07
Singapore	0.26	0.07	0.08
Slovak Republic	0.26	0.07	0.07
South Africa (5)	0.41	0.17	0.17
Spain	0.27	0.07	0.08
Sweden	0.19	0.03	0.04
Turkey (5)	0.33	0.11	0.12
United Arab Emirates	0.27	0.07	0.08
United States	0.25	0.06	0.08
<b>International Median</b>	<b>0.27</b>	<b>0.07</b>	<b>0.08</b>
<b>Benchmarking Participants</b>			
Ontario, Canada	0.18	0.03	0.04
Quebec, Canada	0.21	0.04	0.05
Moscow City, Russian Fed.	0.19	0.03	0.04
Madrid, Spain	0.28	0.08	0.10
Abu Dhabi, UAE	0.30	0.09	0.10
Dubai, UAE	0.17	0.03	0.03



# Students Like Learning Mathematics – Grade 4

## About the Scale

The *Students Like Learning Mathematics* scale was created based on students’ responses to nine items listed below.



<sup>T</sup> Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.

### Item Parameters for the TIMSS 2019 *Students Like Learning Mathematics* Scale – Grade 4

Item	delta	tau_1	tau_2	tau_3	Infit
ASBM02A	-0.36071	-0.72190	-0.46691	1.18881	0.78
ASBM02B <sup>R</sup>	0.25692	-0.42734	0.08319	0.34415	1.77
ASBM02C <sup>R</sup>	0.13685	-0.71463	0.14695	0.56768	1.33
ASBM02D	-0.64160	-0.71305	-0.29401	1.00706	1.14
ASBM02E	-0.20358	-0.49481	-0.33283	0.82764	0.64
ASBM02F	0.01126	-1.11828	-0.10444	1.22272	1.01
ASBM02G	0.09150	-0.86159	-0.20061	1.06220	1.00
ASBM02H	0.34970	-0.96071	-0.17174	1.13245	0.83
ASBM02I	0.35966	-0.48032	-0.05428	0.53460	0.88

<sup>R</sup> Reverse coded

### Scale Transformation Constants for the TIMSS 2019 *Students Like Learning Mathematics* Scale – Grade 4

#### Scale Transformation Constants

A = 8.402636

B = 1.234546

Transformed Scale Score = 8.402636 + 1.234546 • Logit Scale Score

**Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS  
2019 Students Like Learning Mathematics Scale – Grade 4**

Raw Score	Transformed Scale Score	Cutpoint
0	3.85307	
1	5.17652	
2	5.79688	
3	6.21498	
4	6.54051	
5	6.81155	
6	7.04782	
7	7.26046	
8	7.45571	
9	7.64004	
10	7.81505	
11	7.98325	
12	8.14669	
13	8.30721	8.4
14	8.46650	
15	8.62627	
16	8.78843	
17	8.95513	
18	9.12899	
19	9.31319	
20	9.51007	
21	9.72723	
22	9.97246	
23	10.25879	10.2
24	10.60755	
25	11.06393	
26	11.73885	
27	13.14434	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Students Like Learning Mathematics* Scale – Grade 4

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item									
			ASBM02A	ASBM02B R	ASBM02C R	ASBM02D	ASBM02E	ASBM02F	ASBM02G	ASBM02H	ASBM02I	
Albania	0.81	46	0.78	0.33	0.55	0.53	0.82	0.69	0.75	0.76	0.77	
Armenia	0.86	52	0.71	0.39	0.39	0.74	0.86	0.75	0.79	0.82	0.84	
Australia	0.94	68	0.89	0.73	0.80	0.70	0.91	0.78	0.84	0.90	0.86	
Austria	0.94	68	0.89	0.70	0.74	0.73	0.91	0.79	0.86	0.90	0.86	
Azerbaijan	0.78	50	0.79	0.03	0.38	0.72	0.85	0.70	0.79	0.80	0.84	
Bahrain	0.89	56	0.78	0.52	0.57	0.75	0.88	0.70	0.81	0.81	0.82	
Belgium (Flemish)	0.93	64	0.88	0.76	0.81	0.64	0.92	0.76	0.69	0.84	0.84	
Bosnia and Herzegovina	0.91	60	0.83	0.55	0.67	0.68	0.90	0.79	0.77	0.89	0.84	
Bulgaria	0.93	65	0.85	0.56	0.73	0.75	0.90	0.83	0.88	0.84	0.84	
Canada	0.93	64	0.87	0.65	0.77	0.69	0.90	0.76	0.81	0.87	0.84	
Chile	0.90	57	0.81	0.51	0.65	0.66	0.89	0.70	0.82	0.85	0.83	
Chinese Taipei	0.94	67	0.87	0.70	0.69	0.76	0.91	0.83	0.85	0.87	0.85	
Croatia	0.94	67	0.89	0.68	0.82	0.78	0.93	0.84	0.60	0.92	0.86	
Cyprus	0.92	62	0.85	0.65	0.70	0.73	0.89	0.76	0.79	0.86	0.84	
Czech Republic	0.93	65	0.89	0.63	0.72	0.73	0.92	0.79	0.73	0.91	0.88	
Denmark	0.93	65	0.86	0.69	0.79	0.79	0.89	0.76	0.75	0.88	0.84	
England	0.93	66	0.88	0.71	0.78	0.69	0.91	0.76	0.82	0.89	0.85	
Finland	0.93	65	0.86	0.67	0.82	0.74	0.91	0.80	0.70	0.87	0.85	
France	0.91	60	0.86	0.67	0.74	0.71	0.89	0.71	0.69	0.82	0.84	
Georgia	0.86	50	0.78	0.47	0.53	0.61	0.85	0.70	0.74	0.82	0.78	
Germany	0.94	67	0.87	0.71	0.74	0.74	0.91	0.81	0.78	0.90	0.87	
Hong Kong SAR	0.93	66	0.86	0.56	0.68	0.79	0.91	0.85	0.86	0.87	0.87	
Hungary	0.92	62	0.88	0.62	0.70	0.67	0.91	0.79	0.74	0.87	0.85	
Iran, Islamic Rep. of	0.87	52	0.80	0.53	0.53	0.68	0.87	0.59	0.82	0.76	0.81	
Ireland	0.93	65	0.87	0.68	0.77	0.71	0.91	0.74	0.81	0.88	0.83	
Italy	0.93	64	0.86	0.72	0.80	0.67	0.89	0.78	0.71	0.87	0.85	
Japan	0.93	66	0.88	0.60	0.71	0.75	0.91	0.81	0.86	0.88	0.84	
Kazakhstan	0.88	54	0.76	0.39	0.69	0.65	0.85	0.73	0.78	0.83	0.82	
Korea, Rep. of	0.95	71	0.88	0.69	0.81	0.75	0.92	0.87	0.91	0.84	0.87	
Kosovo	0.63	37	0.70	0.08	0.26	0.56	0.85	0.75	0.51	0.63	0.72	
Kuwait	0.87	53	0.78	0.26	0.37	0.75	0.88	0.76	0.83	0.83	0.82	
Latvia	0.93	64	0.87	0.65	0.78	0.70	0.89	0.77	0.83	0.86	0.84	
Lithuania	0.92	61	0.86	0.71	0.73	0.59	0.89	0.78	0.85	0.79	0.81	
Malta	0.91	59	0.85	0.61	0.75	0.66	0.88	0.70	0.71	0.85	0.84	
Montenegro	0.90	57	0.83	0.53	0.66	0.68	0.88	0.76	0.72	0.88	0.79	
Morocco	0.78	42	0.58	0.32	0.37	0.67	0.80	0.69	0.72	0.78	0.69	
Netherlands	0.92	63	0.83	0.68	0.77	0.64	0.90	0.76	0.85	0.84	0.82	
New Zealand	0.94	66	0.87	0.71	0.76	0.71	0.91	0.77	0.84	0.88	0.85	
North Macedonia	0.81	46	0.80	0.35	0.43	0.59	0.86	0.66	0.63	0.77	0.80	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Students Like Learning Mathematics* Scale – Grade 4

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item									
			ASBM02A	ASBM02B <sup>R</sup>	ASBM02C <sup>R</sup>	ASBM02D	ASBM02E	ASBM02F	ASBM02G	ASBM02H	ASBM02I	
Northern Ireland	0.93	64	0.86	0.66	0.77	0.66	0.90	0.79	0.80	0.88	0.83	
Norway (5)	0.94	67	0.87	0.66	0.79	0.75	0.90	0.79	0.86	0.87	0.84	
Oman	0.80	44	0.72	0.27	0.40	0.73	0.84	0.66	0.78	0.59	0.77	
Pakistan	0.75	42	0.65	-0.03	-0.05	0.73	0.80	0.68	0.76	0.74	0.76	
Philippines	0.76	36	0.69	0.31	0.40	0.65	0.74	0.63	0.66	0.46	0.72	
Poland	0.93	64	0.87	0.67	0.75	0.76	0.90	0.77	0.86	0.72	0.85	
Portugal	0.92	62	0.86	0.66	0.71	0.68	0.89	0.76	0.80	0.85	0.81	
Qatar	0.90	56	0.78	0.49	0.56	0.73	0.88	0.75	0.82	0.83	0.83	
Russian Federation	0.90	58	0.84	0.53	0.72	0.66	0.87	0.76	0.73	0.84	0.83	
Saudi Arabia	0.86	52	0.72	0.36	0.49	0.75	0.86	0.72	0.82	0.83	0.78	
Serbia	0.93	66	0.85	0.66	0.79	0.76	0.91	0.80	0.78	0.90	0.84	
Singapore	0.93	65	0.86	0.74	0.77	0.72	0.90	0.73	0.81	0.85	0.86	
Slovak Republic	0.93	63	0.88	0.65	0.78	0.56	0.90	0.74	0.82	0.90	0.85	
South Africa (5)	0.80	42	0.72	0.29	0.35	0.62	0.79	0.71	0.69	0.70	0.73	
Spain	0.90	58	0.81	0.51	0.72	0.66	0.88	0.73	0.78	0.84	0.84	
Sweden	0.94	70	0.87	0.71	0.85	0.77	0.93	0.84	0.82	0.88	0.84	
Turkey (5)	0.88	54	0.77	0.61	0.71	0.47	0.87	0.65	0.80	0.79	0.83	
United Arab Emirates	0.89	56	0.80	0.51	0.57	0.71	0.87	0.73	0.79	0.82	0.83	
United States	0.93	65	0.87	0.64	0.74	0.71	0.91	0.77	0.87	0.88	0.85	
<b>Benchmarking Participants</b>												
Ontario, Canada	0.93	64	0.88	0.65	0.77	0.68	0.91	0.74	0.83	0.86	0.85	
Quebec, Canada	0.92	62	0.85	0.62	0.76	0.71	0.89	0.76	0.76	0.87	0.82	
Moscow City, Russian Fed.	0.92	61	0.87	0.53	0.75	0.70	0.89	0.75	0.77	0.85	0.86	
Madrid, Spain	0.90	56	0.81	0.54	0.73	0.65	0.87	0.71	0.74	0.83	0.82	
Abu Dhabi, UAE	0.89	55	0.80	0.47	0.53	0.73	0.87	0.73	0.79	0.82	0.83	
Dubai, UAE	0.91	59	0.81	0.59	0.71	0.64	0.87	0.73	0.82	0.83	0.83	

<sup>R</sup> Reverse coded

**Relationship Between the TIMSS 2019 Students Like Learning Mathematics Scale and TIMSS 2019 Achievement – Grade 4**

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
Albania	0.30	0.09	0.06
Armenia	0.25	0.06	0.05
Australia	0.24	0.06	0.05
Austria	0.19	0.04	0.03
Azerbaijan	0.30	0.09	0.08
Bahrain	0.19	0.03	0.03
Belgium (Flemish)	0.18	0.03	0.03
Bosnia and Herzegovina	0.16	0.03	0.03
Bulgaria	0.15	0.02	0.02
Canada	0.23	0.05	0.05
Chile	0.21	0.04	0.04
Chinese Taipei	0.26	0.07	0.06
Croatia	0.21	0.04	0.05
Cyprus	0.24	0.06	0.06
Czech Republic	0.21	0.05	0.04
Denmark	0.20	0.04	0.03
England	0.22	0.05	0.05
Finland	0.16	0.03	0.02
France	0.21	0.05	0.04
Georgia	0.18	0.03	0.03
Germany	0.23	0.05	0.05
Hong Kong SAR	0.23	0.05	0.06
Hungary	0.21	0.04	0.04
Iran, Islamic Rep. of	0.17	0.03	0.03
Ireland	0.20	0.04	0.04
Italy	0.13	0.02	0.02
Japan	0.31	0.09	0.08
Kazakhstan	0.15	0.02	0.01
Korea, Rep. of	0.31	0.10	0.09
Kosovo	0.36	0.13	0.10
Kuwait	0.24	0.06	0.06
Latvia	0.26	0.07	0.06
Lithuania	0.15	0.02	0.02
Malta	0.19	0.04	0.03
Montenegro	0.21	0.04	0.04
Morocco	0.29	0.08	0.08
Netherlands	0.18	0.03	0.03
New Zealand	0.15	0.02	0.02

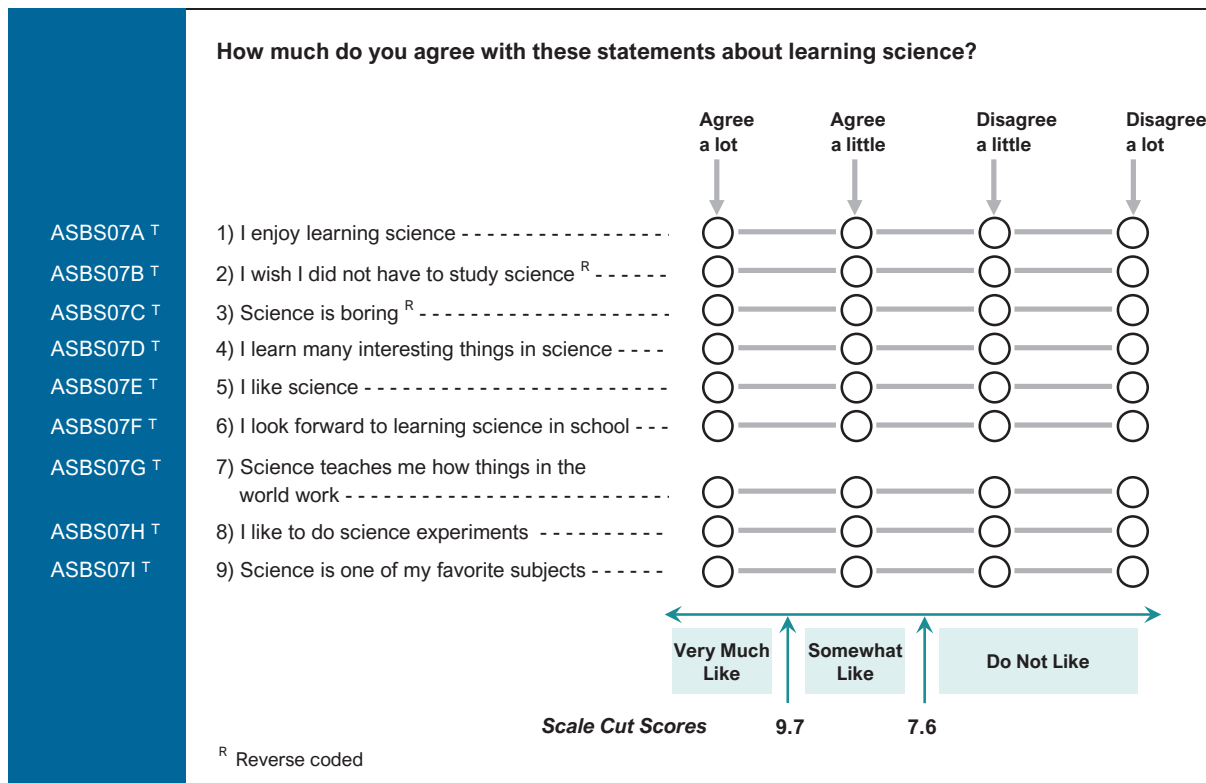
**Relationship Between the TIMSS 2019 *Students Like Learning Mathematics* Scale and TIMSS 2019 Achievement – Grade 4**

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
North Macedonia	0.29	0.08	0.08
Northern Ireland	0.25	0.06	0.06
Norway (5)	0.12	0.02	0.02
Oman	0.28	0.08	0.07
Pakistan	0.12	0.01	0.03
Philippines	0.41	0.16	0.17
Poland	0.20	0.04	0.04
Portugal	0.25	0.06	0.05
Qatar	0.18	0.03	0.05
Russian Federation	0.18	0.03	0.03
Saudi Arabia	0.26	0.07	0.07
Serbia	0.17	0.03	0.03
Singapore	0.30	0.09	0.09
Slovak Republic	0.09	0.01	0.01
South Africa (5)	0.34	0.12	0.13
Spain	0.19	0.04	0.04
Sweden	0.11	0.01	0.01
Turkey (5)	0.23	0.05	0.05
United Arab Emirates	0.21	0.04	0.05
United States	0.19	0.04	0.05
<b>International Median</b>	<b>0.21</b>	<b>0.04</b>	<b>0.04</b>
<b>Benchmarking Participants</b>			
Ontario, Canada	0.21	0.04	0.05
Quebec, Canada	0.26	0.07	0.06
Moscow City, Russian Fed.	0.25	0.06	0.06
Madrid, Spain	0.17	0.03	0.03
Abu Dhabi, UAE	0.16	0.03	0.03
Dubai, UAE	0.12	0.02	0.02

## Students Like Learning Science – Grade 4

### About the Scale

The *Students Like Learning Science* scale was created based on students' responses to nine items listed below.



<sup>T</sup> Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.



### Item Parameters for the TIMSS 2019 *Students Like Learning Science* Scale – Grade 4

Item	delta	tau_1	tau_2	tau_3	Infit
ASBS07A	-0.12179	-0.53434	-0.49509	1.02943	0.81
ASBS07B <sup>R</sup>	0.51587	-0.34763	-0.09494	0.44257	1.55
ASBS07C <sup>R</sup>	0.30062	-0.44642	-0.04532	0.49174	1.25
ASBS07D	-0.46068	-0.25588	-0.41313	0.66901	0.94
ASBS07E	-0.06693	-0.45384	-0.32221	0.77605	0.66
ASBS07F	0.26162	-0.76615	-0.14592	0.91207	0.82
ASBS07G	-0.54440	-0.39669	-0.49739	0.89408	1.13
ASBS07H	-0.38772	-0.17842	-0.29340	0.47182	1.26
ASBS07I	0.50341	-0.65684	-0.14297	0.79981	0.90

<sup>R</sup> Reverse coded

### Scale Transformation Constants for the TIMSS 2019 *Students Like Learning Science* Scale – Grade 4

#### Scale Transformation Constants

A = 7.692952

B = 1.486733

Transformed Scale Score = 7.692952 + 1.486733 • Logit Scale Score

**Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS  
2019 Students Like Learning Science Scale – Grade 4**

Raw Score	Transformed Scale Score	Cutpoint
0	2.69347	
1	4.16658	
2	4.83600	
3	5.28195	
4	5.62666	
5	5.91275	
6	6.16040	
7	6.38769	
8	6.59779	
9	6.79572	
10	6.98534	
11	7.16962	
12	7.35091	
13	7.53117	7.6
14	7.71287	
15	7.89534	
16	8.08274	
17	8.27639	
18	8.47890	
19	8.69346	
20	8.92203	
21	9.17441	
22	9.45888	
23	9.79069	9.7
24	10.19505	
25	10.72673	
26	11.51982	
27	13.19236	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Students Like Learning Science* Scale – Grade 4

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item									
			ASBS07A	ASBS07B <sub>R</sub>	ASBS07C <sub>R</sub>	ASBS07D	ASBS07E	ASBS07F	ASBS07G	ASBS07H	ASBS07I	
Albania	0.75	41	0.76	0.33	0.54	0.60	0.84	0.76	0.52	0.54	0.70	
Armenia	0.86	50	0.74	0.39	0.37	0.76	0.87	0.83	0.72	0.66	0.84	
Australia	0.93	64	0.88	0.72	0.78	0.78	0.91	0.90	0.67	0.68	0.84	
Austria	0.88	54	0.83	0.64	0.73	0.74	0.91	0.90	0.55	0.28	0.84	
Azerbaijan	0.76	45	0.76	0.04	0.36	0.75	0.85	0.80	0.66	0.59	0.80	
Bahrain	0.86	51	0.74	0.51	0.52	0.79	0.86	0.77	0.71	0.66	0.81	
Belgium (Flemish)	0.91	58	0.86	0.76	0.82	0.70	0.91	0.84	0.54	0.43	0.84	
Bosnia and Herzegovina	0.87	52	0.82	0.48	0.61	0.72	0.89	0.87	0.55	0.62	0.81	
Bulgaria	0.87	52	0.82	0.45	0.63	0.76	0.86	0.79	0.67	0.62	0.81	
Canada	0.91	59	0.86	0.64	0.76	0.75	0.91	0.89	0.60	0.60	0.85	
Chile	0.85	49	0.75	0.43	0.56	0.73	0.86	0.81	0.66	0.60	0.78	
Chinese Taipei	0.92	62	0.86	0.61	0.58	0.83	0.91	0.88	0.74	0.74	0.85	
Croatia	0.89	56	0.85	0.61	0.73	0.76	0.91	0.89	0.54	0.44	0.83	
Cyprus	0.92	61	0.87	0.68	0.74	0.78	0.91	0.87	0.68	0.60	0.86	
Czech Republic	0.91	59	0.86	0.62	0.71	0.74	0.91	0.90	0.65	0.57	0.88	
Denmark	0.92	61	0.84	0.71	0.79	0.83	0.90	0.89	0.63	0.52	0.82	
England	0.92	63	0.87	0.73	0.78	0.75	0.91	0.90	0.66	0.62	0.84	
Finland	0.92	63	0.85	0.70	0.78	0.79	0.91	0.87	0.67	0.68	0.84	
France	0.92	61	0.87	0.73	0.77	0.76	0.90	0.85	0.63	0.65	0.83	
Georgia	0.85	48	0.78	0.54	0.56	0.63	0.87	0.82	0.55	0.62	0.75	
Germany	0.92	61	0.83	0.75	0.74	0.78	0.89	0.88	0.65	0.62	0.84	
Hong Kong SAR	0.91	60	0.83	0.42	0.48	0.83	0.92	0.89	0.79	0.78	0.86	
Hungary	0.89	55	0.85	0.62	0.70	0.73	0.90	0.87	0.58	0.47	0.82	
Iran, Islamic Rep. of	0.85	48	0.76	0.50	0.52	0.69	0.84	0.74	0.66	0.68	0.81	
Ireland	0.91	60	0.84	0.66	0.74	0.74	0.90	0.89	0.63	0.67	0.82	
Italy	0.89	53	0.83	0.69	0.73	0.71	0.87	0.85	0.46	0.47	0.83	
Japan	0.92	61	0.86	0.60	0.68	0.77	0.90	0.90	0.69	0.74	0.83	
Kazakhstan	0.88	52	0.78	0.47	0.65	0.73	0.84	0.82	0.70	0.66	0.80	
Korea, Rep. of	0.93	64	0.87	0.71	0.79	0.78	0.90	0.85	0.70	0.72	0.86	
Kosovo	0.71	41	0.77	0.11	0.37	0.61	0.86	0.73	0.66	0.59	0.72	
Kuwait	0.82	47	0.67	0.27	0.37	0.75	0.83	0.81	0.74	0.73	0.78	
Latvia	0.88	52	0.84	0.64	0.75	0.76	0.87	0.65	0.57	0.52	0.82	
Lithuania	0.88	54	0.85	0.71	0.71	0.67	0.88	0.79	0.61	0.50	0.80	
Malta	0.91	59	0.85	0.60	0.74	0.75	0.90	0.87	0.63	0.65	0.84	
Montenegro	0.82	47	0.76	0.34	0.48	0.71	0.86	0.84	0.62	0.67	0.71	
Morocco	0.80	43	0.64	0.40	0.42	0.71	0.80	0.76	0.68	0.72	0.68	
Netherlands	0.90	56	0.84	0.57	0.72	0.73	0.91	0.84	0.62	0.65	0.81	
New Zealand	0.92	61	0.86	0.53	0.63	0.79	0.90	0.89	0.72	0.80	0.83	
North Macedonia	0.81	46	0.79	0.27	0.29	0.75	0.86	0.78	0.69	0.63	0.77	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Students Like Learning Science* Scale – Grade 4

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item									
			ASBS07A	ASBS07B <sup>R</sup>	ASBS07C <sup>R</sup>	ASBS07D	ASBS07E	ASBS07F	ASBS07G	ASBS07H	ASBS07I	
Northern Ireland	0.91	58	0.84	0.65	0.71	0.74	0.89	0.87	0.63	0.69	0.80	
Norway (5)	0.91	60	0.87	0.71	0.79	0.78	0.91	0.89	0.55	0.56	0.82	
Oman	0.79	43	0.66	0.36	0.45	0.68	0.80	0.68	0.71	0.69	0.77	
Pakistan	0.78	41	0.58	0.22	0.20	0.75	0.76	0.68	0.74	0.75	0.77	
Philippines	0.76	37	0.69	0.29	0.36	0.68	0.74	0.54	0.64	0.67	0.68	
Poland	0.90	56	0.85	0.61	0.64	0.82	0.88	0.71	0.70	0.67	0.83	
Portugal	0.88	53	0.82	0.55	0.57	0.73	0.87	0.82	0.67	0.69	0.76	
Qatar	0.86	51	0.73	0.42	0.47	0.75	0.86	0.81	0.73	0.70	0.81	
Russian Federation	0.88	54	0.82	0.57	0.70	0.73	0.87	0.83	0.64	0.56	0.82	
Saudi Arabia	0.85	50	0.70	0.40	0.48	0.79	0.85	0.81	0.71	0.73	0.79	
Serbia	0.90	56	0.84	0.55	0.69	0.75	0.89	0.86	0.63	0.63	0.82	
Singapore	0.91	58	0.85	0.70	0.73	0.76	0.89	0.86	0.64	0.55	0.83	
Slovak Republic	0.90	56	0.86	0.66	0.76	0.61	0.89	0.88	0.60	0.57	0.83	
South Africa (5)	0.79	41	0.69	0.29	0.35	0.66	0.78	0.71	0.68	0.69	0.70	
Spain	0.85	49	0.81	0.43	0.63	0.73	0.88	0.84	0.57	0.42	0.80	
Sweden	0.93	64	0.86	0.73	0.82	0.80	0.91	0.89	0.66	0.62	0.83	
Turkey (5)	0.86	48	0.75	0.55	0.65	0.60	0.84	0.76	0.60	0.63	0.80	
United Arab Emirates	0.88	54	0.77	0.51	0.56	0.76	0.88	0.82	0.72	0.69	0.82	
United States	0.91	59	0.86	0.62	0.69	0.76	0.91	0.88	0.64	0.64	0.84	
<b>Benchmarking Participants</b>												
Ontario, Canada	0.91	60	0.85	0.66	0.77	0.75	0.90	0.89	0.64	0.57	0.84	
Quebec, Canada	0.91	59	0.87	0.60	0.75	0.77	0.91	0.90	0.51	0.63	0.87	
Moscow City, Russian Fed.	0.89	56	0.85	0.61	0.74	0.74	0.89	0.84	0.60	0.48	0.85	
Madrid, Spain	0.86	49	0.83	0.47	0.64	0.72	0.89	0.84	0.55	0.36	0.81	
Abu Dhabi, UAE	0.88	54	0.77	0.46	0.50	0.79	0.88	0.84	0.71	0.71	0.83	
Dubai, UAE	0.88	53	0.79	0.57	0.69	0.68	0.88	0.81	0.68	0.61	0.81	

<sup>R</sup> Reverse coded

**Relationship Between the TIMSS 2019 Students Like Learning Science Scale and TIMSS 2019 Achievement – Grade 4**

Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
Albania	0.20	0.04	0.03
Armenia	0.22	0.05	0.05
Australia	0.10	0.01	0.01
Austria	0.17	0.03	0.02
Azerbaijan	0.22	0.05	0.04
Bahrain	0.33	0.11	0.10
Belgium (Flemish)	0.12	0.02	0.01
Bosnia and Herzegovina	0.08	0.01	0.01
Bulgaria	0.14	0.02	0.02
Canada	0.08	0.01	0.01
Chile	0.20	0.04	0.03
Chinese Taipei	0.17	0.03	0.02
Croatia	0.11	0.01	0.01
Cyprus	0.18	0.03	0.03
Czech Republic	0.09	0.01	0.01
Denmark	0.13	0.02	0.02
England	0.07	0.01	0.00
Finland	0.01	0.00	0.00
France	0.14	0.02	0.02
Georgia	0.08	0.01	0.01
Germany	0.18	0.03	0.03
Hong Kong SAR	0.23	0.05	0.05
Hungary	0.09	0.01	0.01
Iran, Islamic Rep. of	0.26	0.07	0.07
Ireland	0.15	0.02	0.02
Italy	0.09	0.01	0.01
Japan	0.13	0.02	0.01
Kazakhstan	0.14	0.02	0.02
Korea, Rep. of	0.20	0.04	0.03
Kosovo	0.28	0.08	0.07
Kuwait	0.33	0.11	0.10
Latvia	0.05	0.00	0.00
Lithuania	0.07	0.01	0.00
Malta	0.21	0.04	0.04
Montenegro	0.13	0.02	0.03
Morocco	0.35	0.12	0.10
Netherlands	0.16	0.03	0.02
New Zealand	0.15	0.02	0.02

**Relationship Between the TIMSS 2019 *Students Like Learning Science* Scale and TIMSS 2019 Achievement – Grade 4**

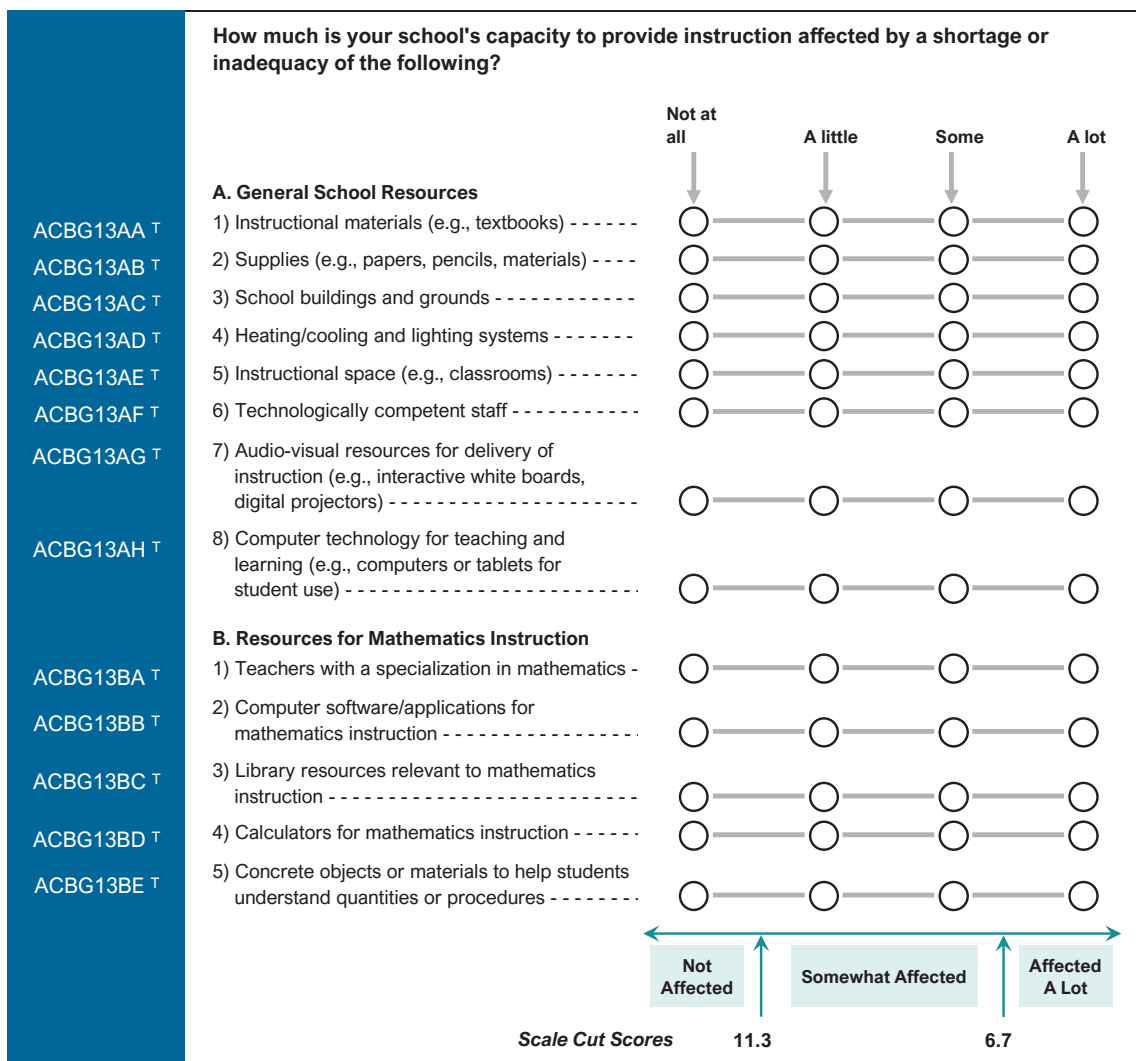
Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
North Macedonia	0.31	0.10	0.09
Northern Ireland	0.21	0.04	0.04
Norway (5)	0.09	0.01	0.01
Oman	0.34	0.11	0.11
Pakistan	0.19	0.04	0.05
Philippines	0.50	0.25	0.23
Poland	0.08	0.01	0.01
Portugal	0.20	0.04	0.05
Qatar	0.34	0.12	0.13
Russian Federation	0.04	0.00	0.00
Saudi Arabia	0.33	0.11	0.12
Serbia	0.03	0.00	0.01
Singapore	0.15	0.02	0.02
Slovak Republic	0.06	0.00	0.00
South Africa (5)	0.42	0.18	0.17
Spain	0.10	0.01	0.01
Sweden	0.05	0.00	0.01
Turkey (5)	0.29	0.09	0.08
United Arab Emirates	0.32	0.10	0.09
United States	0.13	0.02	0.02
<b>International Median</b>	<b>0.15</b>	<b>0.02</b>	<b>0.02</b>
<b>Benchmarking Participants</b>			
Ontario, Canada	0.07	0.00	0.01
Quebec, Canada	0.10	0.01	0.01
Moscow City, Russian Fed.	0.03	0.00	0.00
Madrid, Spain	0.09	0.01	0.01
Abu Dhabi, UAE	0.32	0.10	0.10
Dubai, UAE	0.15	0.02	0.02

## Scales Based on Principals' Reports

# Instruction Affected by Mathematics Resource Shortages – Grade 4

### About the Scale

The *Instruction Affected by Mathematics Resource Shortages* scale was created based on principals' responses to thirteen items listed below.



<sup>T</sup> Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.

**Item Parameters for the TIMSS 2019 *Instruction Affected by Mathematics*  
Resource Shortages Scale – Grade 4**

Item	delta	tau_1	tau_2	tau_3	Infit
ACBG13AA	-0.14948	-0.24821	0.06659	0.18162	0.94
ACBG13AB	-0.38241	-0.22495	0.19483	0.03012	0.86
ACBG13AC	0.12747	-0.72711	0.13093	0.59618	1.11
ACBG13AD	-0.13054	-0.44482	0.17299	0.27183	0.97
ACBG13AE	0.17053	-0.44105	-0.02256	0.46361	1.12
ACBG13AF	0.18053	-1.21486	-0.06356	1.27842	1.00
ACBG13AG	0.09526	-0.75238	0.02378	0.72860	0.95
ACBG13AH	0.32224	-0.95290	0.03310	0.91980	1.10
ACBG13BA	0.00799	-0.52502	0.00573	0.51929	1.10
ACBG13BB	0.16554	-1.32115	0.08121	1.23994	1.07
ACBG13BC	0.07814	-1.30714	0.04775	1.25939	1.15
ACBG13BD	-0.52163	-0.74124	0.19132	0.54992	1.35
ACBG13BE	0.03636	-1.10053	-0.05826	1.15879	0.86

**Scale Transformation Constants for the TIMSS 2019 *Instruction Affected by Mathematics*  
Resource Shortages Scale – Grade 4**

**Scale Transformation Constants**

A = 8.983616

B = 1.642771

Transformed Scale Score = 8.983616 + 1.642771 • Logit Scale Score



**Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS  
2019 Instruction Affected by Mathematics Resource Shortages Scale – Grade 4**

Raw Score	Transformed Scale Score	Cutpoint
0	2.26751	
1	4.10533	
2	4.97458	
3	5.55459	
4	5.99316	
5	6.34731	
6	6.64531	6.7
7	6.90436	
8	7.13441	
9	7.34236	
10	7.53320	
11	7.70956	
12	7.87690	
13	8.03580	
14	8.18794	
15	8.33477	
16	8.47754	
17	8.61741	
18	8.75540	
19	8.89246	
20	9.03124	
21	9.16743	
22	9.30709	
23	9.44946	
24	9.59555	
25	9.74642	
26	9.90334	
27	10.06763	
28	10.23978	
29	10.42410	
30	10.62249	
31	10.83857	
32	11.07716	
33	11.34502	11.3
34	11.65202	
35	12.01510	
36	12.46230	
37	13.05030	
38	13.92655	
39	15.77025	

**Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 Instruction Affected by Mathematics Resource Shortages Scale – Grade 4**

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item												
			ACBG13AA	ACBG13AB	ACBG13AC	ACBG13AD	ACBG13AE	ACBG13AF	ACBG13AG	ACBG13AH	ACBG13BA	ACBG13BB	ACBG13BC	ACBG13BD	ACBG13BE
Albania	0.90	46	0.73	0.81	0.81	0.77	0.75	0.73	0.62	0.63	0.63	0.46	0.48	0.47	0.78
Armenia	0.88	42	0.65	0.53	0.61	0.68	0.54	0.68	0.64	0.64	0.69	0.68	0.71	0.63	0.71
Australia	0.92	51	0.66	0.72	0.71	0.67	0.74	0.68	0.78	0.80	0.56	0.74	0.72	0.72	0.75
Austria	0.82	33	0.54	0.57	0.60	0.50	0.61	0.61	0.58	0.60	0.63	0.61	0.61	0.50	0.53
Azerbaijan	0.86	38	0.53	0.58	0.60	0.66	0.61	0.65	0.52	0.61	0.61	0.60	0.71	0.59	0.65
Bahrain	0.97	74	0.92	0.91	0.88	0.90	0.94	0.89	0.88	0.83	0.90	0.79	0.71	0.69	0.88
Belgium (Flemish)	0.89	46	0.76	0.76	0.62	0.71	0.62	0.61	0.78	0.71	0.52	0.66	0.48	0.71	0.78
Bosnia and Herzegovina	0.89	43	0.74	0.69	0.72	0.67	0.68	0.60	0.69	0.68	0.54	0.56	0.62	0.58	0.72
Bulgaria	0.86	41	0.76	0.78	0.75	0.80	0.65	0.31	0.75	0.66	0.64	0.47	0.53	0.37	0.63
Canada	0.90	47	0.75	0.77	0.73	0.69	0.64	0.66	0.76	0.74	0.51	0.64	0.67	0.65	0.67
Chile	0.92	52	0.68	0.70	0.67	0.59	0.69	0.79	0.83	0.80	0.54	0.69	0.78	0.72	0.82
Chinese Taipei	0.92	51	0.72	0.74	0.70	0.80	0.69	0.76	0.80	0.76	0.66	0.72	0.65	0.60	0.68
Croatia	0.85	38	0.65	0.71	0.67	0.71	0.69	0.65	0.54	0.38	0.56	0.62	0.54	0.41	0.72
Cyprus	0.92	51	0.83	0.81	0.62	0.73	0.78	0.77	0.73	0.54	0.67	0.77	0.69	0.64	0.69
Czech Republic	0.77	29	0.61	0.57	0.28	0.45	0.40	0.47	0.67	0.58	0.37	0.73	0.54	0.45	0.72
Denmark	0.91	49	0.77	0.78	0.62	0.58	0.59	0.68	0.80	0.78	0.59	0.75	0.62	0.68	0.81
England	0.84	37	0.56	0.44	0.60	0.58	0.52	0.58	0.65	0.66	0.49	0.78	0.55	0.67	0.75
Finland	0.88	43	0.69	0.60	0.59	0.57	0.71	0.73	0.72	0.68	0.59	0.74	0.55	0.54	0.73
France	0.82	32	0.57	0.52	0.59	0.43	0.54	0.56	0.69	0.52	0.57	0.63	0.60	0.49	0.62
Georgia	0.89	45	0.75	0.67	0.59	0.66	0.61	0.67	0.71	0.76	0.67	0.74	0.73	0.18	0.72
Germany	0.83	35	0.61	0.67	0.47	0.36	0.52	0.57	0.66	0.75	0.36	0.71	0.63	0.51	0.65
Hong Kong SAR	0.95	61	0.82	0.80	0.71	0.84	0.77	0.74	0.85	0.83	0.76	0.79	0.76	0.70	0.77
Hungary	0.91	48	0.72	0.58	0.66	0.75	0.73	0.62	0.76	0.71	0.53	0.66	0.67	0.69	0.84
Iran, Islamic Rep. of	0.91	47	0.71	0.76	0.68	0.77	0.79	0.74	0.69	0.43	0.79	0.65	0.57	0.54	0.72
Ireland	0.84	36	0.64	0.66	0.54	0.66	0.50	0.64	0.76	0.57	0.37	0.56	0.54	0.60	0.62
Italy	0.89	44	0.67	0.62	0.62	0.58	0.67	0.61	0.70	0.69	0.57	0.71	0.71	0.73	0.73
Japan	0.89	46	0.75	0.75	0.77	0.60	0.77	0.59	0.66	0.66	0.54	0.56	0.55	0.70	0.83
Kazakhstan	0.94	58	0.77	0.73	0.66	0.78	0.76	0.74	0.81	0.78	0.78	0.81	0.82	0.63	0.76
Korea, Rep. of	0.95	63	0.85	0.88	0.74	0.89	0.87	0.79	0.81	0.84	0.69	0.70	0.71	0.64	0.85
Kosovo	0.83	35	0.53	0.64	0.57	0.53	0.45	0.62	0.69	0.63	0.46	0.61	0.55	0.64	0.68
Kuwait	0.94	60	0.84	0.84	0.78	0.83	0.87	0.77	0.82	0.78	0.81	0.63	0.60	0.58	0.84
Latvia	0.89	44	0.74	0.71	0.63	0.71	0.65	0.70	0.62	0.57	0.73	0.56	0.77	0.53	0.67
Lithuania	0.87	40	0.64	0.69	0.36	0.53	0.41	0.67	0.66	0.66	0.62	0.73	0.72	0.61	0.76
Malta	0.89	44	0.79	0.76	0.63	0.54	0.53	0.75	0.83	0.84	0.49	0.62	0.41	0.37	0.79
Montenegro	0.89	44	0.69	0.71	0.70	0.69	0.68	0.71	0.68	0.70	0.51	0.66	0.65	0.55	0.65
Morocco	0.80	38	-0.17	0.10	0.35	0.55	-0.13	0.75	0.72	0.68	0.65	0.83	0.84	0.80	0.68
Netherlands	0.84	35	0.58	0.46	0.62	0.49	0.52	0.68	0.60	0.59	0.45	0.79	0.68	0.50	0.67
New Zealand	0.90	47	0.74	0.78	0.68	0.76	0.69	0.72	0.82	0.71	0.49	0.60	0.63	0.61	0.64
North Macedonia	0.91	47	0.71	0.76	0.70	0.77	0.71	0.79	0.72	0.67	0.59	0.62	0.55	0.60	0.68
Northern Ireland	0.86	40	0.76	0.67	0.65	0.54	0.58	0.59	0.69	0.73	0.51	0.66	0.52	0.56	0.66

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Instruction Affected by Mathematics Resource Shortages* Scale – Grade 4

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item												
			ACBG13AA	ACBG13AB	ACBG13AC	ACBG13AD	ACBG13AE	ACBG13AF	ACBG13AG	ACBG13AH	ACBG13BA	ACBG13BB	ACBG13BC	ACBG13BD	ACBG13BE
Norway (5)	0.85	37	0.67	0.61	0.63	0.64	0.60	0.60	0.67	0.53	0.58	0.67	0.45	0.54	0.64
Oman	0.94	57	0.86	0.82	0.70	0.85	0.84	0.85	0.70	0.72	0.80	0.75	0.62	0.42	0.79
Pakistan	0.77	31	0.60	0.69	0.80	0.79	0.83	0.75	0.27	-0.01	0.73	-0.13	0.01	0.05	0.27
Philippines	0.85	36	0.57	0.63	0.53	0.59	0.54	0.61	0.70	0.64	0.54	0.54	0.64	0.68	0.57
Poland	0.90	45	0.62	0.61	0.68	0.64	0.73	0.75	0.75	0.67	0.62	0.69	0.55	0.60	0.74
Portugal	0.91	48	0.64	0.64	0.76	0.71	0.76	0.66	0.70	0.68	0.58	0.71	0.72	0.72	0.73
Qatar	0.98	85	0.93	0.95	0.91	0.96	0.94	0.95	0.95	0.93	0.92	0.91	0.91	0.79	0.93
Russian Federation	0.92	52	0.77	0.68	0.66	0.69	0.70	0.76	0.79	0.75	0.66	0.74	0.79	0.56	0.79
Saudi Arabia	0.90	46	0.75	0.77	0.63	0.78	0.74	0.70	0.73	0.47	0.73	0.62	0.42	0.61	0.75
Serbia	0.87	40	0.77	0.73	0.73	0.71	0.75	0.67	0.64	0.59	0.46	0.49	0.47	0.45	0.65
Singapore	0.98	80	0.94	0.93	0.90	0.93	0.89	0.85	0.94	0.94	0.85	0.86	0.78	0.90	0.92
Slovak Republic	0.92	52	0.72	0.82	0.63	0.84	0.65	0.61	0.81	0.72	0.79	0.72	0.72	0.55	0.71
South Africa (5)	0.84	36	0.16	0.11	0.48	0.64	0.41	0.69	0.76	0.70	0.49	0.74	0.76	0.66	0.70
Spain	0.86	39	0.57	0.67	0.61	0.60	0.68	0.65	0.72	0.59	0.59	0.63	0.60	0.53	0.66
Sweden	0.86	40	0.66	0.73	0.58	0.63	0.61	0.62	0.71	0.64	0.58	0.67	0.35	0.63	0.71
Turkey (5)	0.92	52	0.82	0.80	0.67	0.78	0.78	0.59	0.79	0.67	0.76	0.69	0.62	0.52	0.78
United Arab Emirates	0.97	74	0.89	0.88	0.89	0.90	0.89	0.91	0.91	0.86	0.84	0.79	0.78	0.76	0.88
United States	0.93	55	0.77	0.81	0.77	0.78	0.70	0.78	0.79	0.77	0.57	0.67	0.69	0.74	0.75
<b>Benchmarking Participants</b>															
Ontario, Canada	0.89	44	0.68	0.72	0.77	0.63	0.53	0.68	0.76	0.76	0.50	0.64	0.65	0.58	0.62
Quebec, Canada	0.93	54	0.86	0.82	0.68	0.75	0.76	0.69	0.78	0.73	0.63	0.67	0.74	0.71	0.70
Moscow City, Russian Fed.	0.95	65	0.86	0.82	0.77	0.79	0.85	0.83	0.83	0.81	0.80	0.83	0.83	0.59	0.81
Madrid, Spain	0.88	41	0.66	0.68	0.72	0.69	0.70	0.46	0.62	0.61	0.65	0.57	0.66	0.59	0.71
Abu Dhabi, UAE	0.96	70	0.90	0.86	0.86	0.87	0.89	0.91	0.89	0.82	0.80	0.68	0.70	0.75	0.87
Dubai, UAE	0.98	80	0.91	0.94	0.89	0.92	0.85	0.93	0.94	0.88	0.88	0.88	0.86	0.81	0.89

**Relationship Between the TIMSS 2019 *Instruction Affected by Mathematics Resource Shortages* Scale and TIMSS 2019 Achievement – Grade 4**

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
Albania	0.14	0.02	0.03
Armenia	0.05	0.00	0.01
Australia	0.09	0.01	0.01
Austria	0.08	0.01	0.01
Azerbaijan	0.01	0.00	0.00
Bahrain	0.13	0.02	0.01
Belgium (Flemish)	0.02	0.00	0.00
Bosnia and Herzegovina	0.04	0.00	0.00
Bulgaria	0.14	0.02	0.01
Canada	0.08	0.01	0.01
Chile	0.15	0.02	0.04
Chinese Taipei	-0.01	0.00	0.00
Croatia	0.06	0.00	0.00
Cyprus	0.04	0.00	0.01
Czech Republic	-0.03	0.00	0.00
Denmark	0.03	0.00	0.00
England	0.15	0.02	0.00
Finland	0.04	0.00	0.00
France	0.13	0.02	0.01
Georgia	0.03	0.00	0.00
Germany	0.08	0.01	0.00
Hong Kong SAR	-0.06	0.00	0.01
Hungary	-0.04	0.00	0.00
Iran, Islamic Rep. of	0.12	0.01	0.01
Ireland	0.11	0.01	0.01
Italy	0.08	0.01	0.01
Japan	0.01	0.00	0.00
Kazakhstan	-0.01	0.00	0.00
Korea, Rep. of	0.02	0.00	0.00
Kosovo	0.01	0.00	0.00
Kuwait	0.04	0.00	0.01
Latvia	-0.10	0.01	0.01
Lithuania	-0.02	0.00	0.00
Malta	0.08	0.01	0.01
Montenegro	0.02	0.00	0.01
Morocco	-0.25	0.06	0.07
Netherlands	0.04	0.00	0.00
New Zealand	0.09	0.01	0.01

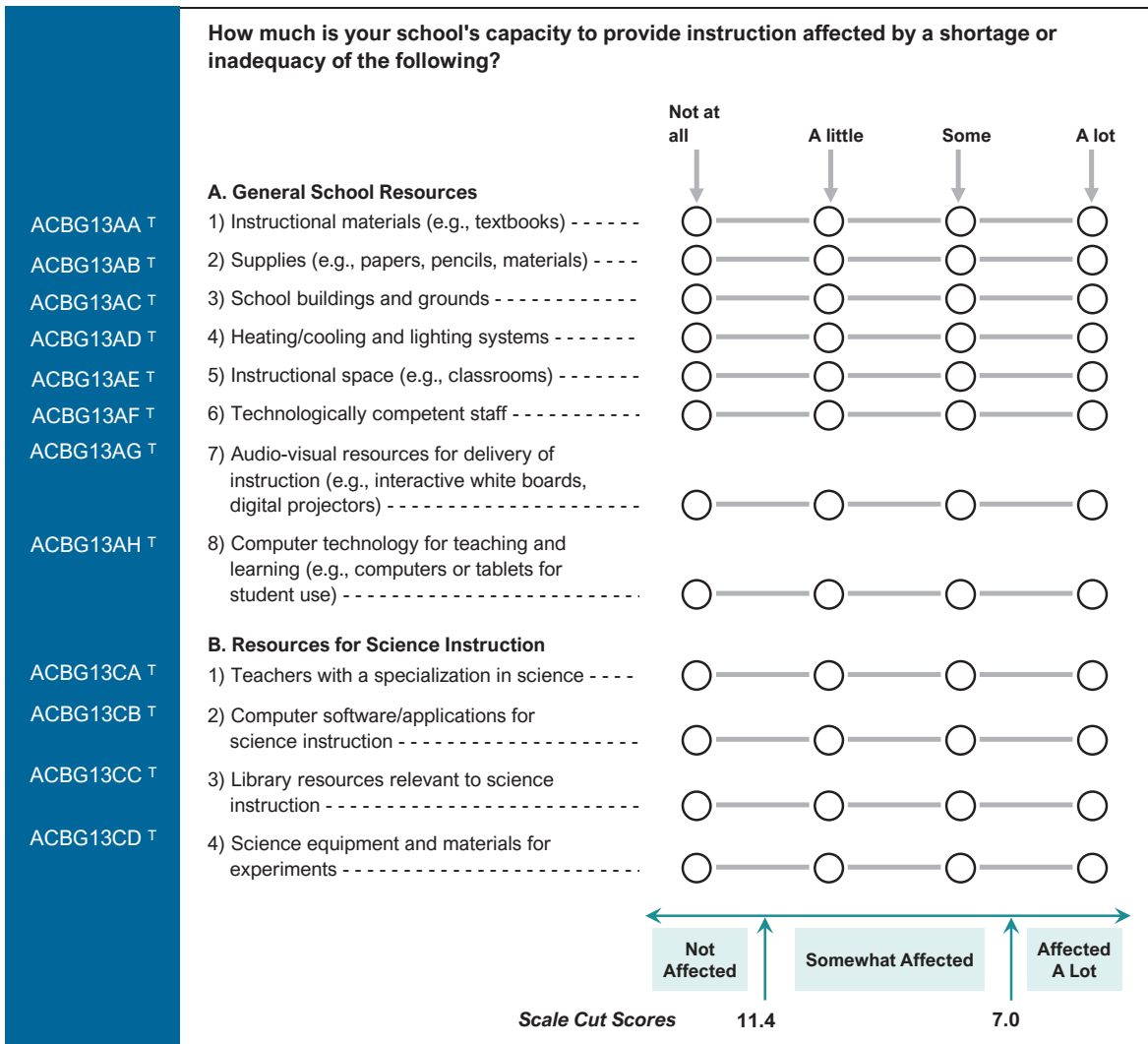
**Relationship Between the TIMSS 2019 *Instruction Affected by Mathematics Resource Shortages* Scale and TIMSS 2019 Achievement – Grade 4**

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
North Macedonia	0.07	0.01	0.00
Northern Ireland	0.04	0.00	0.00
Norway (5)	0.02	0.00	0.00
Oman	0.05	0.00	0.01
Pakistan	-0.16	0.03	0.02
Philippines	0.00	0.00	0.01
Poland	0.04	0.00	0.00
Portugal	0.06	0.00	0.00
Qatar	0.24	0.06	0.06
Russian Federation	0.11	0.01	0.01
Saudi Arabia	-0.04	0.00	0.01
Serbia	0.11	0.01	0.01
Singapore	0.02	0.00	0.01
Slovak Republic	0.08	0.01	0.01
South Africa (5)	0.10	0.01	0.05
Spain	0.13	0.02	0.02
Sweden	0.05	0.00	0.01
Turkey (5)	0.09	0.01	0.01
United Arab Emirates	0.18	0.03	0.06
United States	0.04	0.00	0.00
<b>International Median</b>	<b>0.04</b>	<b>0.00</b>	<b>0.01</b>
<b>Benchmarking Participants</b>			
Ontario, Canada	0.13	0.02	0.03
Quebec, Canada	0.05	0.00	0.00
Moscow City, Russian Fed.	-0.04	0.00	0.00
Madrid, Spain	0.05	0.00	0.00
Abu Dhabi, UAE	0.22	0.05	0.07
Dubai, UAE	0.05	0.00	0.04

# Instruction Affected by Science Resource Shortages – Grade 4

## About the Scale

The *Instruction Affected by Science Resource Shortages* scale was created based on principals' responses to twelve items listed below.



<sup>T</sup> Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.

**Item Parameters for the TIMSS 2019 *Instruction Affected by Science Resource Shortages* Scale – Grade 4**

Item	delta	tau_1	tau_2	tau_3	Infit
ACBG13AA	-0.26317	-0.24640	0.07411	0.17229	0.96
ACBG13AB	-0.49732	-0.22859	0.20397	0.02462	0.89
ACBG13AC	0.00857	-0.72314	0.13827	0.58487	1.07
ACBG13AD	-0.24911	-0.44652	0.18290	0.26362	0.95
ACBG13AE	0.04975	-0.43752	-0.01409	0.45161	1.08
ACBG13AF	0.05434	-1.21339	-0.05364	1.26703	0.97
ACBG13AG	-0.02743	-0.75072	0.03353	0.71719	0.97
ACBG13AH	0.19884	-0.94645	0.03998	0.90647	1.10
ACBG13CA	0.05539	-0.62018	0.03427	0.58591	1.20
ACBG13CB	0.19116	-1.27970	0.01680	1.26290	1.11
ACBG13CC	-0.02535	-1.27782	-0.03564	1.31346	1.02
ACBG13CD	0.50433	-1.02898	-0.04452	1.07350	1.08

**Scale Transformation Constants for the TIMSS 2019 *Instruction Affected by Science Resource Shortages* Scale – Grade 4**

**Scale Transformation Constants**

A = 9.169706

B = 1.659666

Transformed Scale Score = 9.169706 + 1.659666 • Logit Scale Score

**Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS  
2019 Instruction Affected by Science Resource Shortages Scale – Grade 4**

Raw Score	Transformed Scale Score	Cutpoint
0	2.54711	
1	4.40071	
2	5.27500	
3	5.85711	
4	6.29613	
5	6.64979	
6	6.94814	7.0
7	7.20753	
8	7.43843	
9	7.64797	
10	7.84045	
11	8.02213	
12	8.19407	
13	8.35844	
14	8.51709	
15	8.67164	
16	8.82352	
17	8.97398	
18	9.12232	
19	9.27534	
20	9.42850	
21	9.58484	
22	9.74563	
23	9.91222	
24	10.08616	
25	10.26917	
26	10.46207	
27	10.67024	
28	10.89636	
29	11.14546	
30	11.42448	11.4
31	11.74332	
32	12.11928	
33	12.58077	
34	13.18547	
35	14.08130	
36	15.95552	



### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 Instruction Affected by Science Resource Shortages Scale – Grade 4

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item											
			ACBG13AA	ACBG13AB	ACBG13AC	ACBG13AD	ACBG13AE	ACBG13AF	ACBG13AG	ACBG13AH	ACBG13CA	ACBG13CB	ACBG13CC	ACBG13CD
Albania	0.91	50	0.67	0.76	0.79	0.76	0.71	0.71	0.67	0.68	0.68	0.61	0.66	0.71
Armenia	0.87	42	0.60	0.54	0.65	0.69	0.55	0.68	0.68	0.67	0.69	0.69	0.70	0.64
Australia	0.89	46	0.65	0.68	0.71	0.63	0.73	0.72	0.75	0.80	0.47	0.57	0.70	0.68
Austria	0.83	35	0.49	0.55	0.64	0.55	0.63	0.60	0.59	0.64	0.53	0.60	0.67	0.56
Azerbaijan	0.85	38	0.52	0.53	0.56	0.65	0.56	0.73	0.56	0.62	0.67	0.65	0.75	0.54
Bahrain	0.97	76	0.92	0.91	0.88	0.91	0.95	0.88	0.89	0.83	0.90	0.76	0.76	0.87
Belgium (Flemish)	0.89	46	0.66	0.66	0.66	0.72	0.66	0.65	0.77	0.72	0.51	0.76	0.68	0.66
Bosnia and Herzegovina	0.89	44	0.70	0.69	0.73	0.69	0.71	0.62	0.72	0.69	0.58	0.61	0.66	0.53
Bulgaria	0.83	41	0.79	0.81	0.75	0.82	0.65	0.29	0.74	0.64	0.65	0.43	0.50	0.29
Canada	0.89	45	0.74	0.75	0.74	0.68	0.65	0.69	0.75	0.77	0.47	0.60	0.68	0.48
Chile	0.91	51	0.66	0.68	0.70	0.62	0.74	0.77	0.80	0.77	0.64	0.69	0.77	0.69
Chinese Taipei	0.92	55	0.74	0.73	0.70	0.79	0.72	0.75	0.82	0.79	0.70	0.69	0.70	0.78
Croatia	0.87	42	0.67	0.73	0.69	0.74	0.66	0.68	0.57	0.35	0.60	0.63	0.57	0.75
Cyprus	0.91	52	0.84	0.80	0.64	0.75	0.80	0.77	0.71	0.59	0.59	0.78	0.65	0.67
Czech Republic	0.77	29	0.57	0.55	0.37	0.42	0.42	0.46	0.65	0.63	0.40	0.74	0.57	0.60
Denmark	0.90	48	0.79	0.75	0.63	0.57	0.58	0.68	0.81	0.77	0.59	0.70	0.68	0.70
England	0.84	38	0.48	0.26	0.67	0.56	0.49	0.63	0.61	0.65	0.60	0.71	0.76	0.77
Finland	0.88	43	0.69	0.55	0.63	0.57	0.73	0.71	0.71	0.69	0.58	0.61	0.61	0.73
France	0.81	34	0.45	0.37	0.44	0.28	0.39	0.65	0.72	0.61	0.66	0.74	0.74	0.65
Georgia	0.90	49	0.74	0.64	0.60	0.66	0.63	0.69	0.72	0.76	0.66	0.78	0.74	0.73
Germany	0.83	37	0.62	0.66	0.54	0.41	0.56	0.55	0.67	0.74	0.48	0.68	0.65	0.60
Hong Kong SAR	0.93	58	0.83	0.81	0.74	0.85	0.80	0.77	0.84	0.83	0.50	0.62	0.77	0.69
Hungary	0.90	48	0.71	0.61	0.70	0.76	0.75	0.62	0.76	0.71	0.59	0.74	0.67	0.65
Iran, Islamic Rep. of	0.91	51	0.72	0.76	0.71	0.78	0.81	0.74	0.67	0.41	0.79	0.74	0.61	0.71
Ireland	0.82	34	0.60	0.61	0.58	0.64	0.55	0.64	0.79	0.64	0.52	0.48	0.47	0.45
Italy	0.87	42	0.63	0.62	0.64	0.59	0.69	0.65	0.71	0.67	0.58	0.73	0.67	0.53
Japan	0.90	50	0.77	0.79	0.78	0.60	0.79	0.61	0.65	0.68	0.61	0.59	0.68	0.86
Kazakhstan	0.93	58	0.77	0.74	0.67	0.77	0.76	0.75	0.81	0.78	0.80	0.79	0.76	0.73
Korea, Rep. of	0.96	70	0.87	0.90	0.78	0.90	0.89	0.80	0.83	0.84	0.73	0.77	0.81	0.88
Kosovo	0.83	35	0.59	0.68	0.60	0.61	0.53	0.64	0.65	0.61	0.50	0.60	0.54	0.55
Kuwait	0.95	64	0.85	0.84	0.78	0.83	0.88	0.79	0.81	0.78	0.81	0.68	0.66	0.86
Latvia	0.89	46	0.76	0.70	0.66	0.71	0.68	0.68	0.61	0.57	0.71	0.63	0.72	0.69
Lithuania	0.86	40	0.66	0.67	0.40	0.54	0.44	0.70	0.67	0.70	0.55	0.77	0.68	0.72
Malta	0.88	45	0.77	0.72	0.67	0.56	0.58	0.77	0.80	0.83	0.53	0.56	0.44	0.67
Montenegro	0.89	45	0.72	0.72	0.72	0.71	0.67	0.71	0.70	0.71	0.51	0.62	0.70	0.57
Morocco	0.76	37	-0.21	0.07	0.33	0.55	-0.18	0.77	0.75	0.70	0.64	0.84	0.83	0.71
Netherlands	0.83	37	0.60	0.44	0.71	0.53	0.47	0.64	0.65	0.45	0.60	0.67	0.71	0.70
New Zealand	0.88	46	0.75	0.80	0.73	0.77	0.72	0.72	0.83	0.74	0.31	0.48	0.61	0.44
North Macedonia	0.90	48	0.72	0.78	0.70	0.78	0.72	0.78	0.75	0.68	0.60	0.64	0.61	0.51
Northern Ireland	0.86	40	0.69	0.61	0.64	0.48	0.55	0.62	0.69	0.74	0.62	0.58	0.64	0.69

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Instruction Affected by Science Resource Shortages* Scale – Grade 4

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item											
			ACBG13AA	ACBG13AB	ACBG13AC	ACBG13AD	ACBG13AE	ACBG13AF	ACBG13AG	ACBG13AH	ACBG13CA	ACBG13CB	ACBG13CC	ACBG13CD
Norway (5)	0.83	35	0.65	0.50	0.65	0.63	0.63	0.67	0.67	0.54	0.51	0.63	0.53	0.48
Oman	0.94	62	0.86	0.82	0.71	0.85	0.86	0.85	0.69	0.72	0.83	0.74	0.73	0.73
Pakistan	0.77	33	0.26	0.57	0.41	0.64	0.45	0.73	0.65	0.50	0.67	0.59	0.69	0.59
Philippines	0.83	36	0.59	0.65	0.57	0.62	0.59	0.63	0.70	0.60	0.42	0.50	0.65	0.66
Poland	0.89	46	0.59	0.61	0.68	0.68	0.73	0.76	0.75	0.72	0.67	0.66	0.66	0.59
Portugal	0.90	47	0.62	0.64	0.75	0.70	0.76	0.68	0.71	0.70	0.55	0.69	0.67	0.71
Qatar	0.99	87	0.94	0.95	0.92	0.96	0.94	0.95	0.95	0.93	0.93	0.88	0.92	0.92
Russian Federation	0.92	54	0.76	0.67	0.68	0.67	0.71	0.77	0.78	0.77	0.68	0.78	0.77	0.76
Saudi Arabia	0.90	48	0.72	0.75	0.62	0.76	0.71	0.71	0.77	0.53	0.72	0.70	0.56	0.72
Serbia	0.88	44	0.76	0.72	0.75	0.70	0.76	0.68	0.69	0.59	0.43	0.53	0.62	0.64
Singapore	0.98	80	0.93	0.92	0.90	0.93	0.90	0.86	0.95	0.94	0.81	0.88	0.84	0.90
Slovak Republic	0.91	51	0.71	0.81	0.65	0.84	0.67	0.62	0.82	0.73	0.77	0.71	0.70	0.43
South Africa (5)	0.83	38	0.02	-0.01	0.43	0.63	0.34	0.63	0.80	0.75	0.60	0.79	0.82	0.80
Spain	0.86	40	0.56	0.65	0.65	0.62	0.69	0.68	0.73	0.60	0.59	0.59	0.65	0.56
Sweden	0.85	39	0.67	0.72	0.62	0.65	0.65	0.63	0.71	0.67	0.57	0.59	0.36	0.61
Turkey (5)	0.92	53	0.81	0.79	0.69	0.80	0.80	0.60	0.80	0.68	0.77	0.67	0.60	0.72
United Arab Emirates	0.97	77	0.89	0.88	0.89	0.90	0.90	0.91	0.91	0.86	0.85	0.78	0.83	0.90
United States	0.92	53	0.76	0.77	0.78	0.78	0.72	0.79	0.79	0.76	0.57	0.61	0.69	0.66
<b>Benchmarking Participants</b>														
Ontario, Canada	0.89	45	0.69	0.70	0.77	0.61	0.53	0.69	0.73	0.78	0.62	0.64	0.71	0.56
Quebec, Canada	0.88	47	0.86	0.83	0.71	0.76	0.79	0.71	0.80	0.75	0.25	0.53	0.62	0.28
Moscow City, Russian Fed.	0.95	67	0.86	0.81	0.76	0.78	0.85	0.83	0.83	0.82	0.81	0.79	0.81	0.85
Madrid, Spain	0.87	41	0.66	0.67	0.73	0.67	0.70	0.50	0.60	0.60	0.63	0.63	0.65	0.63
Abu Dhabi, UAE	0.96	72	0.89	0.86	0.87	0.88	0.89	0.91	0.90	0.83	0.82	0.65	0.77	0.89
Dubai, UAE	0.98	81	0.91	0.95	0.88	0.92	0.85	0.94	0.94	0.90	0.88	0.84	0.89	0.88

**Relationship Between the TIMSS 2019 *Instruction Affected by Science Resource Shortages* Scale and TIMSS 2019 Achievement – Grade 4**

Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
Albania	0.13	0.02	0.04
Armenia	0.06	0.00	0.01
Australia	0.10	0.01	0.01
Austria	0.13	0.02	0.02
Azerbaijan	0.01	0.00	0.00
Bahrain	0.18	0.03	0.03
Belgium (Flemish)	0.02	0.00	0.00
Bosnia and Herzegovina	0.05	0.00	0.00
Bulgaria	0.16	0.02	0.01
Canada	0.08	0.01	0.00
Chile	0.14	0.02	0.03
Chinese Taipei	-0.01	0.00	0.00
Croatia	0.02	0.00	0.00
Cyprus	0.01	0.00	0.01
Czech Republic	-0.05	0.00	0.00
Denmark	-0.01	0.00	0.00
England	0.17	0.03	0.02
Finland	0.02	0.00	0.00
France	0.14	0.02	0.02
Georgia	0.02	0.00	0.00
Germany	0.07	0.00	0.00
Hong Kong SAR	-0.05	0.00	0.01
Hungary	-0.04	0.00	0.00
Iran, Islamic Rep. of	0.13	0.02	0.02
Ireland	0.05	0.00	0.01
Italy	0.05	0.00	0.00
Japan	0.01	0.00	0.00
Kazakhstan	0.02	0.00	0.00
Korea, Rep. of	0.02	0.00	0.00
Kosovo	0.01	0.00	0.00
Kuwait	-0.01	0.00	0.01
Latvia	-0.06	0.00	0.01
Lithuania	-0.02	0.00	0.00
Malta	0.13	0.02	0.01
Montenegro	0.00	0.00	0.01
Morocco	-0.22	0.05	0.05
Netherlands	0.07	0.00	0.00
New Zealand	0.08	0.01	0.01

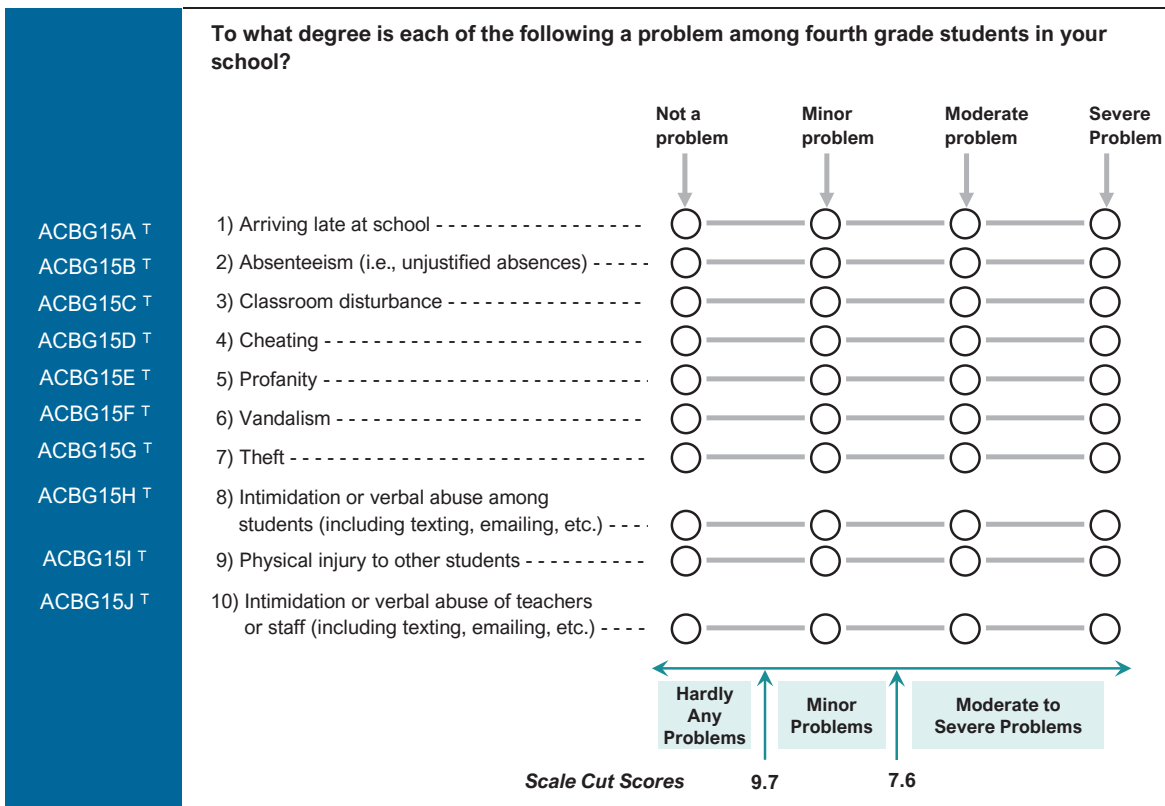
**Relationship Between the TIMSS 2019 *Instruction Affected by Science Resource Shortages* Scale and TIMSS 2019 Achievement – Grade 4**

Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
North Macedonia	0.10	0.01	0.01
Northern Ireland	0.02	0.00	0.00
Norway (5)	0.04	0.00	0.00
Oman	0.04	0.00	0.00
Pakistan	-0.16	0.03	0.03
Philippines	-0.02	0.00	0.02
Poland	0.04	0.00	0.00
Portugal	0.06	0.00	0.00
Qatar	0.20	0.04	0.04
Russian Federation	0.08	0.01	0.00
Saudi Arabia	-0.04	0.00	0.01
Serbia	0.12	0.01	0.01
Singapore	0.01	0.00	0.00
Slovak Republic	0.11	0.01	0.01
South Africa (5)	0.10	0.01	0.05
Spain	0.15	0.02	0.02
Sweden	0.06	0.00	0.01
Turkey (5)	0.09	0.01	0.01
United Arab Emirates	0.15	0.02	0.06
United States	0.05	0.00	0.00
<b>International Median</b>	<b>0.05</b>	<b>0.00</b>	<b>0.01</b>
<b>Benchmarking Participants</b>			
Ontario, Canada	0.10	0.01	0.01
Quebec, Canada	0.02	0.00	0.00
Moscow City, Russian Fed.	-0.05	0.00	0.00
Madrid, Spain	0.05	0.00	0.00
Abu Dhabi, UAE	0.21	0.05	0.07
Dubai, UAE	-0.02	0.00	0.03

# School Discipline – Grade 4

## About the Scale

The *School Discipline* scale was created based on principals’ responses to ten items listed below.



<sup>T</sup> Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.

### Item Parameters for the TIMSS 2019 School Discipline Scale – Grade 4

Item	delta	tau_1	tau_2	tau_3	Infit
ACBG15A	-0.04835	-2.12043	-0.42165	2.54208	1.27
ACBG15B	0.28790	-1.45910	-0.51461	1.97371	1.22
ACBG15C	0.78849	-2.13154	-0.25288	2.38442	1.00
ACBG15D	-0.50395	-1.36108	-0.70227	2.06335	1.07
ACBG15E	0.48418	-1.65568	-0.39478	2.05046	0.91
ACBG15F	-0.31766	-0.47898	-0.62657	1.10555	0.86
ACBG15G	-0.53958	0.31575	-1.17406	0.85831	0.77
ACBG15H	0.21488	-1.40063	-0.58577	1.98640	0.94
ACBG15I	0.30591	-1.40756	-0.73711	2.14467	0.85
ACBG15J	-0.67182	0.16233	-0.91357	0.75124	0.87

### Scale Transformation Constants for the TIMSS 2019 School Discipline Scale – Grade 4

#### Scale Transformation Constants

A = 7.809340

B = 0.952078

Transformed Scale Score = 7.809340 + 0.952078 • Logit Scale Score

**Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS  
2019 School Discipline Scale – Grade 4**

Raw Score	Transformed Scale Score	Cutpoint
0	3.70440	
1	4.77250	
2	5.27812	
3	5.61661	
4	5.87500	
5	6.08629	
6	6.26778	
7	6.42945	
8	6.57768	
9	6.71549	
10	6.84975	
11	6.98118	
12	7.11207	
13	7.24453	
14	7.38070	
15	7.52341	7.6
16	7.67299	
17	7.83372	
18	8.00732	
19	8.19660	
20	8.40499	
21	8.63392	
22	8.88534	
23	9.16002	
24	9.45841	
25	9.78042	9.7
26	10.13101	
27	10.52330	
28	10.98914	
29	11.61576	
30	12.79234	

**Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 School Discipline Scale – Grade 4**

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
Albania	0.92	61	0.67	0.80	0.63	0.73	0.75	0.86	0.88	0.83	0.80	0.85
Armenia	0.95	67	0.68	0.77	0.83	0.67	0.88	0.87	0.84	0.88	0.87	0.88
Australia	0.89	52	0.61	0.67	0.75	0.65	0.82	0.74	0.63	0.76	0.80	0.74
Austria	0.89	51	0.59	0.68	0.73	0.65	0.82	0.73	0.70	0.76	0.84	0.62
Azerbaijan	0.96	76	0.73	0.85	0.88	0.73	0.88	0.93	0.94	0.92	0.90	0.93
Bahrain	0.97	80	0.83	0.86	0.83	0.93	0.90	0.93	0.91	0.93	0.93	0.88
Belgium (Flemish)	0.85	45	0.48	0.52	0.76	0.52	0.78	0.71	0.58	0.78	0.80	0.69
Bosnia and Herzegovina	0.96	75	0.74	0.83	0.88	0.75	0.85	0.93	0.94	0.88	0.90	0.92
Bulgaria	0.94	67	0.69	0.82	0.80	0.85	0.81	0.89	0.88	0.81	0.81	0.81
Canada	0.88	49	0.61	0.64	0.70	0.62	0.81	0.76	0.68	0.70	0.74	0.72
Chile	0.90	55	0.54	0.63	0.76	0.76	0.82	0.76	0.75	0.80	0.78	0.75
Chinese Taipei	0.90	54	0.69	0.65	0.69	0.73	0.78	0.81	0.82	0.80	0.79	0.56
Croatia	0.86	45	0.63	0.56	0.63	0.71	0.68	0.76	0.60	0.73	0.74	0.66
Cyprus	0.90	55	0.66	0.72	0.79	0.63	0.80	0.73	0.69	0.82	0.81	0.72
Czech Republic	0.87	47	0.52	0.47	0.67	0.77	0.81	0.76	0.72	0.75	0.76	0.58
Denmark	0.80	36	0.61	0.57	0.61	0.23	0.71	0.58	0.49	0.70	0.76	0.62
England	0.63	24	0.28	0.31	0.50	0.38	0.64	0.60	0.24	0.48	0.63	0.64
Finland	0.84	42	0.50	0.57	0.76	0.43	0.77	0.68	0.59	0.80	0.71	0.58
France	0.88	49	0.53	0.64	0.62	0.64	0.77	0.72	0.67	0.77	0.84	0.74
Georgia	0.97	76	0.77	0.77	0.85	0.80	0.92	0.93	0.93	0.93	0.89	0.89
Germany	0.88	49	0.63	0.61	0.75	0.67	0.79	0.77	0.73	0.70	0.75	0.61
Hong Kong SAR	0.88	49	0.70	0.60	0.71	0.71	0.82	0.79	0.73	0.58	0.77	0.56
Hungary	0.88	50	0.61	0.71	0.72	0.74	0.72	0.71	0.74	0.77	0.71	0.65
Iran, Islamic Rep. of	0.91	55	0.69	0.70	0.74	0.76	0.83	0.78	0.79	0.75	0.70	0.62
Ireland	0.82	41	0.58	0.60	0.80	0.64	0.73	0.51	0.64	0.73	0.63	0.47
Italy	0.91	58	0.45	0.73	0.66	0.61	0.68	0.88	0.87	0.83	0.89	0.86
Japan	0.88	54	0.56	0.42	0.82	0.80	0.87	0.78	0.78	0.80	0.60	0.80
Kazakhstan	0.97	82	0.71	0.92	0.90	0.76	0.90	0.96	0.96	0.96	0.95	0.96
Korea, Rep. of	0.96	73	0.70	0.81	0.78	0.90	0.84	0.91	0.92	0.89	0.89	0.87
Kosovo	0.96	75	0.76	0.79	0.85	0.84	0.87	0.92	0.91	0.92	0.88	0.90
Kuwait	0.94	63	0.61	0.67	0.82	0.83	0.85	0.86	0.83	0.84	0.79	0.80
Latvia	0.79	35	0.47	0.48	0.57	0.51	0.76	0.58	0.60	0.68	0.73	0.44
Lithuania	0.82	40	0.68	0.66	0.60	0.72	0.63	0.71	0.51	0.56	0.51	0.67
Malta	0.88	50	0.68	0.65	0.68	0.69	0.72	0.79	0.69	0.75	0.71	0.72
Montenegro	0.96	73	0.69	0.82	0.86	0.67	0.89	0.91	0.91	0.91	0.89	0.92
Morocco	0.96	76	0.63	0.76	0.87	0.91	0.92	0.93	0.94	0.89	0.91	0.87
Netherlands	0.72	31	0.28	0.41	0.75	0.43	0.59	0.44	0.49	0.68	0.59	0.70
New Zealand	0.89	52	0.65	0.67	0.76	0.55	0.80	0.69	0.74	0.75	0.83	0.76
North Macedonia	0.95	68	0.64	0.73	0.87	0.81	0.84	0.85	0.89	0.86	0.88	0.86
Northern Ireland	0.79	38	0.48	0.53	0.72	0.63	0.71	0.40	0.53	0.64	0.76	0.62



### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 School Discipline Scale – Grade 4

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
Norway (5)	0.88	51	0.64	0.52	0.75	0.68	0.77	0.76	0.69	0.73	0.76	0.79
Oman	0.96	75	0.73	0.82	0.76	0.92	0.89	0.92	0.92	0.91	0.87	0.88
Pakistan	0.91	56	0.65	0.64	0.65	0.79	0.84	0.78	0.86	0.80	0.77	0.69
Philippines	0.87	47	0.55	0.67	0.60	0.76	0.74	0.73	0.73	0.68	0.70	0.65
Poland	0.84	42	0.52	0.64	0.69	0.58	0.74	0.79	0.64	0.66	0.68	0.44
Portugal	0.93	63	0.55	0.83	0.77	0.69	0.75	0.86	0.88	0.85	0.81	0.87
Qatar	0.95	69	0.71	0.77	0.80	0.90	0.82	0.86	0.86	0.84	0.86	0.86
Russian Federation	0.82	40	0.58	0.51	0.58	0.42	0.62	0.73	0.75	0.75	0.70	0.59
Saudi Arabia	0.96	75	0.59	0.73	0.80	0.91	0.91	0.93	0.94	0.93	0.94	0.92
Serbia	0.96	72	0.83	0.80	0.85	0.81	0.81	0.91	0.91	0.87	0.84	0.87
Singapore	0.84	42	0.61	0.61	0.69	0.62	0.73	0.67	0.64	0.66	0.75	0.49
Slovak Republic	0.90	54	0.69	0.71	0.70	0.69	0.82	0.81	0.76	0.74	0.70	0.73
South Africa (5)	0.89	51	0.63	0.65	0.75	0.70	0.73	0.75	0.73	0.76	0.82	0.58
Spain	0.91	57	0.59	0.72	0.66	0.66	0.74	0.86	0.78	0.80	0.83	0.84
Sweden	0.81	38	0.58	0.55	0.73	0.45	0.70	0.63	0.26	0.64	0.73	0.72
Turkey (5)	0.96	73	0.74	0.79	0.85	0.88	0.82	0.88	0.89	0.90	0.84	0.90
United Arab Emirates	0.93	63	0.65	0.70	0.74	0.81	0.81	0.85	0.85	0.85	0.84	0.81
United States	0.89	53	0.64	0.66	0.65	0.68	0.76	0.76	0.79	0.77	0.78	0.75
<b>Benchmarking Participants</b>												
Ontario, Canada	0.88	50	0.62	0.65	0.73	0.55	0.82	0.75	0.71	0.73	0.75	0.72
Quebec, Canada	0.87	48	0.56	0.66	0.61	0.69	0.78	0.78	0.68	0.69	0.69	0.74
Moscow City, Russian Fed.	0.87	48	0.59	0.61	0.64	0.65	0.72	0.78	0.76	0.75	0.70	0.73
Madrid, Spain	0.93	62	0.60	0.79	0.77	0.77	0.81	0.89	0.79	0.81	0.82	0.81
Abu Dhabi, UAE	0.90	53	0.64	0.64	0.71	0.69	0.75	0.76	0.76	0.83	0.83	0.67
Dubai, UAE	0.83	45	0.47	0.57	0.61	0.70	0.75	0.77	0.73	0.62	0.68	0.74

### Relationship Between the TIMSS 2019 School Discipline Scale and TIMSS 2019 Achievement – Grade 4

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
Albania	0.02	0.00	0.00	0.03	0.00	0.00
Armenia	0.05	0.00	0.01	0.06	0.00	0.01
Australia	0.24	0.06	0.05	0.23	0.05	0.05
Austria	0.16	0.02	0.02	0.19	0.04	0.03
Azerbaijan	0.00	0.00	0.01	-0.01	0.00	0.01
Bahrain	0.16	0.03	0.02	0.26	0.07	0.05
Belgium (Flemish)	0.14	0.02	0.02	0.16	0.03	0.02
Bosnia and Herzegovina	0.01	0.00	0.00	0.05	0.00	0.00
Bulgaria	0.21	0.04	0.06	0.21	0.04	0.06
Canada	0.12	0.01	0.02	0.10	0.01	0.01
Chile	0.18	0.03	0.03	0.18	0.03	0.02
Chinese Taipei	0.01	0.00	0.00	0.01	0.00	0.00
Croatia	-0.04	0.00	0.00	-0.03	0.00	0.00
Cyprus	0.13	0.02	0.02	0.12	0.01	0.01
Czech Republic	0.11	0.01	0.01	0.11	0.01	0.01
Denmark	0.10	0.01	0.01	0.09	0.01	0.01
England	0.23	0.05	0.02	0.26	0.07	0.02
Finland	0.08	0.01	0.01	0.08	0.01	0.02
France	0.17	0.03	0.02	0.17	0.03	0.03
Georgia	0.03	0.00	0.00	0.04	0.00	0.00
Germany	0.25	0.06	0.06	0.26	0.07	0.07
Hong Kong SAR	0.15	0.02	0.02	0.18	0.03	0.03
Hungary	0.18	0.03	0.04	0.17	0.03	0.04
Iran, Islamic Rep. of	0.14	0.02	0.01	0.15	0.02	0.01
Ireland	0.15	0.02	0.01	0.15	0.02	0.01
Italy	0.06	0.00	0.00	0.07	0.01	0.00
Japan	0.05	0.00	0.00	0.04	0.00	0.00
Kazakhstan	0.05	0.00	0.00	0.05	0.00	0.00
Korea, Rep. of	0.07	0.00	0.01	0.06	0.00	0.00
Kosovo	-0.07	0.00	0.00	-0.08	0.01	0.01
Kuwait	0.14	0.02	0.02	0.20	0.04	0.04
Latvia	0.00	0.00	0.00	0.01	0.00	0.00
Lithuania	-0.11	0.01	0.01	-0.12	0.01	0.01
Malta	0.17	0.03	0.04	0.17	0.03	0.04
Montenegro	-0.02	0.00	0.00	-0.02	0.00	0.00
Morocco	0.03	0.00	0.02	0.02	0.00	0.02
Netherlands	0.11	0.01	0.01	0.15	0.02	0.01

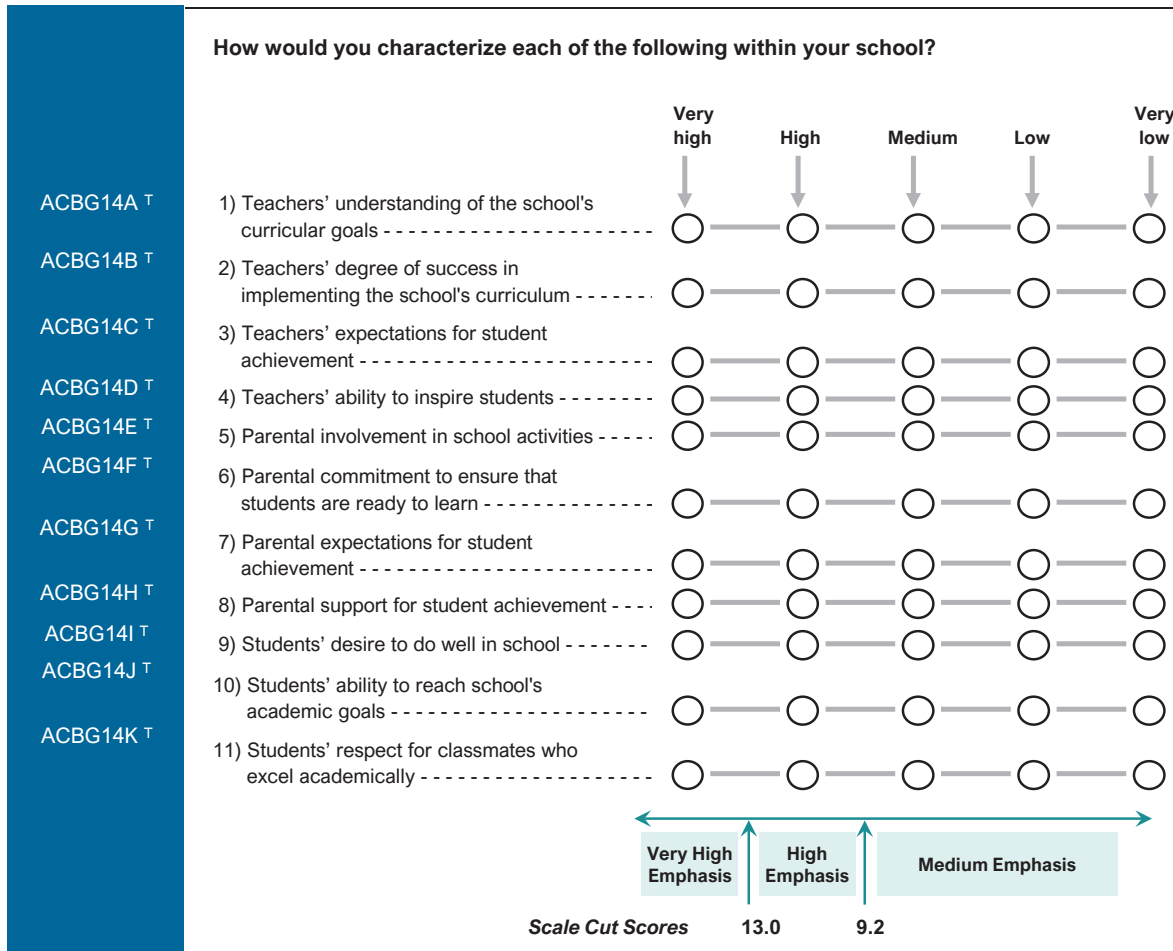
### Relationship Between the TIMSS 2019 School Discipline Scale and TIMSS 2019 Achievement – Grade 4

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
New Zealand	0.25	0.06	0.05	0.26	0.07	0.06
North Macedonia	0.08	0.01	0.01	0.09	0.01	0.01
Northern Ireland	0.15	0.02	0.02	0.13	0.02	0.01
Norway (5)	0.06	0.00	0.00	0.06	0.00	0.01
Oman	0.01	0.00	0.00	0.01	0.00	0.00
Pakistan	-0.06	0.00	0.01	-0.06	0.00	0.01
Philippines	0.13	0.02	0.04	0.13	0.02	0.04
Poland	-0.01	0.00	0.00	-0.01	0.00	0.00
Portugal	0.09	0.01	0.01	0.08	0.01	0.01
Qatar	0.05	0.00	0.01	0.06	0.00	0.01
Russian Federation	0.03	0.00	0.00	0.02	0.00	0.00
Saudi Arabia	0.07	0.00	0.00	0.07	0.01	0.01
Serbia	-0.03	0.00	0.00	-0.03	0.00	0.00
Singapore	0.05	0.00	0.00	0.06	0.00	0.00
Slovak Republic	0.17	0.03	0.05	0.20	0.04	0.09
South Africa (5)	0.13	0.02	0.01	0.12	0.02	0.01
Spain	0.15	0.02	0.02	0.16	0.03	0.02
Sweden	0.17	0.03	0.01	0.17	0.03	0.01
Turkey (5)	0.20	0.04	0.05	0.20	0.04	0.05
United Arab Emirates	0.22	0.05	0.05	0.24	0.06	0.06
United States	0.18	0.03	0.03	0.20	0.04	0.03
<b>International Median</b>	<b>0.11</b>	<b>0.01</b>	<b>0.01</b>	<b>0.10</b>	<b>0.01</b>	<b>0.01</b>
<b>Benchmarking Participants</b>						
Ontario, Canada	0.17	0.03	0.04	0.13	0.02	0.02
Quebec, Canada	0.03	0.00	0.01	0.02	0.00	0.00
Moscow City, Russian Fed.	0.00	0.00	0.00	0.00	0.00	0.00
Madrid, Spain	0.10	0.01	0.03	0.10	0.01	0.02
Abu Dhabi, UAE	0.22	0.05	0.04	0.25	0.06	0.05
Dubai, UAE	0.04	0.00	0.00	0.05	0.00	0.00

# School Emphasis on Academic Success— Principals’ Reports – Grade 4

## About the Scale

The *School Emphasis on Academic Success* scale was created based on principals’ responses to eleven items listed below.<sup>1</sup>



<sup>1</sup> 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.

<sup>T</sup> Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.

**Item Parameters for the TIMSS 2019 School Emphasis on Academic Success—Principals' Reports Scale – Grade 4**

Item	delta	tau_1	tau_2	tau_3	Infit
ACBG14A	-1.51453	-3.71990	0.14195	3.57795	1.12
ACBG14B	-1.06786	-3.81822	0.14006	3.67816	0.98
ACBG14C	-0.77174	-3.36668	-0.07105	3.43773	1.03
ACBG14D	-0.86155	-3.51615	0.09339	3.42276	1.03
ACBG14E	1.29590	-2.49610	0.11848	2.37762	1.15
ACBG14F	1.41750	-2.64527	0.12898	2.51629	0.95
ACBG14G	-0.15848	-2.55875	-0.22955	2.78830	1.14
ACBG14H	1.31862	-2.82962	0.18549	2.64413	0.90
ACBG14I	0.06237	-3.37852	0.05400	3.32452	0.92
ACBG14J	0.48757	-3.88724	0.26174	3.62550	0.88
ACBG14K	-0.20780	-3.11968	-0.13994	3.25962	1.14

**Scale Transformation Constants for the TIMSS 2019 School Emphasis on Academic Success—Principals' Reports Scale – Grade 4**

**Scale Transformation Constants**

A = 9.213867

B = 1.105570

Transformed Scale Score = 9.213867 + 1.105570 • Logit Scale Score

**Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019  
School Emphasis on Academic Success—Principals' Reports Scale – Grade 4**

Raw Score	Transformed Scale Score	Cutpoint
0	1.33825	
1	2.77163	
2	3.56947	
3	4.18606	
4	4.71768	
5	5.20235	
6	5.65593	
7	6.08580	
8	6.49334	
9	6.87782	
10	7.23985	
11	7.58308	
12	7.91194	
13	8.23156	
14	8.54700	
15	8.86258	
16	9.18132	9.2
17	9.50476	
18	9.83206	
19	10.16093	
20	10.48841	
21	10.81202	
22	11.13070	
23	11.44500	
24	11.75683	
25	12.06931	
26	12.38668	
27	12.71485	
28	13.06080	13.0
29	13.43532	
30	13.85847	
31	14.36918	
32	15.06494	
33	16.40427	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 School Emphasis on Academic Success—Principals' Reports Scale – Grade 4

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item										
			ACBG14A	ACBG14B	ACBG14C	ACBG14D	ACBG14E	ACBG14F	ACBG14G	ACBG14H	ACBG14I	ACBG14J	ACBG14K
Albania	0.86	42	0.62	0.63	0.55	0.62	0.65	0.74	0.63	0.73	0.69	0.73	0.54
Armenia	0.86	43	0.55	0.55	0.63	0.64	0.60	0.81	0.61	0.79	0.73	0.61	0.67
Australia	0.92	55	0.69	0.78	0.74	0.70	0.77	0.75	0.71	0.77	0.78	0.77	0.72
Austria	0.85	41	0.43	0.68	0.68	0.47	0.75	0.80	0.59	0.72	0.60	0.72	0.45
Azerbaijan	0.89	48	0.62	0.73	0.77	0.72	0.65	0.76	0.71	0.70	0.70	0.72	0.55
Bahrain	0.94	63	0.78	0.81	0.83	0.78	0.69	0.79	0.79	0.85	0.85	0.84	0.72
Belgium (Flemish)	0.82	37	0.29	0.48	0.47	0.44	0.74	0.80	0.50	0.74	0.72	0.69	0.60
Bosnia and Herzegovina	0.88	47	0.65	0.65	0.62	0.76	0.68	0.79	0.39	0.67	0.72	0.77	0.73
Bulgaria	0.92	56	0.60	0.69	0.73	0.71	0.77	0.80	0.71	0.82	0.80	0.82	0.72
Canada	0.91	52	0.61	0.68	0.71	0.68	0.76	0.78	0.73	0.81	0.74	0.76	0.68
Chile	0.92	55	0.71	0.78	0.79	0.77	0.70	0.76	0.78	0.79	0.78	0.63	0.69
Chinese Taipei	0.91	53	0.65	0.73	0.66	0.75	0.66	0.77	0.70	0.81	0.78	0.81	0.67
Croatia	0.83	38	0.42	0.64	0.75	0.69	0.62	0.67	0.55	0.65	0.64	0.58	0.52
Cyprus	0.92	55	0.54	0.68	0.59	0.61	0.76	0.88	0.81	0.87	0.82	0.88	0.65
Czech Republic	0.87	44	0.46	0.63	0.58	0.66	0.74	0.73	0.65	0.72	0.75	0.68	0.64
Denmark	0.92	56	0.71	0.74	0.73	0.66	0.73	0.81	0.81	0.85	0.72	0.73	0.69
England	0.88	47	0.70	0.68	0.58	0.63	0.79	0.83	0.81	0.83	0.60	0.63	0.29
Finland	0.88	47	0.57	0.59	0.70	0.61	0.70	0.77	0.71	0.75	0.77	0.73	0.62
France	0.83	40	0.46	0.45	0.43	0.67	0.67	0.79	0.59	0.81	0.76	0.72	0.41
Georgia	0.90	49	0.68	0.68	0.78	0.70	0.74	0.78	0.65	0.78	0.74	0.58	0.58
Germany	0.86	42	0.51	0.56	0.68	0.52	0.73	0.80	0.64	0.78	0.62	0.70	0.54
Hong Kong SAR	0.92	57	0.65	0.78	0.74	0.78	0.66	0.84	0.82	0.81	0.73	0.83	0.65
Hungary	0.89	50	0.37	0.68	0.67	0.75	0.69	0.83	0.59	0.82	0.79	0.75	0.67
Iran, Islamic Rep. of	0.89	49	0.64	0.76	0.55	0.68	0.72	0.76	0.69	0.73	0.69	0.77	0.68
Ireland	0.92	56	0.65	0.66	0.73	0.70	0.77	0.86	0.83	0.80	0.78	0.81	0.58
Italy	0.87	45	0.68	0.73	0.67	0.67	0.58	0.72	0.54	0.77	0.67	0.78	0.53
Japan	0.89	47	0.56	0.58	0.72	0.59	0.68	0.79	0.77	0.82	0.72	0.75	0.47
Kazakhstan	0.90	50	0.63	0.67	0.70	0.74	0.66	0.77	0.70	0.80	0.68	0.71	0.72
Korea, Rep. of	0.92	56	0.64	0.70	0.73	0.70	0.79	0.78	0.72	0.82	0.81	0.78	0.76
Kosovo	0.85	41	0.62	0.61	0.64	0.68	0.65	0.72	0.60	0.63	0.67	0.75	0.43
Kuwait	0.92	57	0.72	0.70	0.78	0.77	0.75	0.80	0.77	0.80	0.77	0.78	0.65
Latvia	0.78	32	0.47	0.46	0.53	0.63	0.62	0.65	0.43	0.72	0.64	0.53	0.41
Lithuania	0.87	43	0.67	0.72	0.71	0.73	0.72	0.71	0.59	0.68	0.55	0.59	0.50
Malta	0.89	48	0.41	0.58	0.71	0.67	0.60	0.84	0.78	0.77	0.75	0.76	0.66
Montenegro	0.82	37	0.69	0.68	0.39	0.53	0.68	0.72	0.34	0.67	0.58	0.68	0.62
Morocco	0.90	51	0.66	0.65	0.74	0.71	0.75	0.81	0.74	0.76	0.67	0.74	0.57
Netherlands	0.81	37	0.55	0.67	0.62	0.60	0.12	0.53	0.65	0.64	0.67	0.77	0.59
New Zealand	0.90	52	0.60	0.71	0.72	0.69	0.63	0.74	0.77	0.79	0.77	0.77	0.67
North Macedonia	0.90	52	0.68	0.70	0.74	0.72	0.71	0.81	0.61	0.72	0.74	0.79	0.68
Northern Ireland	0.90	51	0.43	0.62	0.80	0.60	0.69	0.82	0.84	0.77	0.81	0.72	0.64

**Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 School Emphasis on Academic Success—Principals' Reports Scale – Grade 4**

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item										
			ACBG14A	ACBG14B	ACBG14C	ACBG14D	ACBG14E	ACBG14F	ACBG14G	ACBG14H	ACBG14I	ACBG14J	ACBG14K
Norway (5)	0.85	41	0.61	0.54	0.72	0.64	0.79	0.71	0.67	0.75	0.55	0.43	0.54
Oman	0.90	50	0.62	0.67	0.73	0.70	0.73	0.80	0.65	0.77	0.72	0.71	0.62
Pakistan	0.89	48	0.60	0.70	0.70	0.52	0.69	0.73	0.61	0.79	0.76	0.73	0.75
Philippines	0.91	52	0.53	0.60	0.56	0.67	0.75	0.87	0.81	0.83	0.79	0.78	0.66
Poland	0.88	46	0.60	0.67	0.65	0.67	0.68	0.72	0.63	0.76	0.78	0.68	0.61
Portugal	0.88	47	0.58	0.67	0.72	0.61	0.72	0.78	0.67	0.78	0.72	0.67	0.60
Qatar	0.91	53	0.64	0.67	0.74	0.74	0.69	0.79	0.63	0.76	0.80	0.81	0.69
Russian Federation	0.87	43	0.62	0.72	0.63	0.61	0.73	0.69	0.51	0.71	0.70	0.72	0.58
Saudi Arabia	0.90	51	0.68	0.71	0.66	0.63	0.71	0.78	0.69	0.80	0.79	0.77	0.62
Serbia	0.86	42	0.66	0.75	0.66	0.67	0.60	0.74	0.47	0.64	0.65	0.62	0.60
Singapore	0.91	53	0.55	0.71	0.77	0.58	0.72	0.80	0.81	0.79	0.81	0.80	0.62
Slovak Republic	0.87	44	0.59	0.69	0.59	0.55	0.68	0.74	0.54	0.79	0.81	0.71	0.53
South Africa (5)	0.90	49	0.58	0.66	0.65	0.67	0.77	0.78	0.72	0.79	0.67	0.67	0.72
Spain	0.89	47	0.47	0.65	0.74	0.63	0.78	0.82	0.75	0.81	0.63	0.69	0.52
Sweden	0.91	54	0.67	0.76	0.76	0.65	0.76	0.81	0.76	0.81	0.72	0.80	0.52
Turkey (5)	0.89	49	0.62	0.69	0.72	0.60	0.78	0.81	0.63	0.78	0.70	0.74	0.57
United Arab Emirates	0.94	63	0.81	0.82	0.84	0.81	0.75	0.83	0.67	0.81	0.83	0.83	0.73
United States	0.92	55	0.61	0.69	0.66	0.68	0.80	0.86	0.76	0.85	0.79	0.74	0.70
<b>Benchmarking Participants</b>													
Ontario, Canada	0.91	53	0.58	0.67	0.69	0.69	0.80	0.81	0.70	0.84	0.74	0.78	0.69
Quebec, Canada	0.89	47	0.71	0.70	0.69	0.64	0.69	0.71	0.75	0.75	0.71	0.64	0.58
Moscow City, Russian Fed.	0.87	43	0.63	0.66	0.62	0.76	0.69	0.74	0.39	0.67	0.70	0.63	0.64
Madrid, Spain	0.89	48	0.43	0.68	0.79	0.50	0.78	0.84	0.75	0.81	0.70	0.67	0.57
Abu Dhabi, UAE	0.94	64	0.83	0.80	0.85	0.79	0.74	0.82	0.65	0.85	0.84	0.85	0.77
Dubai, UAE	0.94	62	0.82	0.80	0.84	0.80	0.78	0.84	0.72	0.82	0.78	0.80	0.67



**Relationship Between the TIMSS 2019 School Emphasis on Academic Success—Principals' Reports Scale and TIMSS 2019 Achievement – Grade 4**

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
Albania	0.21	0.04	0.03	0.22	0.05	0.03
Armenia	0.06	0.00	0.00	0.04	0.00	0.00
Australia	0.22	0.05	0.04	0.21	0.04	0.04
Austria	0.21	0.04	0.03	0.26	0.07	0.06
Azerbaijan	-0.01	0.00	0.00	0.01	0.00	0.00
Bahrain	0.05	0.00	0.00	0.13	0.02	0.03
Belgium (Flemish)	0.16	0.03	0.01	0.16	0.02	0.01
Bosnia and Herzegovina	0.02	0.00	0.01	0.03	0.00	0.01
Bulgaria	0.39	0.15	0.12	0.42	0.18	0.15
Canada	0.14	0.02	0.02	0.13	0.02	0.01
Chile	0.24	0.06	0.05	0.22	0.05	0.04
Chinese Taipei	0.10	0.01	0.01	0.09	0.01	0.01
Croatia	0.06	0.00	0.00	0.07	0.00	0.01
Cyprus	0.16	0.03	0.02	0.14	0.02	0.02
Czech Republic	0.21	0.05	0.04	0.19	0.04	0.03
Denmark	0.10	0.01	0.01	0.09	0.01	0.01
England	0.21	0.05	0.05	0.25	0.06	0.07
Finland	0.11	0.01	0.01	0.13	0.02	0.01
France	0.22	0.05	0.03	0.23	0.05	0.04
Georgia	0.07	0.01	0.01	0.06	0.00	0.01
Germany	0.28	0.08	0.05	0.27	0.07	0.05
Hong Kong SAR	0.17	0.03	0.02	0.21	0.05	0.03
Hungary	0.29	0.08	0.04	0.26	0.07	0.03
Iran, Islamic Rep. of	0.20	0.04	0.02	0.22	0.05	0.03
Ireland	0.17	0.03	0.03	0.15	0.02	0.03
Italy	0.06	0.00	0.00	0.08	0.01	0.00
Japan	0.13	0.02	0.01	0.11	0.01	0.01
Kazakhstan	0.03	0.00	0.01	0.02	0.00	0.01
Korea, Rep. of	0.18	0.03	0.02	0.16	0.03	0.02
Kosovo	0.13	0.02	0.01	0.15	0.02	0.02
Kuwait	0.19	0.04	0.04	0.20	0.04	0.04
Latvia	0.11	0.01	0.01	0.12	0.01	0.01
Lithuania	0.19	0.04	0.01	0.19	0.04	0.01
Malta	0.23	0.05	0.04	0.26	0.07	0.05
Montenegro	0.02	0.00	0.00	0.03	0.00	0.00
Morocco	0.21	0.04	0.04	0.20	0.04	0.03
Netherlands	0.10	0.01	0.01	0.14	0.02	0.02

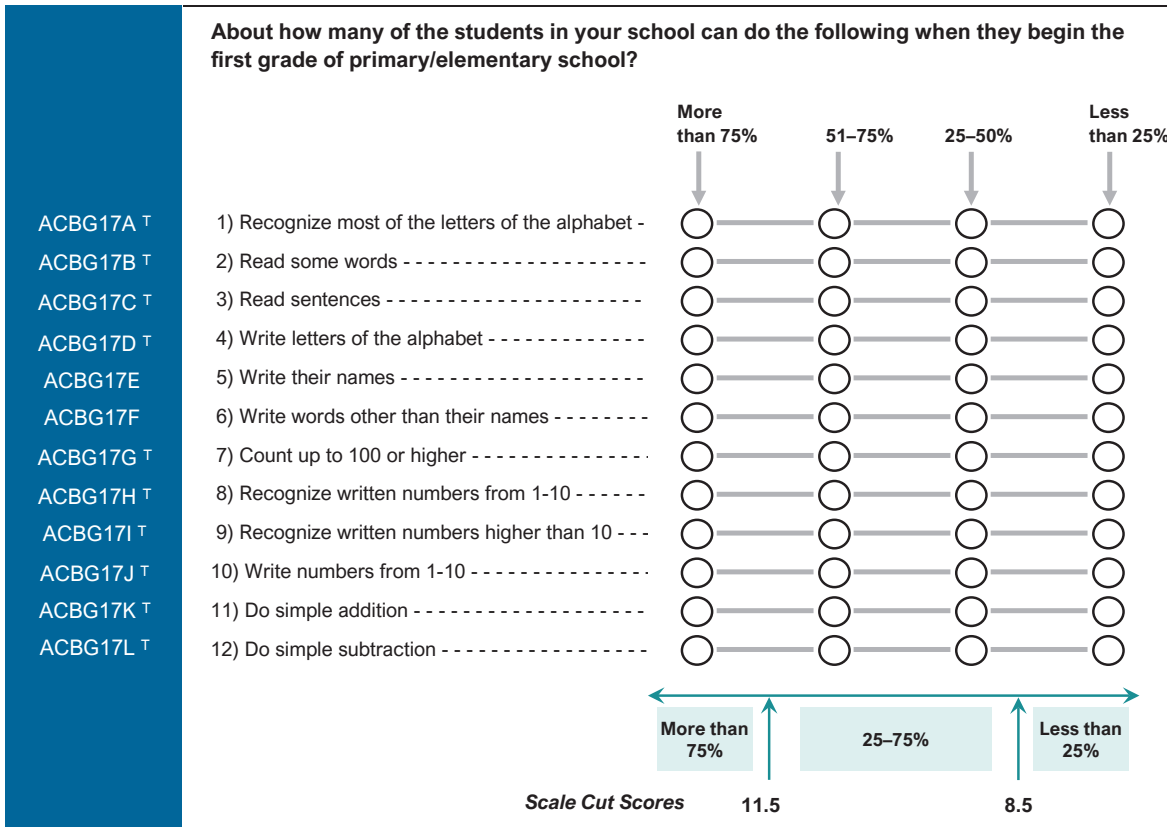
**Relationship Between the TIMSS 2019 School Emphasis on Academic Success—Principals' Reports Scale and TIMSS 2019 Achievement – Grade 4**

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
New Zealand	0.27	0.07	0.07	0.27	0.07	0.07
North Macedonia	0.21	0.04	0.02	0.23	0.05	0.03
Northern Ireland	0.18	0.03	0.03	0.14	0.02	0.02
Norway (5)	0.15	0.02	0.01	0.17	0.03	0.01
Oman	0.17	0.03	0.02	0.20	0.04	0.02
Pakistan	0.23	0.05	0.03	0.24	0.06	0.05
Philippines	0.09	0.01	0.01	0.10	0.01	0.01
Poland	0.14	0.02	0.01	0.14	0.02	0.01
Portugal	0.18	0.03	0.02	0.16	0.02	0.02
Qatar	0.08	0.01	0.00	0.09	0.01	0.01
Russian Federation	0.14	0.02	0.03	0.13	0.02	0.03
Saudi Arabia	0.14	0.02	0.02	0.18	0.03	0.03
Serbia	0.14	0.02	0.02	0.14	0.02	0.02
Singapore	0.15	0.02	0.02	0.16	0.03	0.02
Slovak Republic	0.31	0.10	0.04	0.35	0.12	0.04
South Africa (5)	0.26	0.07	0.06	0.26	0.07	0.06
Spain	0.21	0.04	0.03	0.19	0.04	0.03
Sweden	0.23	0.05	0.05	0.25	0.06	0.06
Turkey (5)	0.30	0.09	0.07	0.28	0.08	0.06
United Arab Emirates	0.37	0.14	0.13	0.40	0.16	0.16
United States	0.26	0.07	0.06	0.28	0.08	0.06
<b>International Median</b>	<b>0.17</b>	<b>0.03</b>	<b>0.02</b>	<b>0.16</b>	<b>0.03</b>	<b>0.03</b>
<b>Benchmarking Participants</b>						
Ontario, Canada	0.14	0.02	0.02	0.11	0.01	0.01
Quebec, Canada	0.14	0.02	0.02	0.13	0.02	0.02
Moscow City, Russian Fed.	0.04	0.00	0.00	0.05	0.00	0.00
Madrid, Spain	0.22	0.05	0.04	0.20	0.04	0.03
Abu Dhabi, UAE	0.39	0.15	0.17	0.43	0.18	0.20
Dubai, UAE	0.20	0.04	0.04	0.20	0.04	0.04

# Schools Where Students Enter with Literacy and Numeracy Skills – Grade 4

## About the Scale

The *Schools Where Students Enter with Literacy and Numeracy Skills* scale was created based on principals' responses to twelve items listed below.



<sup>T</sup> Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.

**Item Parameters for the TIMSS 2019 Schools Where Students Enter with Literacy and Numeracy Skills Scale – Grade 4**

Item	delta	tau_1	tau_2	tau_3	Infit
ACBG17A	-0.72531	-1.60124	0.01778	1.58346	1.28
ACBG17B	0.28400	-1.70182	-0.01923	1.72105	1.14
ACBG17C	1.50852	-1.39085	-0.20204	1.59289	1.12
ACBG17D	-0.58439	-1.95844	0.18365	1.77479	1.16
ACBG17E	-1.66731	-1.47535	0.11321	1.36214	1.61
ACBG17F	0.54604	-1.72628	-0.06684	1.79312	0.97
ACBG17G	1.07922	-1.89888	-0.16212	2.06100	1.46
ACBG17H	-1.89417	-2.02701	0.38834	1.63867	1.15
ACBG17I	0.07560	-1.89253	-0.09470	1.98723	1.08
ACBG17J	-0.88472	-1.53692	0.16155	1.37537	1.08
ACBG17K	0.86027	-1.92773	-0.05223	1.97996	1.03
ACBG17L	1.40225	-1.74952	-0.13408	1.88360	1.16

**Scale Transformation Constants for the TIMSS 2019 Schools Where Students Enter with Literacy and Numeracy Skills Scale – Grade 4**

**Scale Transformation Constants**

A = 10.004848

B = 0.6920950

Transformed Scale Score = 10.004848 + 0.6920950 • Logit Scale Score

**Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS  
2019 Schools Where Students Enter with Literacy and Numeracy Skills  
Scale – Grade 4**

Raw Score	Transformed Scale Score	Cutpoint
0	6.11923	
1	6.99979	
2	7.45729	
3	7.78264	
4	8.04034	
5	8.25669	
6	8.44586	8.5
7	8.61529	
8	8.77012	
9	8.91382	
10	9.04893	
11	9.17718	
12	9.30061	
13	9.42002	
14	9.53638	
15	9.65056	
16	9.76331	
17	9.87533	
18	9.98694	
19	10.09967	
20	10.21320	
21	10.32848	
22	10.44619	
23	10.56707	
24	10.69194	
25	10.82142	
26	10.95725	
27	11.10057	
28	11.25305	
29	11.41684	
30	11.59476	11.5
31	11.79087	
32	12.01080	
33	12.26650	
34	12.58081	
35	13.01404	
36	13.85372	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 Schools Where Students Enter with Literacy and Numeracy Skills Scale – Grade 4

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item												
			ACBG17A	ACBG17B	ACBG17C	ACBG17D	ACBG17E	ACBG17F	ACBG17G	ACBG17H	ACBG17I	ACBG17J	ACBG17K	ACBG17L	
Albania	0.94	59	0.73	0.76	0.78	0.80	0.72	0.82	0.68	0.73	0.80	0.74	0.84	0.81	
Armenia	0.95	65	0.72	0.85	0.83	0.85	0.83	0.88	0.76	0.70	0.77	0.79	0.84	0.84	
Australia	0.97	76	0.86	0.91	0.90	0.87	0.73	0.91	0.85	0.85	0.91	0.91	0.85	0.86	
Austria	0.91	52	0.82	0.83	0.75	0.66	0.41	0.77	0.67	0.59	0.75	0.75	0.80	0.76	
Azerbaijan	0.97	72	0.76	0.88	0.82	0.88	0.88	0.88	0.75	0.82	0.86	0.85	0.90	0.91	
Bahrain	0.97	73	0.82	0.90	0.87	0.88	0.88	0.90	0.83	0.79	0.90	0.82	0.84	0.82	
Belgium (Flemish)	0.86	42	0.63	0.68	0.46	0.74	0.56	0.66	0.49	0.62	0.69	0.66	0.73	0.73	
Bosnia and Herzegovina	0.94	61	0.78	0.83	0.77	0.81	0.73	0.84	0.74	0.71	0.82	0.80	0.74	0.75	
Bulgaria	0.97	76	0.85	0.86	0.81	0.89	0.89	0.89	0.86	0.84	0.90	0.88	0.89	0.89	
Canada	0.95	64	0.79	0.85	0.77	0.83	0.77	0.86	0.75	0.80	0.82	0.83	0.78	0.78	
Chile	0.96	70	0.82	0.86	0.83	0.86	0.81	0.88	0.80	0.79	0.89	0.82	0.83	0.82	
Chinese Taipei	0.96	71	0.88	0.85	0.81	0.88	0.82	0.85	0.82	0.82	0.85	0.80	0.86	0.87	
Croatia	0.94	60	0.80	0.84	0.75	0.81	0.71	0.79	0.65	0.74	0.80	0.82	0.79	0.76	
Cyprus	0.93	59	0.77	0.84	0.80	0.76	0.62	0.81	0.79	0.70	0.79	0.71	0.83	0.78	
Czech Republic	0.88	45	0.73	0.74	0.58	0.68	0.58	0.67	0.55	0.72	0.69	0.76	0.67	0.62	
Denmark	0.92	55	0.80	0.82	0.68	0.64	0.55	0.70	0.77	0.76	0.81	0.80	0.79	0.75	
England	0.96	72	0.89	0.88	0.82	0.83	0.86	0.86	0.76	0.85	0.87	0.89	0.83	0.80	
Finland	0.91	50	0.68	0.69	0.67	0.66	0.55	0.73	0.63	0.72	0.75	0.78	0.80	0.79	
France	0.91	51	0.70	0.74	0.67	0.75	0.53	0.81	0.73	0.65	0.80	0.71	0.76	0.72	
Georgia	0.97	74	0.78	0.83	0.90	0.91	0.86	0.94	0.84	0.73	0.91	0.83	0.86	0.87	
Germany	0.87	43	0.68	0.71	0.62	0.67	0.56	0.61	0.52	0.69	0.70	0.73	0.68	0.69	
Hong Kong SAR	0.95	64	0.77	0.87	0.82	0.83	0.81	0.83	0.78	0.73	0.78	0.74	0.83	0.80	
Hungary	0.90	51	0.76	0.72	0.55	0.75	0.80	0.72	0.60	0.79	0.75	0.81	0.66	0.57	
Iran, Islamic Rep. of	0.96	69	0.83	0.85	0.85	0.86	0.89	0.71	0.77	0.81	0.85	0.80	0.89	0.86	
Ireland	0.88	54	0.84	0.83	0.84	0.82	0.63	0.82	0.41	0.76	0.62	0.76	0.82	0.54	
Italy	0.93	57	0.72	0.78	0.79	0.71	0.52	0.82	0.72	0.80	0.83	0.79	0.79	0.75	
Japan	0.94	62	0.70	0.77	0.85	0.81	0.68	0.84	0.74	0.80	0.84	0.84	0.80	0.78	
Kazakhstan	0.95	63	0.63	0.77	0.75	0.76	0.86	0.87	0.78	0.77	0.82	0.78	0.88	0.85	
Korea, Rep. of	0.96	73	0.84	0.85	0.88	0.90	0.72	0.89	0.86	0.80	0.88	0.86	0.88	0.87	
Kosovo	0.95	64	0.77	0.84	0.79	0.84	0.76	0.85	0.74	0.71	0.81	0.81	0.84	0.83	
Kuwait	0.97	77	0.86	0.90	0.87	0.90	0.86	0.92	0.85	0.82	0.92	0.87	0.90	0.85	
Latvia	0.89	46	0.48	0.63	0.74	0.66	0.67	0.69	0.60	0.74	0.74	0.75	0.72	0.68	
Lithuania	0.94	62	0.73	0.79	0.84	0.79	0.62	0.81	0.73	0.75	0.86	0.79	0.86	0.86	
Malta	0.96	68	0.79	0.88	0.84	0.89	0.87	0.87	0.64	0.76	0.85	0.82	0.87	0.81	
Montenegro	0.92	54	0.76	0.75	0.71	0.78	0.76	0.80	0.57	0.72	0.77	0.75	0.73	0.67	
Morocco	0.97	77	0.91	0.93	0.89	0.92	0.91	0.90	0.84	0.89	0.90	0.87	0.86	0.68	
Netherlands	0.93	57	0.79	0.73	0.79	0.70	0.57	0.79	0.72	0.76	0.77	0.79	0.83	0.79	
New Zealand	0.95	66	0.85	0.87	0.81	0.85	0.74	0.88	0.79	0.85	0.84	0.85	0.75	0.69	
North Macedonia	0.93	56	0.76	0.78	0.67	0.82	0.68	0.74	0.78	0.59	0.78	0.71	0.82	0.78	
Northern Ireland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 Schools Where Students Enter with Literacy and Numeracy Skills Scale – Grade 4

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item												
			ACBG17A	ACBG17B	ACBG17C	ACBG17D	ACBG17E	ACBG17F	ACBG17G	ACBG17H	ACBG17I	ACBG17J	ACBG17K	ACBG17L	
Norway (5)	0.92	53	0.78	0.77	0.62	0.75	0.67	0.75	0.63	0.80	0.78	0.78	0.73	0.67	
Oman	0.95	66	0.75	0.85	0.81	0.83	0.80	0.86	0.81	0.75	0.84	0.76	0.86	0.81	
Pakistan	0.96	70	0.78	0.79	0.76	0.91	0.90	0.87	0.85	0.81	0.85	0.80	0.88	0.86	
Philippines	0.96	70	0.72	0.88	0.83	0.84	0.77	0.82	0.88	0.81	0.87	0.85	0.90	0.90	
Poland	0.93	58	0.74	0.74	0.72	0.82	0.77	0.82	0.63	0.69	0.78	0.85	0.80	0.79	
Portugal	0.94	59	0.76	0.82	0.72	0.75	0.66	0.85	0.73	0.72	0.84	0.78	0.79	0.79	
Qatar	0.98	79	0.89	0.91	0.89	0.91	0.91	0.93	0.88	0.85	0.89	0.87	0.89	0.87	
Russian Federation	0.96	68	0.79	0.86	0.84	0.83	0.81	0.84	0.71	0.82	0.87	0.81	0.84	0.84	
Saudi Arabia	0.96	72	0.82	0.89	0.81	0.89	0.87	0.90	0.83	0.78	0.86	0.84	0.86	0.86	
Serbia	0.93	58	0.77	0.79	0.68	0.77	0.81	0.79	0.63	0.80	0.78	0.81	0.80	0.72	
Singapore	0.95	71	0.85	0.88	0.80	0.93	0.90	0.87	0.59	0.87	0.86	0.90	0.83	0.79	
Slovak Republic	0.91	52	0.71	0.80	0.63	0.74	0.69	0.79	0.64	0.72	0.67	0.75	0.76	0.70	
South Africa (5)	0.94	60	0.75	0.80	0.69	0.79	0.76	0.83	0.70	0.79	0.81	0.79	0.78	0.80	
Spain	0.90	51	0.69	0.85	0.82	0.73	0.60	0.87	0.62	0.64	0.63	0.67	0.73	0.64	
Sweden	0.95	66	0.74	0.82	0.81	0.81	0.79	0.83	0.79	0.80	0.79	0.84	0.86	0.82	
Turkey (5)	0.98	79	0.88	0.92	0.92	0.92	0.90	0.93	0.84	0.79	0.90	0.84	0.92	0.91	
United Arab Emirates	0.98	80	0.89	0.93	0.88	0.92	0.90	0.92	0.89	0.85	0.91	0.89	0.89	0.88	
United States	0.98	83	0.91	0.93	0.87	0.93	0.91	0.93	0.91	0.92	0.94	0.92	0.90	0.85	
<b>Benchmarking Participants</b>															
Ontario, Canada	0.96	69	0.82	0.88	0.82	0.87	0.82	0.90	0.78	0.82	0.83	0.84	0.80	0.80	
Quebec, Canada	0.93	58	0.78	0.81	0.71	0.79	0.70	0.78	0.70	0.75	0.80	0.80	0.74	0.73	
Moscow City, Russian Fed	0.94	60	0.69	0.78	0.81	0.79	0.77	0.83	0.65	0.68	0.72	0.85	0.83	0.84	
Madrid, Spain	0.92	56	0.61	0.79	0.82	0.73	0.59	0.86	0.59	0.72	0.82	0.79	0.82	0.78	
Abu Dhabi, UAE	0.98	82	0.91	0.92	0.90	0.92	0.90	0.90	0.89	0.88	0.93	0.89	0.91	0.90	
Dubai, UAE	0.98	84	0.95	0.95	0.89	0.94	0.89	0.94	0.90	0.88	0.92	0.92	0.90	0.88	

A dash (–) indicates comparable data not available.

**Relationship Between the TIMSS 2019 Schools Where Students Enter with Literacy and Numeracy Skills Scale and TIMSS 2019 Achievement – Grade 4**

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
Albania	0.06	0.00	0.01	0.07	0.00	0.01
Armenia	-0.01	0.00	0.01	-0.01	0.00	0.01
Australia	0.20	0.04	0.03	0.21	0.05	0.03
Austria	0.11	0.01	0.01	0.16	0.02	0.02
Azerbaijan	0.02	0.00	0.00	0.03	0.00	0.00
Bahrain	0.04	0.00	0.00	0.11	0.01	0.01
Belgium (Flemish)	0.14	0.02	0.01	0.16	0.03	0.01
Bosnia and Herzegovina	0.05	0.00	0.00	0.03	0.00	0.00
Bulgaria	0.39	0.15	0.12	0.44	0.19	0.15
Canada	0.10	0.01	0.01	0.10	0.01	0.01
Chile	0.22	0.05	0.05	0.19	0.04	0.04
Chinese Taipei	0.03	0.00	0.00	0.04	0.00	0.00
Croatia	0.07	0.01	0.00	0.10	0.01	0.00
Cyprus	0.10	0.01	0.01	0.11	0.01	0.01
Czech Republic	0.09	0.01	0.01	0.08	0.01	0.01
Denmark	0.06	0.00	0.00	0.05	0.00	0.00
England	0.21	0.04	0.01	0.24	0.06	0.02
Finland	0.08	0.01	0.01	0.08	0.01	0.01
France	0.17	0.03	0.01	0.16	0.02	0.01
Georgia	0.07	0.00	0.01	0.09	0.01	0.01
Germany	0.18	0.03	0.02	0.17	0.03	0.02
Hong Kong SAR	0.13	0.02	0.01	0.13	0.02	0.01
Hungary	0.15	0.02	0.01	0.12	0.01	0.01
Iran, Islamic Rep. of	0.03	0.00	0.00	0.05	0.00	0.00
Ireland	0.14	0.02	0.02	0.14	0.02	0.01
Italy	-0.03	0.00	0.00	-0.03	0.00	0.00
Japan	0.06	0.00	0.00	0.06	0.00	0.00
Kazakhstan	0.11	0.01	0.01	0.08	0.01	0.00
Korea, Rep. of	0.08	0.01	0.01	0.08	0.01	0.01
Kosovo	0.04	0.00	0.00	0.06	0.00	0.00
Kuwait	0.14	0.02	0.03	0.09	0.01	0.01
Latvia	0.02	0.00	0.00	0.02	0.00	0.00
Lithuania	0.12	0.01	0.01	0.11	0.01	0.01
Malta	0.14	0.02	0.01	0.14	0.02	0.02
Montenegro	0.01	0.00	0.00	0.02	0.00	0.00
Morocco	0.20	0.04	0.02	0.19	0.04	0.02
Netherlands	0.05	0.00	0.00	0.05	0.00	0.00



**Relationship Between the TIMSS 2019 Schools Where Students Enter with Literacy and Numeracy Skills Scale and TIMSS 2019 Achievement – Grade 4**

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
New Zealand	0.24	0.06	0.05	0.25	0.06	0.05
North Macedonia	0.11	0.01	0.02	0.07	0.01	0.02
Northern Ireland	-	-	-	-	-	-
Norway (5)	0.10	0.01	0.02	0.13	0.02	0.02
Oman	0.10	0.01	0.01	0.12	0.01	0.01
Pakistan	0.09	0.01	0.05	0.14	0.02	0.04
Philippines	0.13	0.02	0.01	0.16	0.02	0.01
Poland	0.03	0.00	0.00	0.05	0.00	0.00
Portugal	0.04	0.00	0.00	0.05	0.00	0.00
Qatar	0.18	0.03	0.03	0.18	0.03	0.03
Russian Federation	0.15	0.02	0.02	0.18	0.03	0.02
Saudi Arabia	0.10	0.01	0.01	0.11	0.01	0.02
Serbia	0.19	0.04	0.02	0.20	0.04	0.02
Singapore	0.10	0.01	0.00	0.11	0.01	0.00
Slovak Republic	0.31	0.10	0.07	0.35	0.12	0.08
South Africa (5)	0.01	0.00	0.04	0.00	0.00	0.05
Spain	0.20	0.04	0.04	0.20	0.04	0.03
Sweden	0.13	0.02	0.01	0.17	0.03	0.02
Turkey (5)	0.14	0.02	0.02	0.15	0.02	0.02
United Arab Emirates	0.30	0.09	0.09	0.30	0.09	0.09
United States	0.15	0.02	0.02	0.15	0.02	0.02
<b>International Median</b>	<b>0.10</b>	<b>0.01</b>	<b>0.01</b>	<b>0.11</b>	<b>0.01</b>	<b>0.01</b>
<b>Benchmarking Participants</b>						
Ontario, Canada	0.16	0.03	0.02	0.13	0.02	0.02
Quebec, Canada	0.03	0.00	0.00	0.05	0.00	0.00
Moscow City, Russian Fed.	0.02	0.00	0.00	0.02	0.00	0.00
Madrid, Spain	0.08	0.01	0.01	0.08	0.01	0.01
Abu Dhabi, UAE	0.32	0.10	0.10	0.35	0.12	0.13
Dubai, UAE	0.28	0.08	0.05	0.26	0.07	0.05

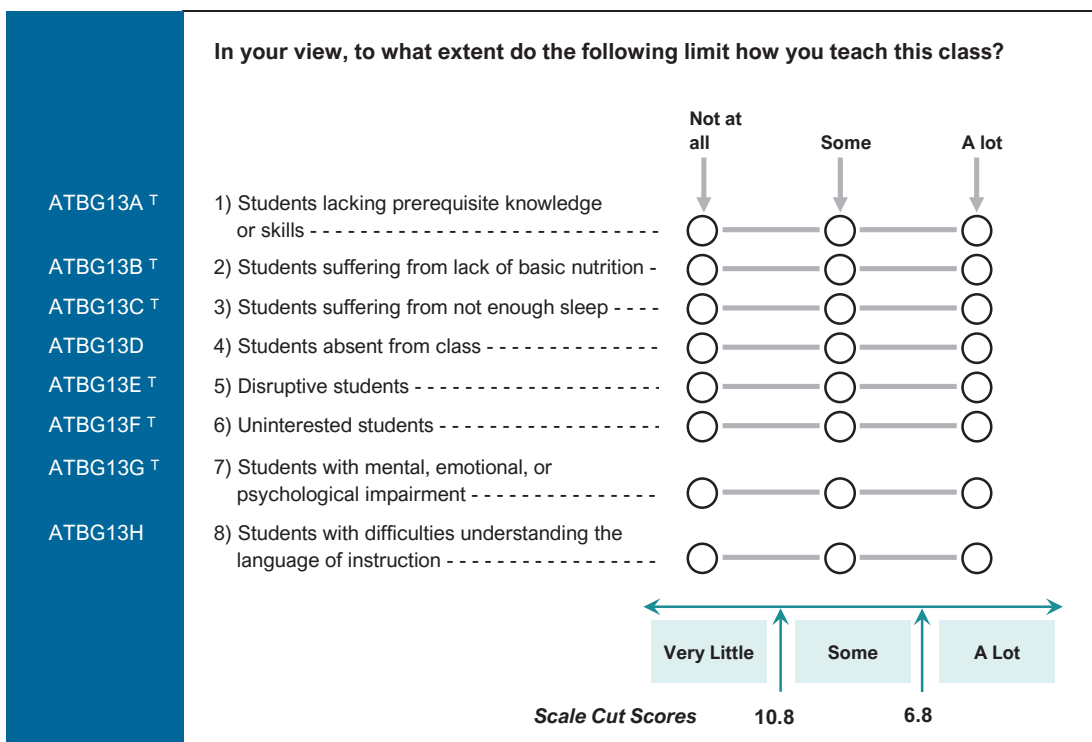
A dash (–) indicates comparable data not available.

### Scales Based on Teachers' Reports

## Classroom Teaching Limited by Students Not Ready for Instruction – Grade 4

### About the Scale

The *Classroom Teaching Limited by Students Not Ready for Instruction* scale was created based on teachers' responses to eight items listed below.



<sup>T</sup> Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.

**Item Parameters for the TIMSS 2019 Classroom Teaching Limited by Students Not Ready for Instruction Scale – Grade 4**

Item	delta	tau_1	tau_2	Infit
ATBG13A	0.91125	-2.07515	2.07515	1.04
ATBG13B	-1.09075	-1.07877	1.07877	1.08
ATBG13C	-0.28607	-1.55578	1.55578	0.96
ATBG13D	-0.02520	-1.59451	1.59451	1.00
ATBG13E	0.52548	-1.39807	1.39807	0.97
ATBG13F	0.51002	-1.82889	1.82889	0.94
ATBG13G	-0.04183	-1.36843	1.36843	1.02
ATBG13H	-0.50290	-1.21050	1.21050	1.05

**Scale Transformation Constants for the TIMSS 2019 Classroom Teaching Limited by Students Not Ready for Instruction Scale – Grade 4**

**Scale Transformation Constants**

$$A = 8.854136$$

$$B = 1.257770$$

$$\text{Transformed Scale Score} = 8.854136 + 1.257770 \cdot \text{Logit Scale Score}$$

**Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019 Classroom Teaching Limited by Students Not Ready for Instruction Scale – Grade 4**

Raw Score	Transformed Scale Score	Cutpoint
0	3.29994	
1	4.83892	
2	5.65218	
3	6.26163	
4	6.78649	6.8
5	7.27293	
6	7.74710	
7	8.22648	
8	8.72059	
9	9.23472	
10	9.76704	
11	10.31572	
12	10.88870	10.8
13	11.50809	
14	12.22222	
15	13.14707	
16	14.80460	

**Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 Classroom Teaching Limited by Students Not Ready for Instruction Scale – Grade 4**

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item							
			ATBG13A	ATBG13B	ATBG13C	ATBG13D	ATBG13E	ATBG13F	ATBG13G	ATBG13H
Albania	0.81	43	0.46	0.69	0.77	0.61	0.61	0.75	0.73	0.59
Armenia	0.80	42	0.39	0.61	0.71	0.70	0.67	0.72	0.66	0.65
Australia	0.81	43	0.66	0.71	0.72	0.69	0.69	0.62	0.61	0.51
Austria	0.75	37	0.74	0.18	0.71	0.61	0.51	0.60	0.64	0.66
Azerbaijan	0.71	34	0.52	0.41	0.64	0.65	0.58	0.58	0.63	0.63
Bahrain	0.76	38	0.55	0.50	0.64	0.55	0.62	0.74	0.66	0.62
Belgium (Flemish)	0.77	38	0.67	0.52	0.57	0.55	0.70	0.67	0.67	0.59
Bosnia and Herzegovina	0.82	45	0.47	0.66	0.71	0.68	0.69	0.71	0.68	0.72
Bulgaria	0.83	46	0.69	0.66	0.63	0.70	0.63	0.74	0.65	0.70
Canada	0.78	40	0.62	0.71	0.70	0.61	0.61	0.58	0.69	0.53
Chile	0.81	43	0.58	0.72	0.76	0.69	0.56	0.74	0.68	0.46
Chinese Taipei	0.82	45	0.53	0.60	0.65	0.68	0.70	0.72	0.71	0.74
Croatia	0.80	41	0.53	0.61	0.70	0.63	0.72	0.70	0.59	0.64
Cyprus	0.76	38	0.47	0.54	0.64	0.64	0.62	0.69	0.67	0.64
Czech Republic	0.68	32	0.61	0.44	0.64	0.49	0.52	0.70	0.59	0.48
Denmark	0.76	38	0.60	0.64	0.63	0.56	0.68	0.62	0.71	0.42
England	0.76	37	0.62	0.52	0.74	0.53	0.55	0.58	0.70	0.57
Finland	0.74	36	0.59	0.53	0.64	0.49	0.67	0.60	0.69	0.57
France	0.78	39	0.48	0.62	0.66	0.65	0.71	0.66	0.51	0.68
Georgia	0.71	34	0.57	0.49	0.58	0.59	0.66	0.60	0.54	0.59
Germany	0.78	41	0.72	0.62	0.67	0.57	0.55	0.67	0.67	0.63
Hong Kong SAR	0.76	38	0.66	0.54	0.61	0.64	0.57	0.64	0.66	0.62
Hungary	0.78	40	0.65	0.59	0.67	0.58	0.56	0.70	0.71	0.62
Iran, Islamic Rep. of	0.84	48	0.56	0.74	0.75	0.67	0.69	0.70	0.77	0.64
Ireland	0.79	40	0.61	0.61	0.64	0.72	0.67	0.66	0.54	0.60
Italy	0.82	44	0.70	0.58	0.64	0.74	0.69	0.65	0.64	0.67
Japan	0.76	38	0.67	0.29	0.50	0.47	0.69	0.77	0.75	0.66
Kazakhstan	0.87	53	0.53	0.56	0.75	0.71	0.80	0.78	0.81	0.81
Korea, Rep. of	0.87	53	0.50	0.70	0.81	0.80	0.66	0.73	0.80	0.76
Kosovo	0.65	30	0.62	0.61	0.69	0.46	0.32	0.61	0.54	0.43
Kuwait	0.75	37	0.55	0.57	0.67	0.46	0.70	0.68	0.58	0.62
Latvia	0.75	37	0.57	0.38	0.60	0.68	0.69	0.68	0.71	0.46
Lithuania	0.83	46	0.49	0.69	0.74	0.72	0.77	0.70	0.66	0.64
Malta	0.85	50	0.49	0.74	0.76	0.74	0.68	0.74	0.68	0.76
Montenegro	0.78	40	0.40	0.59	0.65	0.72	0.62	0.69	0.68	0.69
Morocco	0.73	35	0.57	0.61	0.56	0.45	0.65	0.66	0.53	0.64
Netherlands	0.79	41	0.49	0.61	0.75	0.67	0.76	0.63	0.52	0.61
New Zealand	0.76	37	0.46	0.65	0.68	0.61	0.70	0.66	0.62	0.46
North Macedonia	0.65	29	0.50	0.33	0.47	0.59	0.69	0.68	0.61	0.32
Northern Ireland	0.71	35	0.45	0.56	0.74	0.60	0.65	0.73	0.56	0.27

**Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 Classroom Teaching Limited by Students Not Ready for Instruction Scale – Grade 4**

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item							
			ATBG13A	ATBG13B	ATBG13C	ATBG13D	ATBG13E	ATBG13F	ATBG13G	ATBG13H
Norway (5)	0.81	43	0.62	0.65	0.74	0.67	0.72	0.76	0.62	0.42
Oman	0.84	46	0.53	0.65	0.67	0.72	0.70	0.75	0.69	0.71
Pakistan	0.66	29	0.57	0.70	0.52	0.34	0.48	0.54	0.63	0.45
Philippines	0.81	43	0.63	0.65	0.66	0.66	0.76	0.75	0.58	0.50
Poland	0.74	36	0.66	0.39	0.58	0.60	0.60	0.75	0.68	0.47
Portugal	0.83	47	0.47	0.78	0.78	0.76	0.74	0.74	0.54	0.59
Qatar	0.78	40	0.59	0.59	0.72	0.59	0.66	0.66	0.59	0.62
Russian Federation	0.86	52	0.48	0.64	0.73	0.81	0.76	0.79	0.78	0.70
Saudi Arabia	0.71	33	0.48	0.47	0.59	0.59	0.66	0.75	0.50	0.51
Serbia	0.81	44	0.40	0.62	0.69	0.71	0.72	0.65	0.75	0.71
Singapore	0.83	47	0.65	0.59	0.69	0.74	0.63	0.66	0.71	0.77
Slovak Republic	0.87	53	0.70	0.65	0.75	0.65	0.80	0.76	0.74	0.75
South Africa (5)	0.78	40	0.60	0.61	0.69	0.59	0.68	0.75	0.63	0.45
Spain	0.77	38	0.62	0.57	0.68	0.62	0.73	0.64	0.58	0.50
Sweden	0.68	32	0.53	0.08	0.51	0.55	0.72	0.64	0.67	0.58
Turkey (5)	0.82	44	0.55	0.62	0.69	0.62	0.74	0.72	0.69	0.67
United Arab Emirates	0.83	46	0.65	0.60	0.72	0.62	0.73	0.75	0.67	0.68
United States	0.79	42	0.64	0.68	0.73	0.65	0.67	0.67	0.66	0.41
<b>Benchmarking Participants</b>										
Ontario, Canada	0.82	45	0.62	0.78	0.73	0.63	0.66	0.59	0.71	0.63
Quebec, Canada	0.69	32	0.64	0.59	0.58	0.54	0.52	0.59	0.62	0.40
Moscow City, Russian Fed.	0.84	49	0.40	0.69	0.76	0.77	0.68	0.71	0.73	0.76
Madrid, Spain	0.77	39	0.68	0.57	0.69	0.57	0.63	0.67	0.59	0.56
Abu Dhabi, UAE	0.83	46	0.67	0.54	0.68	0.64	0.71	0.73	0.69	0.72
Dubai, UAE	0.82	45	0.68	0.66	0.71	0.60	0.71	0.74	0.63	0.61

**Relationship Between the TIMSS 2019 Classroom Teaching Limited by Students Not Ready for Instruction Scale and TIMSS 2019 Achievement – Grade 4**

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
Albania	0.09	0.01	0.02	0.07	0.01	0.02
Armenia	0.05	0.00	0.01	0.04	0.00	0.00
Australia	0.28	0.08	0.06	0.26	0.07	0.06
Austria	0.22	0.05	0.03	0.25	0.06	0.04
Azerbaijan	0.01	0.00	0.00	-0.01	0.00	0.00
Bahrain	0.05	0.00	0.00	0.18	0.03	0.02
Belgium (Flemish)	0.16	0.03	0.02	0.17	0.03	0.03
Bosnia and Herzegovina	0.06	0.00	0.00	0.05	0.00	0.00
Bulgaria	0.23	0.05	0.07	0.27	0.07	0.08
Canada	0.22	0.05	0.04	0.19	0.04	0.03
Chile	0.18	0.03	0.04	0.20	0.04	0.04
Chinese Taipei	0.04	0.00	0.00	0.04	0.00	0.00
Croatia	-0.01	0.00	0.00	-0.01	0.00	0.00
Cyprus	0.14	0.02	0.02	0.12	0.02	0.01
Czech Republic	0.22	0.05	0.03	0.19	0.04	0.03
Denmark	0.09	0.01	0.01	0.07	0.01	0.00
England	0.09	0.01	0.01	0.10	0.01	0.02
Finland	0.14	0.02	0.02	0.15	0.02	0.03
France	0.21	0.04	0.04	0.20	0.04	0.04
Georgia	0.01	0.00	0.00	0.03	0.00	0.00
Germany	0.26	0.07	0.07	0.22	0.05	0.05
Hong Kong SAR	0.26	0.07	0.03	0.26	0.07	0.05
Hungary	0.21	0.05	0.03	0.20	0.04	0.02
Iran, Islamic Rep. of	0.16	0.03	0.02	0.14	0.02	0.01
Ireland	0.15	0.02	0.01	0.14	0.02	0.01
Italy	0.06	0.00	0.00	0.07	0.00	0.00
Japan	0.06	0.00	0.00	0.03	0.00	0.00
Kazakhstan	0.07	0.01	0.00	0.06	0.00	0.00
Korea, Rep. of	0.06	0.00	0.01	0.08	0.01	0.01
Kosovo	0.05	0.00	0.00	0.06	0.00	0.00
Kuwait	0.16	0.02	0.03	0.15	0.02	0.02
Latvia	0.14	0.02	0.01	0.05	0.00	0.01
Lithuania	0.13	0.02	0.02	0.14	0.02	0.02
Malta	0.18	0.03	0.04	0.18	0.03	0.04
Montenegro	0.10	0.01	0.01	0.10	0.01	0.01
Morocco	0.09	0.01	0.02	0.03	0.00	0.01
Netherlands	0.15	0.02	0.03	0.19	0.04	0.04

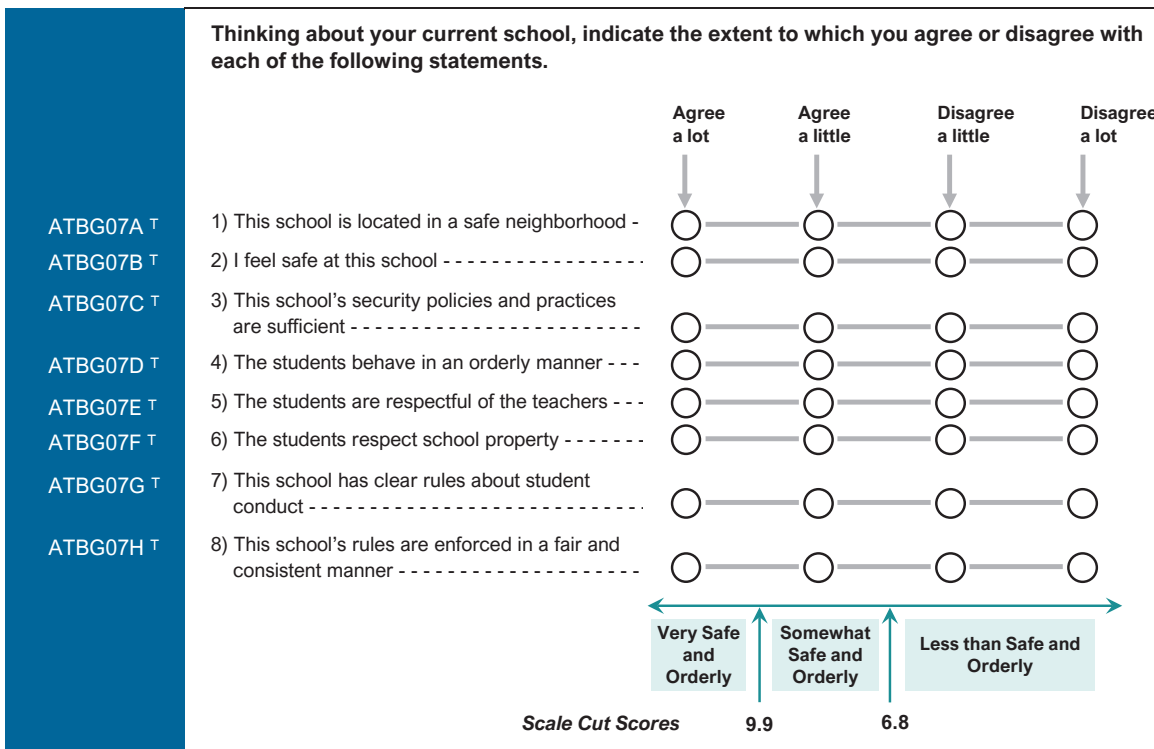
**Relationship Between the TIMSS 2019 Classroom Teaching Limited by Students Not Ready for Instruction Scale and TIMSS 2019 Achievement – Grade 4**

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
New Zealand	0.23	0.05	0.04	0.23	0.05	0.04
North Macedonia	0.14	0.02	0.02	0.13	0.02	0.02
Northern Ireland	0.17	0.03	0.02	0.15	0.02	0.02
Norway (5)	0.13	0.02	0.02	0.13	0.02	0.02
Oman	0.08	0.01	0.02	0.08	0.01	0.01
Pakistan	-0.01	0.00	0.01	-0.04	0.00	0.01
Philippines	0.15	0.02	0.02	0.19	0.04	0.04
Poland	0.16	0.03	0.02	0.08	0.01	0.01
Portugal	0.14	0.02	0.02	0.12	0.01	0.01
Qatar	0.05	0.00	0.01	0.10	0.01	0.01
Russian Federation	0.02	0.00	0.00	0.03	0.00	0.00
Saudi Arabia	0.12	0.02	0.01	0.07	0.00	0.00
Serbia	0.01	0.00	0.00	0.02	0.00	0.00
Singapore	0.40	0.16	0.16	0.40	0.16	0.12
Slovak Republic	0.21	0.04	0.03	0.28	0.08	0.07
South Africa (5)	0.12	0.01	0.02	0.12	0.01	0.01
Spain	0.18	0.03	0.02	0.17	0.03	0.02
Sweden	0.16	0.03	0.01	0.16	0.03	0.01
Turkey (5)	0.27	0.07	0.07	0.19	0.04	0.04
United Arab Emirates	0.27	0.07	0.08	0.29	0.08	0.07
United States	0.26	0.07	0.04	0.27	0.07	0.05
<b>International Median</b>	<b>0.14</b>	<b>0.02</b>	<b>0.02</b>	<b>0.13</b>	<b>0.02</b>	<b>0.02</b>
<b>Benchmarking Participants</b>						
Ontario, Canada	0.26	0.07	0.05	0.21	0.04	0.03
Quebec, Canada	0.12	0.02	0.01	0.13	0.02	0.01
Moscow City, Russian Fed.	0.09	0.01	0.01	0.09	0.01	0.01
Madrid, Spain	0.15	0.02	0.01	0.21	0.04	0.03
Abu Dhabi, UAE	0.28	0.08	0.08	0.29	0.09	0.06
Dubai, UAE	0.24	0.06	0.06	0.25	0.06	0.05

# Safe and Orderly School – Grade 4

## About the Scale

The *Safe and Orderly School* scale was created based on teachers’ responses to eight items listed below.<sup>1</sup>



<sup>1</sup> 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.

† Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.



### Item Parameters for the TIMSS 2019 *Safe and Orderly School* Scale – Grade 4

Item	delta	tau_1	tau_2	Infit
ATBG07A	-0.57100	-1.06224	1.06224	1.32
ATBG07B	-1.45786	-1.30539	1.30539	0.99
ATBG07C	-0.57584	-1.41575	1.41575	1.12
ATBG07D	1.15251	-2.01386	2.01386	0.87
ATBG07E	0.69114	-1.95117	1.95117	0.87
ATBG07F	1.29829	-1.92798	1.92798	0.90
ATBG07G	-0.54040	-1.37123	1.37123	1.03
ATBG07H	0.00316	-1.51773	1.51773	1.00

### Scale Transformation Constants for the TIMSS 2019 *Safe and Orderly School* Scale – Grade 4

#### Scale Transformation Constants

$$A = 8.379152$$

$$B = 0.972455$$

$$\text{Transformed Scale Score} = 8.379152 + 0.972455 \cdot \text{Logit Scale Score}$$

### Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019 *Safe and Orderly School* Scale – Grade 4

Raw Score	Transformed Scale Score	Cutpoint
0	3.88793	
1	5.11715	
2	5.77693	
3	6.27669	
4	6.70234	6.8
5	7.09225	
6	7.46639	
7	7.83877	
8	8.21647	
9	8.61043	
10	9.02958	
11	9.48469	
12	9.99265	9.9
13	10.56968	
14	11.22966	
15	12.02318	
16	13.35176	

**Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 Safe and Orderly School Scale – Grade 4**

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item							
			ATBG07A	ATBG07B	ATBG07C	ATBG07D	ATBG07E	ATBG07F	ATBG07G	ATBG07H
Albania	0.76	41	0.59	0.66	0.43	0.73	0.74	0.71	0.68	0.50
Armenia	0.75	38	0.59	0.54	0.58	0.62	0.64	0.60	0.70	0.62
Australia	0.91	61	0.75	0.68	0.72	0.87	0.88	0.85	0.70	0.78
Austria	0.86	50	0.68	0.68	0.70	0.82	0.70	0.81	0.52	0.71
Azerbaijan	0.81	43	0.37	0.60	0.69	0.70	0.74	0.60	0.70	0.75
Bahrain	0.89	57	0.51	0.66	0.74	0.80	0.80	0.81	0.80	0.84
Belgium (Flemish)	0.83	47	0.52	0.66	0.68	0.73	0.69	0.75	0.69	0.75
Bosnia and Herzegovina	0.85	50	0.55	0.65	0.71	0.73	0.76	0.79	0.68	0.78
Bulgaria	0.85	50	0.67	0.71	0.75	0.73	0.69	0.75	0.69	0.67
Canada	0.89	57	0.59	0.69	0.68	0.84	0.84	0.82	0.75	0.78
Chile	0.88	54	0.70	0.69	0.67	0.82	0.75	0.79	0.76	0.72
Chinese Taipei	0.89	56	0.67	0.74	0.75	0.79	0.76	0.74	0.77	0.78
Croatia	0.89	56	0.67	0.76	0.75	0.79	0.82	0.79	0.62	0.77
Cyprus	0.85	49	0.51	0.66	0.72	0.76	0.78	0.75	0.66	0.72
Czech Republic	0.81	43	0.53	0.63	0.57	0.75	0.76	0.72	0.61	0.67
Denmark	0.88	55	0.59	0.69	0.67	0.80	0.80	0.80	0.74	0.80
England	0.84	48	0.49	0.50	0.55	0.75	0.78	0.75	0.82	0.80
Finland	0.84	49	0.54	0.66	0.54	0.83	0.81	0.72	0.67	0.78
France	0.85	49	0.72	0.69	0.66	0.81	0.77	0.75	0.56	0.58
Georgia	0.81	45	0.47	0.68	0.69	0.73	0.73	0.70	0.72	0.63
Germany	0.86	50	0.68	0.71	0.64	0.80	0.78	0.76	0.62	0.66
Hong Kong SAR	0.86	51	0.55	0.61	0.65	0.71	0.77	0.78	0.82	0.78
Hungary	0.86	51	0.57	0.65	0.74	0.78	0.72	0.77	0.70	0.74
Iran, Islamic Rep. of	0.86	50	0.66	0.67	0.67	0.75	0.68	0.76	0.78	0.67
Ireland	0.87	54	0.51	0.58	0.60	0.84	0.88	0.81	0.74	0.81
Italy	0.81	44	0.55	0.68	0.65	0.68	0.81	0.75	0.49	0.64
Japan	0.79	40	0.65	0.63	0.62	0.74	0.60	0.69	0.50	0.63
Kazakhstan	0.87	53	0.48	0.68	0.77	0.77	0.78	0.75	0.75	0.80
Korea, Rep. of	0.90	59	0.68	0.77	0.81	0.78	0.79	0.74	0.79	0.77
Kosovo	0.74	38	0.53	0.68	0.47	0.80	0.64	0.67	0.45	0.60
Kuwait	0.81	45	0.36	0.67	0.65	0.74	0.74	0.72	0.70	0.69
Latvia	0.79	41	0.37	0.60	0.62	0.67	0.73	0.74	0.65	0.69
Lithuania	0.83	46	0.49	0.59	0.70	0.78	0.78	0.76	0.56	0.72
Malta	0.85	50	0.36	0.68	0.66	0.80	0.81	0.79	0.72	0.74
Montenegro	0.86	51	0.63	0.68	0.72	0.78	0.79	0.74	0.65	0.72
Morocco	0.87	53	0.62	0.72	0.74	0.79	0.69	0.82	0.71	0.71
Netherlands	0.87	53	0.67	0.73	0.76	0.80	0.77	0.73	0.68	0.67
New Zealand	0.87	54	0.50	0.60	0.70	0.81	0.84	0.80	0.76	0.79
North Macedonia	0.82	46	0.60	0.65	0.60	0.74	0.74	0.68	0.65	0.77
Northern Ireland	0.88	55	0.63	0.52	0.50	0.83	0.85	0.85	0.81	0.81

**Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Safe and Orderly School Scale* – Grade 4**

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item							
			ATBG07A	ATBG07B	ATBG07C	ATBG07D	ATBG07E	ATBG07F	ATBG07G	ATBG07H
Norway (5)	0.86	52	0.57	0.71	0.63	0.80	0.81	0.82	0.66	0.70
Oman	0.81	45	0.42	0.57	0.67	0.76	0.74	0.73	0.68	0.71
Pakistan	0.84	48	0.69	0.66	0.63	0.75	0.69	0.63	0.71	0.74
Philippines	0.86	50	0.56	0.63	0.73	0.75	0.80	0.79	0.69	0.68
Poland	0.85	49	0.52	0.70	0.73	0.77	0.76	0.74	0.70	0.69
Portugal	0.82	44	0.67	0.68	0.66	0.77	0.76	0.74	0.50	0.48
Qatar	0.88	55	0.53	0.59	0.63	0.83	0.83	0.81	0.80	0.85
Russian Federation	0.83	47	0.58	0.69	0.60	0.70	0.77	0.77	0.54	0.78
Saudi Arabia	0.85	50	0.51	0.58	0.71	0.76	0.71	0.77	0.79	0.79
Serbia	0.86	51	0.58	0.69	0.75	0.75	0.72	0.69	0.69	0.81
Singapore	0.88	55	0.57	0.62	0.68	0.80	0.82	0.80	0.77	0.80
Slovak Republic	0.83	46	0.43	0.61	0.63	0.73	0.74	0.76	0.73	0.73
South Africa (5)	0.87	53	0.69	0.73	0.71	0.81	0.76	0.77	0.61	0.73
Spain	0.83	47	0.59	0.62	0.54	0.82	0.80	0.75	0.63	0.67
Sweden	0.84	48	0.63	0.71	0.74	0.80	0.80	0.68	0.56	0.62
Turkey (5)	0.89	58	0.73	0.76	0.77	0.78	0.79	0.79	0.72	0.73
United Arab Emirates	0.89	58	0.42	0.55	0.69	0.86	0.87	0.87	0.83	0.85
United States	0.89	58	0.64	0.68	0.67	0.85	0.85	0.85	0.73	0.78
<b>Benchmarking Participants</b>										
Ontario, Canada	0.91	62	0.61	0.75	0.74	0.87	0.86	0.85	0.78	0.81
Quebec, Canada	0.82	45	0.60	0.67	0.63	0.73	0.73	0.63	0.69	0.69
Moscow City, Russian Fed.	0.88	55	0.47	0.72	0.71	0.83	0.81	0.84	0.70	0.80
Madrid, Spain	0.86	51	0.58	0.64	0.67	0.82	0.83	0.75	0.71	0.71
Abu Dhabi, UAE	0.90	59	0.41	0.54	0.67	0.87	0.88	0.88	0.85	0.87
Dubai, UAE	0.88	55	0.40	0.52	0.71	0.82	0.84	0.85	0.83	0.84

### Relationship Between the TIMSS 2019 *Safe and Orderly School* Scale and TIMSS 2019 Achievement – Grade 4

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
Albania	0.01	0.00	0.00	-0.01	0.00	0.00
Armenia	0.09	0.01	0.01	0.04	0.00	0.00
Australia	0.18	0.03	0.03	0.20	0.04	0.04
Austria	0.18	0.03	0.03	0.22	0.05	0.05
Azerbaijan	-0.04	0.00	0.00	-0.04	0.00	0.00
Bahrain	0.03	0.00	0.00	0.21	0.04	0.02
Belgium (Flemish)	0.13	0.02	0.02	0.14	0.02	0.02
Bosnia and Herzegovina	0.04	0.00	0.00	0.06	0.00	0.00
Bulgaria	0.13	0.02	0.01	0.19	0.04	0.03
Canada	0.07	0.00	0.01	0.15	0.02	0.02
Chile	0.18	0.03	0.02	0.20	0.04	0.02
Chinese Taipei	0.01	0.00	0.00	0.04	0.00	0.00
Croatia	-0.01	0.00	0.00	0.01	0.00	0.00
Cyprus	0.02	0.00	0.00	0.05	0.00	0.00
Czech Republic	0.14	0.02	0.01	0.16	0.02	0.01
Denmark	0.11	0.01	0.01	0.10	0.01	0.01
England	0.12	0.01	0.01	0.13	0.02	0.01
Finland	0.12	0.01	0.01	0.10	0.01	0.01
France	0.19	0.03	0.02	0.18	0.03	0.02
Georgia	0.02	0.00	0.01	0.01	0.00	0.00
Germany	0.23	0.05	0.04	0.19	0.04	0.03
Hong Kong SAR	0.18	0.03	0.04	0.12	0.01	0.00
Hungary	0.17	0.03	0.03	0.10	0.01	0.02
Iran, Islamic Rep. of	0.09	0.01	0.00	0.09	0.01	0.00
Ireland	0.13	0.02	0.02	0.15	0.02	0.02
Italy	0.09	0.01	0.00	0.10	0.01	0.01
Japan	0.06	0.00	0.00	0.05	0.00	0.00
Kazakhstan	0.04	0.00	0.00	0.07	0.01	0.01
Korea, Rep. of	0.12	0.01	0.01	0.10	0.01	0.01
Kosovo	-0.02	0.00	0.00	-0.01	0.00	0.00
Kuwait	0.16	0.03	0.01	0.18	0.03	0.02
Latvia	0.08	0.01	0.02	0.05	0.00	0.00
Lithuania	0.09	0.01	0.00	0.12	0.01	0.01
Malta	0.13	0.02	0.01	0.12	0.01	0.01
Montenegro	0.00	0.00	0.00	-0.01	0.00	0.00
Morocco	0.26	0.07	0.04	0.23	0.05	0.03
Netherlands	0.12	0.01	0.01	0.17	0.03	0.02

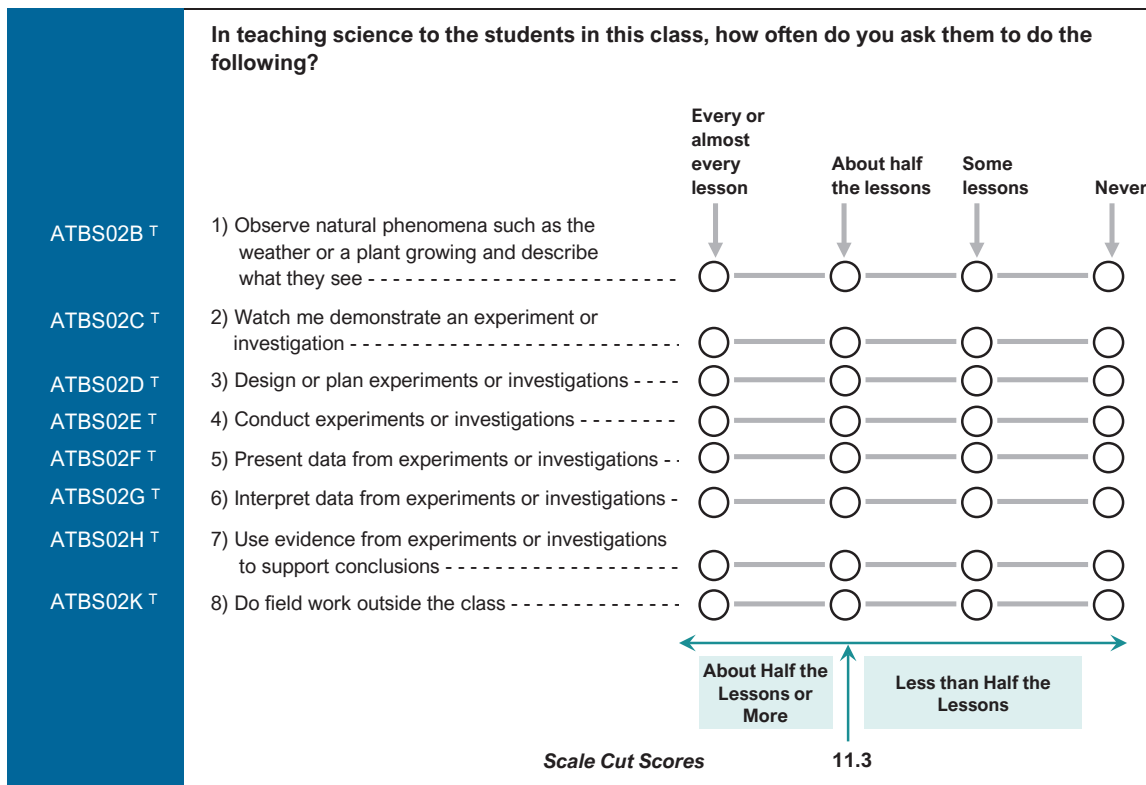
### Relationship Between the TIMSS 2019 *Safe and Orderly School* Scale and TIMSS 2019 Achievement – Grade 4

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
New Zealand	0.16	0.03	0.02	0.17	0.03	0.02
North Macedonia	0.03	0.00	0.01	0.02	0.00	0.01
Northern Ireland	0.13	0.02	0.02	0.12	0.01	0.02
Norway (5)	0.07	0.01	0.00	0.04	0.00	0.00
Oman	0.13	0.02	0.01	0.09	0.01	0.00
Pakistan	0.20	0.04	0.06	0.15	0.02	0.04
Philippines	0.15	0.02	0.02	0.14	0.02	0.00
Poland	0.02	0.00	0.00	-0.02	0.00	0.00
Portugal	0.16	0.03	0.03	0.15	0.02	0.02
Qatar	0.02	0.00	0.00	0.05	0.00	0.00
Russian Federation	0.03	0.00	0.00	-0.01	0.00	0.00
Saudi Arabia	0.11	0.01	0.02	0.14	0.02	0.03
Serbia	-0.08	0.01	0.01	-0.06	0.00	0.00
Singapore	0.06	0.00	0.00	0.03	0.00	0.00
Slovak Republic	0.09	0.01	0.01	0.11	0.01	0.01
South Africa (5)	0.12	0.01	0.01	0.08	0.01	0.01
Spain	0.18	0.03	0.04	0.17	0.03	0.03
Sweden	0.22	0.05	0.03	0.20	0.04	0.02
Turkey (5)	0.23	0.05	0.04	0.13	0.02	0.03
United Arab Emirates	0.29	0.08	0.07	0.34	0.11	0.09
United States	0.23	0.05	0.05	0.24	0.06	0.05
<b>International Median</b>	<b>0.12</b>	<b>0.01</b>	<b>0.01</b>	<b>0.12</b>	<b>0.01</b>	<b>0.01</b>
<b>Benchmarking Participants</b>						
Ontario, Canada	0.18	0.03	0.02	0.19	0.03	0.03
Quebec, Canada	0.04	0.00	0.00	0.07	0.00	0.00
Moscow City, Russian Fed.	0.04	0.00	0.00	0.02	0.00	0.00
Madrid, Spain	0.17	0.03	0.04	0.20	0.04	0.04
Abu Dhabi, UAE	0.37	0.14	0.12	0.37	0.14	0.11
Dubai, UAE	0.15	0.02	0.01	0.14	0.02	0.02

## Teachers' Emphasis on Science Investigation – Grade 4

### About the Scale

The *Teachers' Emphasis on Science Investigation* scale was created based on teachers' responses to eight items listed below.<sup>1</sup>



<sup>1</sup> 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.

<sup>T</sup> Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.

### Item Parameters for the TIMSS 2019 *Teachers' Emphasis on Science Investigation* Scale – Grade 4

Item	delta	tau_1	tau_2	Infit
ATBS02B	-0.99302	-0.87415	0.87415	1.47
ATBS02C	-0.36179	-0.42328	0.42328	1.36
ATBS02D	0.14006	-0.74966	0.74966	0.83
ATBS02E	-0.03386	-0.74195	0.74195	0.82
ATBS02F	0.14169	-0.64943	0.64943	0.73
ATBS02G	-0.00064	-0.58904	0.58904	0.73
ATBS02H	-0.33626	-0.65045	0.65045	0.95
ATBS02K	1.44382	-0.54317	0.54317	1.53

### Scale Transformation Constants for the TIMSS 2019 *Teachers' Emphasis on Science Investigation* Scale – Grade 4

#### Scale Transformation Constants

$$A = 11.370579$$

$$B = 1.2943720$$

$$\text{Transformed Scale Score} = 11.370579 + 1.2943720 \cdot \text{Logit Scale Score}$$

### Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019 *Teachers' Emphasis on Science Investigation* Scale – Grade 4

Raw Score	Transformed Scale Score	Cutpoint
0	6.59220	
1	8.14968	
2	8.93739	
3	9.49744	
4	9.94650	
5	10.33915	
6	10.69474	
7	11.03003	
8	11.35666	11.3
9	11.68739	
10	12.02985	
11	12.39638	
12	12.79933	
13	13.26245	
14	13.83022	
15	14.61161	
16	16.13766	

**Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 Teachers' Emphasis on Science Investigation Scale – Grade 4**

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item								
			ATBS02B	ATBS02C	ATBS02D	ATBS02E	ATBS02F	ATBS02G	ATBS02H	ATBS02K	
Albania	0.84	49	0.64	0.42	0.77	0.72	0.80	0.84	0.80	0.49	
Armenia	0.86	55	0.56	0.68	0.84	0.79	0.87	0.85	0.72	0.55	
Australia	0.88	56	0.63	0.60	0.82	0.87	0.88	0.88	0.72	0.50	
Austria	0.86	55	0.54	0.73	0.81	0.88	0.87	0.86	0.66	0.46	
Azerbaijan	0.86	51	0.61	0.66	0.77	0.76	0.83	0.82	0.72	0.48	
Bahrain	0.85	50	0.54	0.47	0.71	0.85	0.85	0.84	0.80	0.41	
Belgium (Flemish)	0.88	59	0.50	0.42	0.83	0.89	0.90	0.91	0.86	0.66	
Bosnia and Herzegovina	0.90	63	0.54	0.71	0.89	0.89	0.89	0.87	0.82	0.66	
Bulgaria	0.89	61	0.59	0.69	0.87	0.92	0.90	0.86	0.68	0.67	
Canada	0.85	49	0.65	0.59	0.72	0.80	0.78	0.81	0.74	0.48	
Chile	0.87	54	0.58	0.69	0.84	0.85	0.83	0.84	0.59	0.59	
Chinese Taipei	0.88	56	0.68	0.60	0.74	0.80	0.86	0.87	0.86	0.49	
Croatia	0.92	66	0.71	0.71	0.86	0.93	0.93	0.91	0.70	0.70	
Cyprus	0.82	48	0.42	0.31	0.82	0.78	0.92	0.89	0.80	0.20	
Czech Republic	0.80	49	0.55	0.65	0.84	0.83	0.82	0.78	0.57	0.46	
Denmark	0.85	50	0.54	0.51	0.83	0.79	0.84	0.80	0.72	0.50	
England	0.76	39	0.27	0.46	0.68	0.71	0.77	0.82	0.75	0.29	
Finland	0.83	53	0.47	0.60	0.78	0.81	0.87	0.87	0.74	0.56	
France	0.88	56	0.52	0.30	0.81	0.83	0.92	0.91	0.89	0.58	
Georgia	0.87	56	0.54	0.60	0.86	0.91	0.88	0.89	0.72	0.42	
Germany	0.84	49	0.62	0.54	0.67	0.85	0.80	0.83	0.76	0.43	
Hong Kong SAR	0.91	62	0.67	0.70	0.79	0.86	0.86	0.87	0.88	0.63	
Hungary	0.83	52	0.53	0.61	0.79	0.82	0.84	0.76	0.68	0.66	
Iran, Islamic Rep. of	0.87	54	0.61	0.45	0.80	0.82	0.83	0.84	0.81	0.61	
Ireland	0.83	47	0.44	0.45	0.65	0.82	0.85	0.83	0.83	0.43	
Italy	0.90	60	0.64	0.67	0.90	0.89	0.87	0.87	0.78	0.50	
Japan	0.83	47	0.65	0.46	0.74	0.81	0.77	0.80	0.71	0.45	
Kazakhstan	0.90	58	0.62	0.71	0.82	0.77	0.85	0.83	0.72	0.73	
Korea, Rep. of	0.81	47	0.45	0.44	0.75	0.84	0.85	0.86	0.70	0.35	
Kosovo	0.85	51	0.42	0.58	0.77	0.79	0.86	0.84	0.76	0.58	
Kuwait	0.88	57	0.40	0.63	0.85	0.88	0.88	0.88	0.81	0.51	
Latvia	0.87	55	0.61	0.53	0.79	0.86	0.89	0.82	0.80	0.49	
Lithuania	0.90	63	0.50	0.74	0.88	0.90	0.92	0.87	0.75	0.71	
Malta	0.90	60	0.57	0.69	0.84	0.89	0.91	0.90	0.81	0.46	
Montenegro	0.91	65	0.56	0.70	0.86	0.90	0.91	0.89	0.85	0.72	
Morocco	0.85	49	0.52	0.51	0.78	0.81	0.88	0.81	0.74	0.37	
Netherlands	0.88	57	0.62	0.48	0.91	0.92	0.85	0.86	0.81	0.34	
New Zealand	0.86	52	0.64	0.51	0.75	0.82	0.85	0.84	0.76	0.51	
North Macedonia	0.89	58	0.57	0.56	0.80	0.86	0.89	0.88	0.84	0.59	
Northern Ireland	0.89	60	0.44	0.62	0.86	0.90	0.90	0.87	0.88	0.55	



**Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 Teachers' Emphasis on Science Investigation Scale – Grade 4**

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item								
			ATBS02B	ATBS02C	ATBS02D	ATBS02E	ATBS02F	ATBS02G	ATBS02H	ATBS02K	
Norway (5)	0.83	49	0.46	0.52	0.75	0.80	0.85	0.83	0.76	0.49	
Oman	0.81	45	0.40	0.52	0.64	0.82	0.84	0.82	0.70	0.44	
Pakistan	0.86	54	0.54	0.69	0.81	0.81	0.86	0.87	0.81	0.25	
Philippines	0.89	58	0.55	0.62	0.80	0.86	0.87	0.87	0.86	0.55	
Poland	0.83	51	0.54	0.63	0.67	0.74	0.85	0.81	0.82	0.56	
Portugal	0.91	64	0.66	0.74	0.90	0.91	0.93	0.91	0.70	0.57	
Qatar	0.88	55	0.62	0.54	0.79	0.85	0.88	0.87	0.77	0.47	
Russian Federation	0.92	66	0.65	0.74	0.86	0.93	0.90	0.93	0.78	0.68	
Saudi Arabia	0.86	51	0.52	0.53	0.74	0.77	0.85	0.89	0.83	0.44	
Serbia	0.92	65	0.66	0.78	0.88	0.90	0.89	0.89	0.75	0.64	
Singapore	0.81	45	0.54	0.41	0.65	0.76	0.84	0.82	0.71	0.48	
Slovak Republic	0.89	60	0.59	0.57	0.88	0.90	0.91	0.90	0.78	0.53	
South Africa (5)	0.91	63	0.64	0.75	0.82	0.86	0.87	0.90	0.83	0.63	
Spain	0.89	59	0.57	0.66	0.81	0.87	0.85	0.87	0.82	0.66	
Sweden	0.88	57	0.57	0.67	0.88	0.82	0.87	0.85	0.76	0.55	
Turkey (5)	0.90	60	0.53	0.42	0.85	0.91	0.88	0.90	0.87	0.70	
United Arab Emirates	0.91	61	0.60	0.66	0.84	0.89	0.91	0.90	0.79	0.58	
United States	0.90	60	0.69	0.64	0.84	0.85	0.89	0.88	0.79	0.53	
<b>Benchmarking Participants</b>											
Ontario, Canada	0.87	54	0.70	0.64	0.78	0.81	0.82	0.83	0.72	0.53	
Quebec, Canada	0.81	44	0.59	0.61	0.62	0.73	0.75	0.76	0.74	0.43	
Moscow City, Russian Fed.	0.89	61	0.55	0.70	0.90	0.91	0.91	0.91	0.67	0.57	
Madrid, Spain	0.86	53	0.44	0.65	0.84	0.84	0.86	0.83	0.79	0.41	
Abu Dhabi, UAE	0.91	63	0.67	0.74	0.85	0.89	0.89	0.88	0.79	0.59	
Dubai, UAE	0.91	62	0.68	0.62	0.81	0.88	0.92	0.91	0.80	0.61	

**Relationship Between the TIMSS 2019 Teachers' Emphasis on Science Investigation Scale and TIMSS 2019 Achievement – Grade 4**

Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
Albania	0.02	0.00	0.00
Armenia	0.06	0.00	0.00
Australia	-0.01	0.00	0.00
Austria	0.02	0.00	0.00
Azerbaijan	0.02	0.00	0.00
Bahrain	0.05	0.00	0.00
Belgium (Flemish)	0.02	0.00	0.00
Bosnia and Herzegovina	-0.02	0.00	0.00
Bulgaria	0.03	0.00	0.01
Canada	-0.02	0.00	0.00
Chile	0.06	0.00	0.00
Chinese Taipei	-0.02	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	0.01	0.00	0.00
England	-0.02	0.00	0.00
Finland	-0.01	0.00	0.00
France	0.02	0.00	0.00
Georgia	-0.04	0.00	0.00
Germany	-0.04	0.00	0.00
Hong Kong SAR	0.16	0.03	0.00
Hungary	-0.05	0.00	0.00
Iran, Islamic Rep. of	0.06	0.00	0.01
Ireland	-0.03	0.00	0.00
Italy	0.01	0.00	0.00
Japan	-0.02	0.00	0.00
Kazakhstan	-0.04	0.00	0.00
Korea, Rep. of	0.07	0.00	0.00
Kosovo	0.03	0.00	0.00
Kuwait	0.01	0.00	0.00
Latvia	0.01	0.00	0.00
Lithuania	-0.01	0.00	0.00
Malta	0.00	0.00	0.00
Montenegro	-0.01	0.00	0.00
Morocco	0.04	0.00	0.00
Netherlands	-0.01	0.00	0.00
New Zealand	-0.01	0.00	0.00

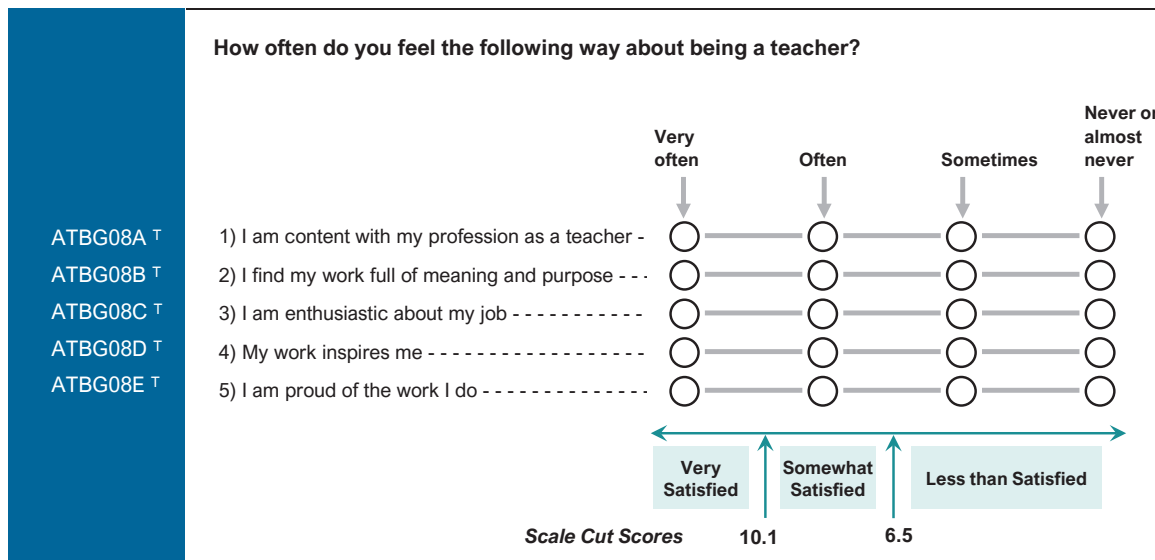
**Relationship Between the TIMSS 2019 Teachers' Emphasis on Science Investigation Scale and TIMSS 2019 Achievement – Grade 4**

Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
North Macedonia	0.04	0.00	0.00
Northern Ireland	0.05	0.00	0.00
Norway (5)	0.03	0.00	0.00
Oman	-0.01	0.00	0.01
Pakistan	0.20	0.04	0.01
Philippines	-0.03	0.00	0.00
Poland	0.02	0.00	0.00
Portugal	-0.05	0.00	0.00
Qatar	-0.14	0.02	0.01
Russian Federation	0.01	0.00	0.00
Saudi Arabia	0.15	0.02	0.01
Serbia	0.05	0.00	0.00
Singapore	0.07	0.00	0.00
Slovak Republic	0.07	0.00	0.01
South Africa (5)	-0.08	0.01	0.00
Spain	-0.05	0.00	0.00
Sweden	0.03	0.00	0.00
Turkey (5)	-0.02	0.00	0.00
United Arab Emirates	0.14	0.02	0.02
United States	0.08	0.01	0.00
<b>International Median</b>	<b>0.01</b>	<b>0.00</b>	<b>0.00</b>
<b>Benchmarking Participants</b>			
Ontario, Canada	-0.03	0.00	0.00
Quebec, Canada	-0.03	0.00	0.00
Moscow City, Russian Fed.	0.03	0.00	0.00
Madrid, Spain	0.04	0.00	0.00
Abu Dhabi, UAE	0.10	0.01	0.01
Dubai, UAE	0.07	0.00	0.01

## Teachers' Job Satisfaction – Grade 4

### About the Scale

The *Teachers' Job Satisfaction* scale was created based on students' responses to five items listed below.<sup>1</sup>



<sup>1</sup> 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.

<sup>T</sup> Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.

### Item Parameters for the TIMSS 2019 Teachers' Job Satisfaction Scale – Grade 4

Item	delta	tau_1	tau_2	Infit
ATBG08A	0.26211	-2.33491	2.33491	1.09
ATBG08B	-0.67089	-2.27457	2.27457	1.10
ATBG08C	0.10245	-2.28986	2.28986	0.94
ATBG08D	0.53886	-2.12788	2.12788	0.91
ATBG08E	-0.23253	-1.97222	1.97222	1.10

### Scale Transformation Constants for the TIMSS 2019 Teachers' Job Satisfaction Scale – Grade 4

#### Scale Transformation Constants

A = 8.286639

B = 0.732139

Transformed Scale Score = 8.286639 + 0.732139 • Logit Scale Score

### Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019 Teachers' Job Satisfaction Scale – Grade 4

Raw Score	Transformed Scale Score	Cutpoint
0	4.84518	
1	5.82502	
2	6.41362	6.5
3	6.92137	
4	7.47949	
5	8.28271	
6	9.09041	
7	9.65527	
8	10.16724	10.1
9	10.75160	
10	11.72115	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Teachers' Job Satisfaction Scale* – Grade 4

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item				
			ATBG08A	ATBG08B	ATBG08C	ATBG08D	ATBG08E
Albania	0.74	49	0.65	0.81	0.68	0.76	0.59
Armenia	0.77	53	0.69	0.66	0.73	0.78	0.77
Australia	0.92	76	0.87	0.88	0.90	0.91	0.79
Austria	0.87	66	0.79	0.77	0.87	0.85	0.78
Azerbaijan	0.79	56	0.77	0.72	0.81	0.71	0.74
Bahrain	0.86	65	0.83	0.72	0.87	0.84	0.78
Belgium (Flemish)	0.89	70	0.82	0.77	0.88	0.86	0.83
Bosnia and Herzegovina	0.86	65	0.77	0.78	0.86	0.83	0.78
Bulgaria	0.89	69	0.81	0.75	0.86	0.89	0.84
Canada	0.92	76	0.87	0.85	0.91	0.89	0.82
Chile	0.90	71	0.86	0.81	0.85	0.90	0.80
Chinese Taipei	0.93	78	0.88	0.90	0.91	0.85	0.88
Croatia	0.88	67	0.84	0.77	0.89	0.85	0.75
Cyprus	0.91	75	0.84	0.89	0.91	0.90	0.78
Czech Republic	0.91	73	0.84	0.88	0.88	0.89	0.78
Denmark	0.89	70	0.81	0.79	0.87	0.87	0.83
England	0.82	59	0.87	0.83	0.78	0.85	0.43
Finland	0.89	69	0.83	0.76	0.89	0.87	0.79
France	0.87	67	0.77	0.74	0.88	0.89	0.79
Georgia	0.77	53	0.70	0.57	0.77	0.81	0.75
Germany	0.86	65	0.77	0.72	0.85	0.83	0.85
Hong Kong SAR	0.93	79	0.87	0.90	0.91	0.89	0.88
Hungary	0.90	72	0.83	0.81	0.87	0.89	0.84
Iran, Islamic Rep. of	0.81	60	0.77	0.79	0.78	0.86	0.65
Ireland	0.92	75	0.84	0.89	0.87	0.89	0.83
Italy	0.85	64	0.76	0.74	0.84	0.85	0.80
Japan	0.90	72	0.84	0.86	0.84	0.87	0.81
Kazakhstan	0.86	64	0.72	0.80	0.82	0.83	0.81
Korea, Rep. of	0.93	79	0.87	0.92	0.87	0.91	0.88
Kosovo	0.58	38	0.48	0.68	0.70	0.62	0.59
Kuwait	0.85	63	0.83	0.77	0.87	0.80	0.69
Latvia	0.85	62	0.82	0.71	0.74	0.84	0.83
Lithuania	0.90	72	0.85	0.70	0.90	0.90	0.88
Malta	0.94	80	0.90	0.90	0.91	0.92	0.85
Montenegro	0.84	62	0.81	0.73	0.83	0.81	0.73
Morocco	0.90	71	0.86	0.77	0.89	0.87	0.81
Netherlands	0.87	67	0.77	0.71	0.88	0.84	0.86
New Zealand	0.91	74	0.83	0.85	0.89	0.91	0.82
North Macedonia	0.86	65	0.72	0.82	0.78	0.83	0.87
Northern Ireland	0.93	80	0.87	0.90	0.93	0.93	0.82

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Teachers' Job Satisfaction Scale* – Grade 4

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item				
			ATBG08A	ATBG08B	ATBG08C	ATBG08D	ATBG08E
Norway (5)	0.89	70	0.82	0.84	0.85	0.88	0.80
Oman	0.82	59	0.80	0.66	0.82	0.81	0.76
Pakistan	0.78	53	0.70	0.70	0.79	0.68	0.77
Philippines	0.91	73	0.82	0.89	0.85	0.87	0.83
Poland	0.91	74	0.86	0.84	0.86	0.87	0.85
Portugal	0.87	66	0.82	0.77	0.88	0.87	0.71
Qatar	0.93	78	0.90	0.86	0.88	0.90	0.88
Russian Federation	0.89	70	0.78	0.83	0.88	0.86	0.85
Saudi Arabia	0.82	58	0.77	0.68	0.82	0.82	0.71
Serbia	0.86	65	0.79	0.76	0.82	0.84	0.83
Singapore	0.95	83	0.90	0.91	0.93	0.93	0.90
Slovak Republic	0.91	73	0.79	0.85	0.87	0.88	0.87
South Africa (5)	0.90	70	0.85	0.84	0.86	0.85	0.79
Spain	0.86	64	0.78	0.78	0.80	0.81	0.84
Sweden	0.89	71	0.79	0.78	0.89	0.91	0.84
Turkey (5)	0.93	77	0.84	0.83	0.94	0.92	0.87
United Arab Emirates	0.91	74	0.83	0.87	0.89	0.89	0.82
United States	0.93	79	0.83	0.92	0.92	0.93	0.84
<b>Benchmarking Participants</b>							
Ontario, Canada	0.92	77	0.87	0.90	0.91	0.91	0.79
Quebec, Canada	0.91	75	0.87	0.80	0.90	0.89	0.84
Moscow City, Russian Fed.	0.90	72	0.80	0.82	0.86	0.91	0.83
Madrid, Spain	0.88	68	0.83	0.83	0.84	0.85	0.78
Abu Dhabi, UAE	0.92	77	0.85	0.89	0.90	0.91	0.83
Dubai, UAE	0.92	75	0.84	0.86	0.90	0.91	0.82

### Relationship Between the TIMSS 2019 Teachers' Job Satisfaction Scale and TIMSS 2019 Achievement – Grade 4

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
Albania	0.03	0.00	0.00	0.01	0.00	0.00
Armenia	0.06	0.00	0.00	0.07	0.01	0.00
Australia	0.00	0.00	0.00	-0.03	0.00	0.00
Austria	0.05	0.00	0.00	0.06	0.00	0.00
Azerbaijan	0.05	0.00	0.00	0.04	0.00	0.00
Bahrain	0.03	0.00	0.00	0.07	0.01	0.00
Belgium (Flemish)	0.00	0.00	0.00	0.00	0.00	0.00
Bosnia and Herzegovina	0.03	0.00	0.00	0.05	0.00	0.00
Bulgaria	0.15	0.02	0.02	0.18	0.03	0.03
Canada	-0.04	0.00	0.00	0.04	0.00	0.00
Chile	0.03	0.00	0.00	-0.04	0.00	0.00
Chinese Taipei	-0.01	0.00	0.00	-0.02	0.00	0.00
Croatia	0.01	0.00	0.00	0.03	0.00	0.00
Cyprus	0.03	0.00	0.00	0.07	0.01	0.00
Czech Republic	0.05	0.00	0.00	0.04	0.00	0.00
Denmark	0.01	0.00	0.00	0.03	0.00	0.00
England	0.06	0.00	0.01	0.08	0.01	0.01
Finland	0.02	0.00	0.00	0.02	0.00	0.00
France	0.02	0.00	0.00	0.04	0.00	0.00
Georgia	-0.07	0.01	0.00	-0.03	0.00	0.00
Germany	-0.03	0.00	0.00	-0.01	0.00	0.00
Hong Kong SAR	0.18	0.03	0.02	0.10	0.01	0.01
Hungary	0.05	0.00	0.00	0.01	0.00	0.00
Iran, Islamic Rep. of	0.05	0.00	0.00	0.04	0.00	0.00
Ireland	0.04	0.00	0.00	0.03	0.00	0.01
Italy	0.01	0.00	0.00	-0.01	0.00	0.00
Japan	-0.03	0.00	0.00	-0.03	0.00	0.00
Kazakhstan	0.02	0.00	0.00	0.01	0.00	0.00
Korea, Rep. of	0.04	0.00	0.00	0.03	0.00	0.00
Kosovo	0.04	0.00	0.00	0.04	0.00	0.00
Kuwait	0.04	0.00	0.00	0.06	0.00	0.01
Latvia	-0.02	0.00	0.00	-0.01	0.00	0.00
Lithuania	0.10	0.01	0.01	0.11	0.01	0.01
Malta	0.07	0.00	0.01	0.08	0.01	0.01
Montenegro	-0.03	0.00	0.00	-0.05	0.00	0.00
Morocco	0.20	0.04	0.03	0.19	0.03	0.04
Netherlands	-0.01	0.00	0.00	0.02	0.00	0.00



### Relationship Between the TIMSS 2019 Teachers' Job Satisfaction Scale and TIMSS 2019 Achievement – Grade 4

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
New Zealand	0.09	0.01	0.01	0.08	0.01	0.01
North Macedonia	-0.01	0.00	0.00	-0.03	0.00	0.00
Northern Ireland	0.04	0.00	0.00	0.03	0.00	0.00
Norway (5)	0.03	0.00	0.00	0.04	0.00	0.00
Oman	0.06	0.00	0.01	0.02	0.00	0.01
Pakistan	0.15	0.02	0.00	0.12	0.01	0.01
Philippines	-0.04	0.00	0.00	-0.04	0.00	0.00
Poland	0.01	0.00	0.00	0.00	0.00	0.00
Portugal	0.05	0.00	0.00	0.06	0.00	0.00
Qatar	-0.02	0.00	0.00	-0.01	0.00	0.00
Russian Federation	-0.01	0.00	0.00	-0.02	0.00	0.00
Saudi Arabia	0.12	0.01	0.02	0.11	0.01	0.01
Serbia	-0.04	0.00	0.00	-0.04	0.00	0.00
Singapore	0.01	0.00	0.01	-0.04	0.00	0.00
Slovak Republic	0.10	0.01	0.01	0.01	0.00	0.01
South Africa (5)	-0.07	0.00	0.01	-0.04	0.00	0.00
Spain	0.03	0.00	0.00	0.05	0.00	0.00
Sweden	0.04	0.00	0.00	0.01	0.00	0.00
Turkey (5)	0.07	0.01	0.01	0.06	0.00	0.01
United Arab Emirates	0.16	0.03	0.03	0.16	0.03	0.03
United States	0.03	0.00	0.00	0.02	0.00	0.00
<b>International Median</b>	<b>0.03</b>	<b>0.00</b>	<b>0.00</b>	<b>0.03</b>	<b>0.00</b>	<b>0.00</b>
<b>Benchmarking Participants</b>						
Ontario, Canada	0.01	0.00	0.00	0.03	0.00	0.00
Quebec, Canada	-0.02	0.00	0.00	0.02	0.00	0.00
Moscow City, Russian Fed.	0.05	0.00	0.01	0.04	0.00	0.01
Madrid, Spain	0.08	0.01	0.01	0.15	0.02	0.03
Abu Dhabi, UAE	0.22	0.05	0.05	0.19	0.04	0.04
Dubai, UAE	0.06	0.00	0.00	0.07	0.00	0.01

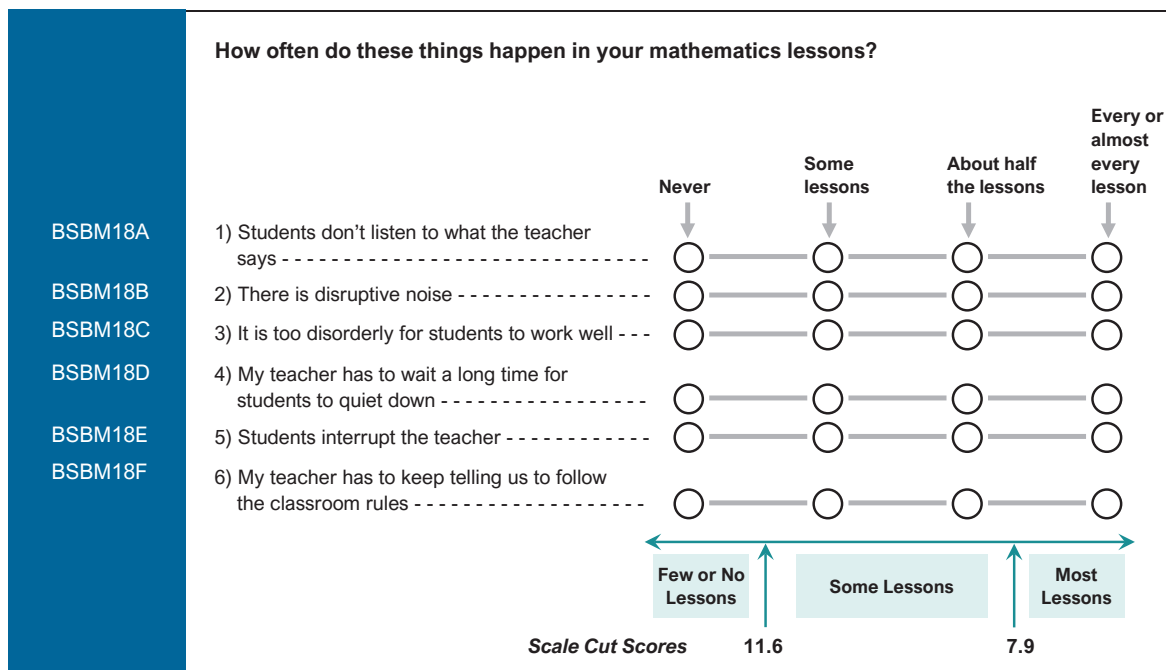
## Appendix 16B: TIMSS 2019 Context Questionnaire Scales—Grade 8

### Scales Based on Students' Reports

## Disorderly Behavior During Mathematics Lessons – Grade 8

### About the Scale

The *Disorderly Behavior During Mathematics Lessons* scale was created based on students' responses to six items listed below.



### Item Parameters for the TIMSS 2019 *Disorderly Behavior During Mathematics Lessons* Scale – Grade 8

Item	delta	tau_1	tau_2	tau_3	Infit
BSBM18A	0.37476	-1.32069	-0.62479	1.94548	1.04
BSBM18B	0.31283	-1.02077	-0.64913	1.66990	0.89
BSBM18C	-0.46280	-0.91951	-0.27631	1.19582	0.95
BSBM18D	-0.13515	-0.67454	-0.57593	1.25047	0.88
BSBM18E	-0.23701	-0.67678	-0.61471	1.29149	0.90
BSBM18F	0.14737	-0.45870	-0.63749	1.09619	1.28

### Scale Transformation Constants for the TIMSS 2019 *Disorderly Behavior During Mathematics Lessons* Scale – Grade 8

#### Scale Transformation Constants

$$A = 9.663799$$

$$B = 1.213350$$

$$\text{Transformed Scale Score} = 9.663799 + 1.213350 \cdot \text{Logit Scale Score}$$

### Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019 *Disorderly Behavior During Mathematics Lessons* Scale – Grade 8

Raw Score	Transformed Scale Score	Cutpoint
0	5.56633	
1	6.82233	
2	7.41866	
3	7.82995	7.9
4	8.15891	
5	8.44435	
6	8.70559	
7	8.95449	
8	9.19981	
9	9.45061	
10	9.71101	
11	9.99445	
12	10.31153	
13	10.67499	
14	11.10344	
15	11.61733	11.6
16	12.25252	
17	13.10820	
18	14.67370	

**Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 Disorderly Behavior During Mathematics Lessons Scale – Grade 8**

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item					
			BSBM18A	BSBM18B	BSBM18C	BSBM18D	BSBM18E	BSBM18F
Australia	0.92	71	0.83	0.84	0.82	0.87	0.87	0.82
Bahrain	0.84	57	0.76	0.81	0.76	0.79	0.80	0.57
Chile	0.90	67	0.76	0.82	0.81	0.85	0.87	0.78
Chinese Taipei	0.90	67	0.77	0.83	0.88	0.85	0.85	0.73
Cyprus	0.87	62	0.78	0.84	0.73	0.84	0.83	0.68
Egypt	0.77	48	0.73	0.78	0.77	0.72	0.76	0.26
England	0.92	73	0.83	0.86	0.85	0.87	0.87	0.84
Finland	0.91	70	0.78	0.84	0.87	0.88	0.86	0.79
France	0.89	65	0.76	0.82	0.84	0.83	0.79	0.80
Georgia	0.86	59	0.70	0.80	0.65	0.83	0.82	0.77
Hong Kong SAR	0.93	74	0.82	0.85	0.90	0.90	0.85	0.83
Hungary	0.90	67	0.78	0.84	0.76	0.87	0.81	0.85
Iran, Islamic Rep. of	0.86	59	0.71	0.79	0.83	0.82	0.78	0.68
Ireland	0.91	69	0.79	0.86	0.83	0.86	0.85	0.79
Israel	0.90	66	0.79	0.85	0.85	0.86	0.82	0.70
Italy	0.90	67	0.74	0.87	0.87	0.85	0.82	0.76
Japan	0.88	63	0.75	0.79	0.82	0.77	0.80	0.82
Jordan	0.83	55	0.77	0.79	0.76	0.78	0.78	0.54
Kazakhstan	0.81	54	0.72	0.82	0.77	0.76	0.79	0.50
Korea, Rep. of	0.90	67	0.83	0.86	0.88	0.83	0.87	0.60
Kuwait	0.81	53	0.75	0.82	0.77	0.77	0.78	0.40
Lebanon	0.83	54	0.70	0.78	0.73	0.78	0.78	0.62
Lithuania	0.90	67	0.81	0.86	0.83	0.86	0.80	0.75
Malaysia	0.73	44	0.68	0.75	0.75	0.71	0.69	0.28
Morocco	0.78	49	0.68	0.76	0.73	0.75	0.73	0.50
New Zealand	0.91	69	0.82	0.83	0.83	0.86	0.87	0.79
Norway (9)	0.91	69	0.77	0.85	0.83	0.87	0.85	0.82
Oman	0.82	53	0.69	0.77	0.76	0.77	0.75	0.61
Portugal	0.92	72	0.75	0.87	0.88	0.88	0.85	0.87
Qatar	0.88	62	0.77	0.82	0.77	0.82	0.81	0.71
Romania	0.87	61	0.68	0.84	0.79	0.83	0.82	0.71
Russian Federation	0.91	70	0.79	0.87	0.88	0.87	0.82	0.80
Saudi Arabia	0.82	54	0.76	0.80	0.72	0.76	0.79	0.52
Singapore	-	-	-	-	-	-	-	-
South Africa (9)	0.80	51	0.69	0.75	0.69	0.76	0.79	0.58
Sweden	0.90	66	0.77	0.84	0.83	0.86	0.83	0.75
Turkey	0.87	61	0.77	0.83	0.74	0.79	0.77	0.77
United Arab Emirates	0.89	65	0.80	0.84	0.81	0.83	0.83	0.72
United States	0.92	70	0.81	0.84	0.82	0.87	0.86	0.83

**Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Disorderly Behavior During Mathematics Lessons* Scale – Grade 8**

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item					
			BSBM18A	BSBM18B	BSBM18C	BSBM18D	BSBM18E	BSBM18F
<b>Benchmarking Participants</b>								
Ontario, Canada	0.91	70	0.82	0.84	0.80	0.87	0.86	0.82
Quebec, Canada	0.90	66	0.78	0.78	0.84	0.85	0.82	0.80
Moscow City, Russian Fed.	0.91	70	0.81	0.87	0.88	0.86	0.80	0.79
Gauteng, RSA (9)	0.85	57	0.73	0.80	0.73	0.79	0.81	0.66
Western Cape, RSA (9)	0.88	62	0.72	0.81	0.80	0.83	0.82	0.74
Abu Dhabi, UAE	0.89	63	0.80	0.83	0.79	0.82	0.83	0.70
Dubai, UAE	0.89	65	0.79	0.82	0.80	0.83	0.83	0.77

A dash (–) indicates comparable data not available.

**Relationship Between the TIMSS 2019 *Disorderly Behavior During Mathematics Lessons* Scale and TIMSS 2019 Achievement – Grade 8**

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
Australia	0.23	0.05	0.05
Bahrain	0.07	0.01	0.00
Chile	0.07	0.00	0.00
Chinese Taipei	0.02	0.00	0.00
Cyprus	0.13	0.02	0.01
Egypt	0.13	0.02	0.01
England	0.28	0.08	0.06
Finland	0.04	0.00	0.00
France	0.06	0.00	0.00
Georgia	0.10	0.01	0.01
Hong Kong SAR	0.04	0.00	0.01
Hungary	0.17	0.03	0.02
Iran, Islamic Rep. of	0.12	0.01	0.01
Ireland	0.29	0.08	0.07
Israel	0.23	0.05	0.04
Italy	0.12	0.01	0.01
Japan	0.08	0.01	0.01
Jordan	0.16	0.02	0.02
Kazakhstan	0.10	0.01	0.01
Korea, Rep. of	-0.07	0.01	0.00
Kuwait	0.07	0.01	0.01
Lebanon	0.07	0.00	0.00
Lithuania	0.08	0.01	0.01
Malaysia	0.27	0.07	0.03
Morocco	0.10	0.01	0.01
New Zealand	0.17	0.03	0.02
Norway (9)	0.05	0.00	0.00
Oman	0.08	0.01	0.00
Portugal	0.04	0.00	0.00
Qatar	0.16	0.03	0.02
Romania	0.21	0.04	0.04
Russian Federation	0.12	0.01	0.01
Saudi Arabia	0.08	0.01	0.01
Singapore	-	-	-
South Africa (9)	0.14	0.02	0.02
Sweden	0.04	0.00	0.00
Turkey	0.10	0.01	0.01
United Arab Emirates	0.19	0.04	0.03
United States	0.25	0.06	0.05
<b>International Median</b>	<b>0.10</b>	<b>0.01</b>	<b>0.01</b>

**Relationship Between the TIMSS 2019 *Disorderly Behavior During Mathematics Lessons* Scale and TIMSS 2019 Achievement – Grade 8**

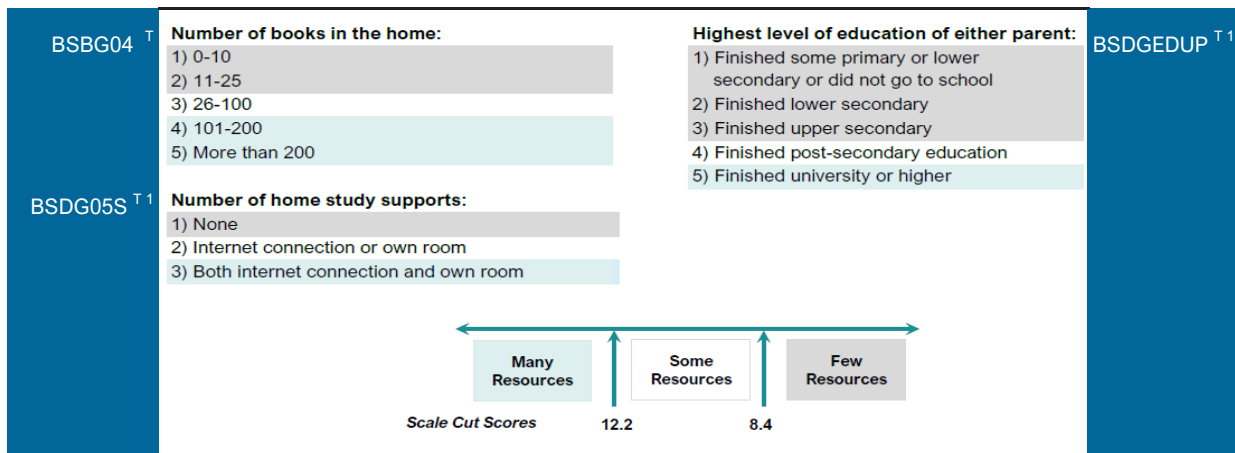
Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
<b>Benchmarking Participants</b>			
Ontario, Canada	0.18	0.03	0.03
Quebec, Canada	0.12	0.02	0.02
Moscow City, Russian Fed.	0.13	0.02	0.01
Gauteng, RSA (9)	0.25	0.06	0.05
Western Cape, RSA (9)	0.28	0.08	0.07
Abu Dhabi, UAE	0.19	0.04	0.03
Dubai, UAE	0.19	0.04	0.03

A dash (–) indicates comparable data not available.

## Home Educational Resources – Grade 8

### About the Scale

The *Home Educational Resources* scale was created based on students' reports regarding the availability of three resources listed below.



<sup>T</sup> Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.

<sup>1</sup> Derived variable. For details, see Supplement 3 of the *TIMSS 2019 User Guide for the International Database*.



### Item Parameters for the TIMSS 2019 *Home Educational Resources* Scale – Grade 8

Item	delta	tau_1	tau_2	tau_3	tau_4	Infit
BSBG04	1.03579	-0.89014	-0.25434	0.71392	0.43056	1.00
BSDG05S	-0.94808	-0.62039	0.62039			0.95
BSDGEDUP	-0.08771	-0.72810	-0.53330	0.92403	0.33737	0.99

### Scale Transformation Constants for the TIMSS 2019 *Home Educational Resources* Scale – Grade 8

#### Scale Transformation Constants

A = 9.168781

B = 1.639257

Transformed Scale Score = 9.168781 + 1.639257 • Logit Scale Score

### Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019 *Home Educational Resources* Scale – Grade 8

Raw Score	Transformed Scale Score	Cutpoint
0	4.55208	
1	6.52207	
2	7.56439	
3	8.35810	8.4
4	9.03613	
5	9.64761	
6	10.23835	
7	10.84499	
8	11.48712	
9	12.25655	12.2
10	13.51543	

**Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Home Educational Resources* Scale – Grade 8**

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item		
			BSBG04	BSDG05S	BSDGEDUP
Australia	0.40	46	0.77	0.44	0.78
Bahrain	0.40	45	0.72	0.50	0.77
Chile	0.41	46	0.71	0.55	0.76
Chinese Taipei	0.48	49	0.81	0.43	0.80
Cyprus	0.47	49	0.80	0.40	0.81
Egypt	0.35	44	0.57	0.68	0.73
England	0.44	48	0.77	0.47	0.79
Finland	0.36	44	0.76	0.35	0.79
France	0.46	49	0.79	0.44	0.80
Georgia	0.48	50	0.82	0.36	0.83
Hong Kong SAR	0.49	50	0.76	0.53	0.79
Hungary	0.51	51	0.86	0.24	0.86
Iran, Islamic Rep. of	0.55	53	0.73	0.65	0.80
Ireland	0.42	47	0.79	0.34	0.81
Israel	0.43	64	0.80	-	0.80
Italy	0.44	47	0.81	0.29	0.83
Japan	0.25	41	0.76	0.22	0.77
Jordan	0.40	46	0.63	0.64	0.76
Kazakhstan	0.40	46	0.71	0.60	0.72
Korea, Rep. of	0.41	47	0.75	0.50	0.78
Kuwait	0.30	41	0.73	0.41	0.73
Lebanon	0.39	45	0.73	0.44	0.79
Lithuania	0.44	49	0.79	0.45	0.80
Malaysia	0.48	49	0.73	0.57	0.78
Morocco	0.56	54	0.75	0.66	0.78
New Zealand	0.44	48	0.79	0.46	0.78
Norway (9)	0.37	46	0.76	0.46	0.78
Oman	0.41	46	0.70	0.51	0.79
Portugal	0.48	49	0.84	0.23	0.85
Qatar	0.38	45	0.72	0.47	0.78
Romania	0.54	53	0.81	0.47	0.84
Russian Federation	0.41	46	0.77	0.40	0.79
Saudi Arabia	0.37	44	0.68	0.51	0.77
Singapore	0.43	47	0.73	0.51	0.79
South Africa (9)	0.42	47	0.65	0.69	0.71
Sweden	0.41	47	0.80	0.42	0.77
Turkey	0.64	59	0.78	0.72	0.81
United Arab Emirates	0.35	44	0.72	0.54	0.72
United States	0.45	49	0.74	0.54	0.79

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Home Educational Resources* Scale – Grade 8

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item		
			BSBG04	BSDG05S	BSDGEDUP
<b>Benchmarking Participants</b>					
Ontario, Canada	0.36	45	0.74	0.44	0.78
Quebec, Canada	0.35	44	0.79	0.27	0.80
Moscow City, Russian Fed.	0.29	42	0.71	0.44	0.76
Gauteng, RSA (9)	0.44	48	0.62	0.72	0.73
Western Cape, RSA (9)	0.59	56	0.75	0.75	0.75
Abu Dhabi, UAE	0.35	44	0.68	0.54	0.74
Dubai, UAE	0.37	45	0.74	0.58	0.68

A dash (–) indicates comparable data not available.

### Relationship Between the TIMSS 2019 *Home Educational Resources* Scale and TIMSS 2019 Achievement – Grade 8

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
Australia	0.41	0.17	0.12	0.46	0.22	0.14
Bahrain	0.15	0.02	0.01	0.28	0.08	0.05
Chile	0.40	0.16	0.11	0.38	0.15	0.10
Chinese Taipei	0.41	0.16	0.13	0.40	0.16	0.13
Cyprus	0.43	0.19	0.12	0.42	0.18	0.11
Egypt	0.18	0.03	0.03	0.18	0.03	0.03
England	0.41	0.17	0.10	0.44	0.20	0.12
Finland	0.37	0.14	0.09	0.39	0.15	0.10
France	0.46	0.22	0.13	0.49	0.24	0.14
Georgia	0.26	0.07	0.04	0.26	0.07	0.04
Hong Kong SAR	0.31	0.09	0.06	0.28	0.08	0.05
Hungary	0.56	0.32	0.24	0.54	0.30	0.22
Iran, Islamic Rep. of	0.44	0.19	0.14	0.44	0.19	0.15
Ireland	0.47	0.22	0.15	0.48	0.23	0.16
Israel	0.43	0.18	0.08	0.41	0.17	0.07
Italy	0.36	0.13	0.10	0.40	0.16	0.12
Japan	0.35	0.12	0.07	0.35	0.12	0.07
Jordan	0.22	0.05	0.03	0.24	0.06	0.04
Kazakhstan	0.25	0.06	0.03	0.25	0.06	0.03
Korea, Rep. of	0.36	0.13	0.11	0.31	0.09	0.08
Kuwait	0.17	0.03	0.02	0.17	0.03	0.02
Lebanon	0.34	0.11	0.07	0.38	0.15	0.10
Lithuania	0.46	0.21	0.12	0.44	0.19	0.12
Malaysia	0.41	0.16	0.10	0.38	0.15	0.09
Morocco	0.25	0.06	0.07	0.15	0.02	0.03
New Zealand	0.44	0.19	0.11	0.50	0.25	0.16
Norway (9)	0.35	0.12	0.09	0.39	0.15	0.10
Oman	0.32	0.10	0.06	0.30	0.09	0.05
Portugal	0.42	0.18	0.12	0.39	0.15	0.11
Qatar	0.37	0.14	0.08	0.34	0.11	0.06
Romania	0.47	0.22	0.16	0.42	0.18	0.13
Russian Federation	0.30	0.09	0.05	0.31	0.09	0.04
Saudi Arabia	0.25	0.06	0.05	0.23	0.05	0.04
Singapore	0.40	0.16	0.10	0.44	0.19	0.12
South Africa (9)	0.26	0.07	0.06	0.28	0.08	0.06
Sweden	0.46	0.22	0.14	0.50	0.25	0.16
Turkey	0.48	0.23	0.18	0.47	0.22	0.17
United Arab Emirates	0.30	0.09	0.05	0.31	0.10	0.06
United States	0.46	0.21	0.13	0.45	0.20	0.13
<b>International Median</b>	<b>0.37</b>	<b>0.14</b>	<b>0.10</b>	<b>0.39</b>	<b>0.15</b>	<b>0.10</b>

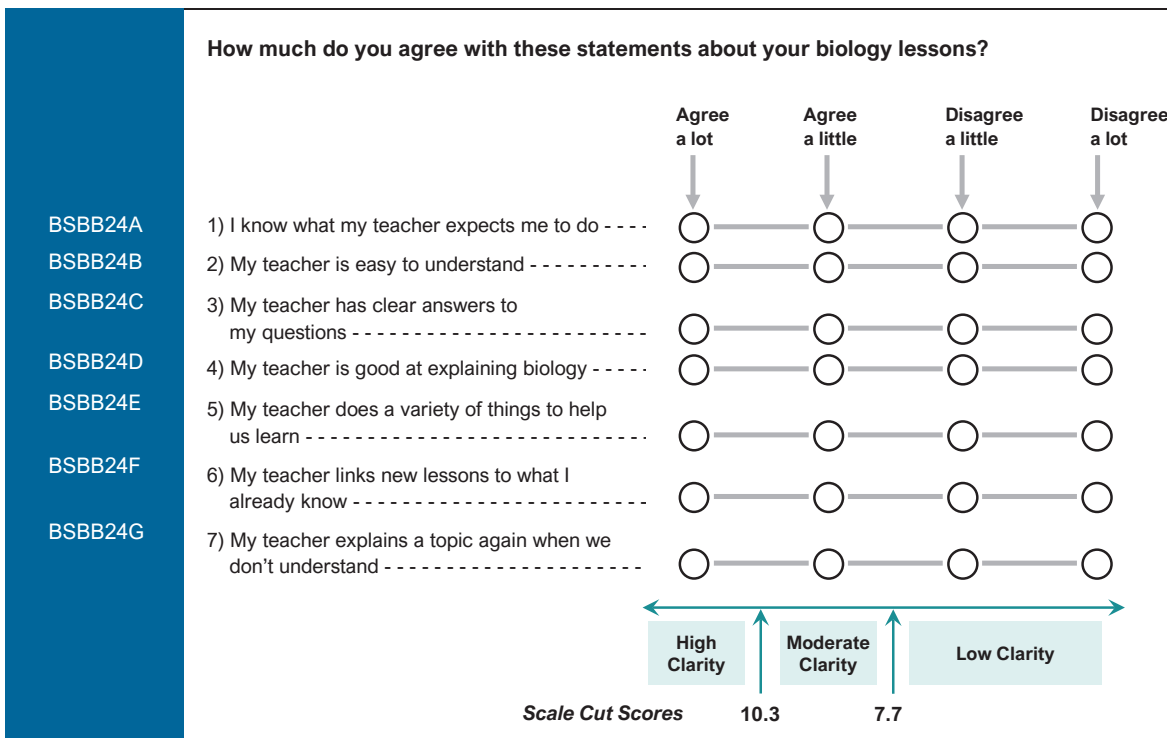
**Relationship Between the TIMSS 2019 *Home Educational Resources* Scale and TIMSS 2019 Achievement – Grade 8**

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
<b>Benchmarking Participants</b>						
Ontario, Canada	0.37	0.14	0.08	0.41	0.17	0.11
Quebec, Canada	0.35	0.12	0.07	0.40	0.16	0.10
Moscow City, Russian Fed.	0.29	0.08	0.05	0.29	0.08	0.05
Gauteng, RSA (9)	0.30	0.09	0.06	0.32	0.10	0.06
Western Cape, RSA (9)	0.47	0.22	0.18	0.47	0.22	0.19
Abu Dhabi, UAE	0.30	0.09	0.06	0.32	0.10	0.06
Dubai, UAE	0.31	0.10	0.06	0.32	0.10	0.06

# Instructional Clarity in Biology Lessons – Grade 8

## About the Scale

The *Instructional Clarity in Biology Lessons* scale was created based on students’ responses to seven items listed below.



### Item Parameters for the TIMSS 2019 *Instructional Clarity in Biology Lessons* Scale – Grade 8

Item	delta	tau_1	tau_2	tau_3	Infit
BSBB24A	0.39375	-1.92236	-0.50414	2.42650	1.46
BSBB24B	0.12682	-1.69599	-0.52211	2.21810	0.90
BSBB24C	-0.12835	-1.55327	-0.39952	1.95279	0.82
BSBB24D	-0.42182	-1.28981	-0.57979	1.86960	0.74
BSBB24E	-0.02631	-1.65061	-0.36700	2.01761	0.92
BSBB24F	0.26751	-1.83617	-0.37156	2.20773	1.10
BSBB24G	-0.21160	-1.31757	-0.47165	1.78922	1.00

### Scale Transformation Constants for the TIMSS 2019 *Instructional Clarity in Biology Lessons* Scale – Grade 8

#### Scale Transformation Constants

$$A = 7.994887$$

$$B = 0.979530$$

$$\text{Transformed Scale Score} = 7.994887 + 0.979530 \cdot \text{Logit Scale Score}$$

### Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019 *Instructional Clarity in Biology Lessons* Scale – Grade 8

Raw Score	Transformed Scale Score	Cutpoint
0	3.80573	
1	4.92740	
2	5.47995	
3	5.86758	
4	6.18006	
5	6.45197	
6	6.70084	
7	6.93739	
8	7.16933	
9	7.40311	
10	7.64551	7.7
11	7.90030	
12	8.17575	
13	8.47625	
14	8.80537	
15	9.16053	
16	9.53839	
17	9.93996	
18	10.37818	10.3
19	10.88385	
20	11.54787	
21	12.77607	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Instructional Clarity in Biology Lessons Scale – Grade 8*

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item						
			BSBB24A	BSBB24B	BSBB24C	BSBB24D	BSBB24E	BSBB24F	BSBB24G
Cyprus	0.92	67	0.67	0.81	0.88	0.89	0.85	0.75	0.84
Finland	0.93	71	0.69	0.88	0.89	0.90	0.87	0.81	0.86
France	0.91	66	0.66	0.87	0.88	0.89	0.82	0.73	0.82
Georgia	0.89	62	0.58	0.84	0.85	0.86	0.81	0.75	0.78
Hungary	0.92	67	0.69	0.85	0.88	0.88	0.81	0.80	0.81
Kazakhstan	0.89	62	0.62	0.80	0.86	0.85	0.82	0.76	0.78
Lebanon	0.90	62	0.65	0.83	0.86	0.85	0.83	0.74	0.74
Lithuania	0.89	62	0.69	0.83	0.84	0.84	0.82	0.73	0.75
Morocco	0.87	57	0.53	0.70	0.81	0.82	0.83	0.78	0.79
Portugal	0.90	62	0.63	0.82	0.85	0.87	0.75	0.77	0.80
Romania	0.91	67	0.66	0.85	0.86	0.86	0.84	0.78	0.86
Russian Federation	0.91	66	0.67	0.83	0.87	0.86	0.86	0.77	0.80
Sweden	0.92	68	0.64	0.86	0.82	0.88	0.88	0.84	0.80
<b>Benchmarking Participants</b>									
Moscow City, Russian Fed.	0.91	65	0.68	0.83	0.85	0.86	0.85	0.78	0.77

### Relationship Between the TIMSS 2019 *Instructional Clarity in Biology Lessons Scale* and *TIMSS 2019 Achievement – Grade 8*

Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
Cyprus	0.16	0.03	0.02
Finland	0.19	0.03	0.03
France	0.04	0.00	0.00
Georgia	0.12	0.01	0.01
Hungary	0.04	0.00	0.00
Kazakhstan	0.15	0.02	0.02
Lebanon	0.18	0.03	0.03
Lithuania	0.04	0.00	0.00
Morocco	0.11	0.01	0.01
Portugal	0.06	0.00	0.01
Romania	0.01	0.00	0.00
Russian Federation	0.05	0.00	0.00
Sweden	0.09	0.01	0.01
<b>International Median</b>	<b>0.09</b>	<b>0.01</b>	<b>0.01</b>
<b>Benchmarking Participants</b>			
Moscow City, Russian Fed.	0.05	0.00	0.00

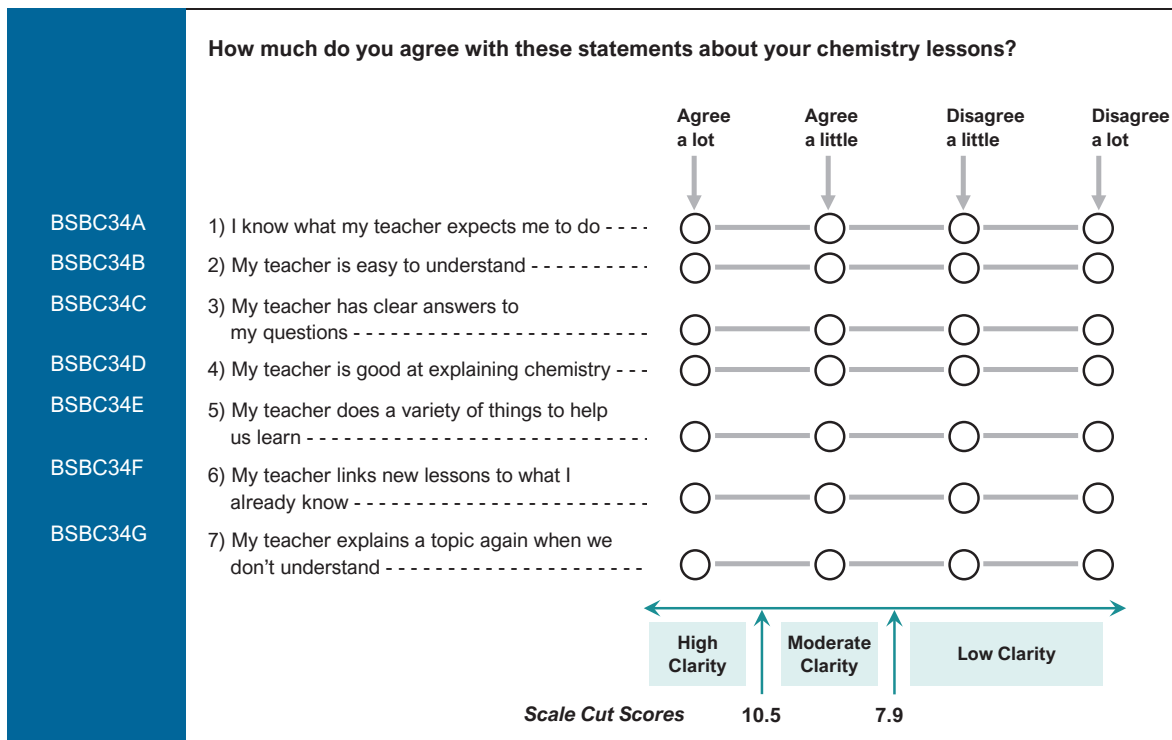
Scale was created for TIMSS 2019 countries where science is taught as separate subjects.



## Instructional Clarity in Chemistry Lessons – Grade 8

### About the Scale

The *Instructional Clarity in Chemistry Lessons* scale was created based on students' responses to seven items listed below.



### Item Parameters for the TIMSS 2019 *Instructional Clarity in Chemistry Lessons* Scale – Grade 8

Item	delta	tau_1	tau_2	tau_3	Infit
BSBC34A	0.30367	-2.02142	-0.58108	2.60250	1.57
BSBC34B	0.29616	-1.88144	-0.52571	2.40715	0.89
BSBC34C	-0.06984	-1.72577	-0.53226	2.25803	0.77
BSBC34D	-0.24544	-1.52782	-0.58802	2.11584	0.76
BSBC34E	-0.10563	-1.79645	-0.47708	2.27353	0.89
BSBC34F	0.16892	-1.95437	-0.46326	2.41763	1.17
BSBC34G	-0.34784	-1.40043	-0.66098	2.06141	1.02

### Scale Transformation Constants for the TIMSS 2019 *Instructional Clarity in Chemistry Lessons* Scale – Grade 8

#### Scale Transformation Constants

$$A = 8.258522$$

$$B = 0.859737$$

$$\text{Transformed Scale Score} = 8.258522 + 0.859737 \cdot \text{Logit Scale Score}$$

### Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019 *Instructional Clarity in Chemistry Lessons* Scale – Grade 8

Raw Score	Transformed Scale Score	Cutpoint
0	4.44982	
1	5.44094	
2	5.93238	
3	6.27893	
4	6.55867	
5	6.80233	
6	7.02593	
7	7.23849	
8	7.44984	
9	7.66458	
10	7.88907	7.9
11	8.13037	
12	8.39611	
13	8.69402	
14	9.02624	
15	9.38399	
16	9.75318	
17	10.12995	
18	10.52773	10.5
19	10.97816	
20	11.56142	
21	12.63681	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Instructional Clarity in Chemistry Lessons* Scale – Grade 8

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item						
			BSBC34A	BSBC34B	BSBC34C	BSBC34D	BSBC34E	BSBC34F	BSBC34G
Cyprus	0.93	71	0.73	0.85	0.90	0.90	0.88	0.76	0.86
Finland	0.94	75	0.71	0.90	0.91	0.92	0.89	0.85	0.86
France	0.93	70	0.69	0.89	0.90	0.90	0.87	0.77	0.82
Georgia	0.93	70	0.64	0.88	0.89	0.90	0.86	0.82	0.85
Hungary	0.93	71	0.72	0.86	0.89	0.90	0.86	0.81	0.84
Kazakhstan	0.92	67	0.67	0.83	0.88	0.88	0.86	0.79	0.82
Lebanon	0.92	67	0.70	0.86	0.88	0.88	0.85	0.78	0.77
Lithuania	0.92	68	0.71	0.86	0.88	0.88	0.86	0.75	0.80
Morocco	0.90	63	0.58	0.75	0.85	0.84	0.85	0.81	0.81
Portugal	0.92	68	0.67	0.86	0.88	0.89	0.83	0.82	0.81
Romania	0.93	71	0.68	0.87	0.89	0.88	0.87	0.81	0.85
Russian Federation	0.92	70	0.72	0.84	0.89	0.88	0.88	0.80	0.83
Sweden	0.94	73	0.68	0.89	0.91	0.91	0.90	0.85	0.83
<b>Benchmarking Participants</b>									
Moscow City, Russian Fed.	0.93	71	0.73	0.85	0.89	0.89	0.88	0.81	0.83

### Relationship Between the TIMSS 2019 *Instructional Clarity in Chemistry Lessons* Scale and TIMSS 2019 Achievement – Grade 8

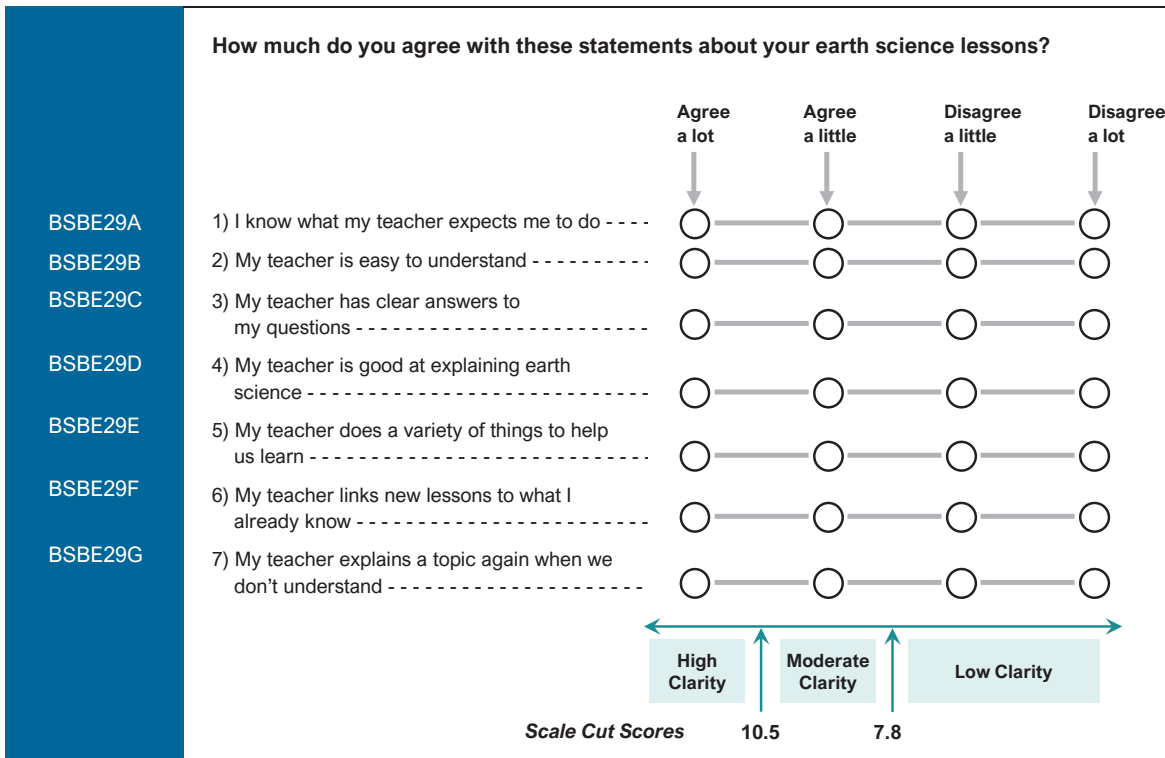
Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
Cyprus	0.18	0.03	0.03
Finland	0.27	0.07	0.06
France	0.05	0.00	0.00
Georgia	0.18	0.03	0.02
Hungary	0.04	0.00	0.00
Kazakhstan	0.18	0.03	0.03
Lebanon	0.19	0.03	0.03
Lithuania	0.12	0.02	0.01
Morocco	0.15	0.02	0.03
Portugal	0.12	0.01	0.01
Romania	0.10	0.01	0.01
Russian Federation	0.14	0.02	0.02
Sweden	0.12	0.01	0.01
<b>International Median</b>	<b>0.14</b>	<b>0.02</b>	<b>0.02</b>
<b>Benchmarking Participants</b>			
Moscow City, Russian Fed.	0.11	0.01	0.01

Scale was created for TIMSS 2019 countries where science is taught as separate subjects.

# Instructional Clarity in Earth Science Lessons – Grade 8

## About the Scale

The *Instructional Clarity in Earth Science Lessons* scale was created based on students’ responses to nine items listed below.



### Item Parameters for the TIMSS 2019 *Instructional Clarity in Earth Science Lessons* Scale – Grade 8

Item	delta	tau_1	tau_2	tau_3	Infit
BSBE29A	0.37167	-1.95461	-0.56539	2.52000	1.52
BSBE29B	0.08286	-1.72660	-0.62489	2.35149	0.91
BSBE29C	-0.22308	-1.57867	-0.58651	2.16518	0.77
BSBE29D	-0.40135	-1.38541	-0.67655	2.06196	0.76
BSBE29E	0.04460	-1.71685	-0.45018	2.16703	0.95
BSBE29F	0.29232	-1.91852	-0.43425	2.35277	1.13
BSBE29G	-0.16702	-1.38739	-0.59333	1.98072	0.97

### Scale Transformation Constants for the TIMSS 2019 *Instructional Clarity in Earth Science Lessons* Scale – Grade 8

#### Scale Transformation Constants

A = 8.161485

B = 0.914376

Transformed Scale Score = 8.161485 + 0.914376 • Logit Scale Score

### Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019 *Instructional Clarity in Earth Science Lessons* Scale – Grade 8

Raw Score	Transformed Scale Score	Cutpoint
0	4.19800	
1	5.23994	
2	5.75344	
3	6.11353	
4	6.40348	
5	6.65566	
6	6.88683	
7	7.10638	
8	7.32462	
9	7.54622	
10	7.77771	7.8
11	8.02627	
12	8.29947	
13	8.60494	
14	8.94504	
15	9.31254	
16	9.69531	
17	10.09005	
18	10.51012	10.5
19	10.98774	
20	11.60849	
21	12.75360	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Instructional Clarity in Earth Science Lessons Scale – Grade 8*

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item						
			BSBE29A	BSBE29B	BSBE29C	BSBE29D	BSBE29E	BSBE29F	BSBE29G
Cyprus	0.94	73	0.74	0.86	0.91	0.91	0.87	0.80	0.87
Finland	0.94	74	0.71	0.89	0.91	0.91	0.88	0.82	0.87
France	0.91	66	0.66	0.87	0.88	0.89	0.82	0.73	0.82
Georgia	0.91	66	0.61	0.84	0.87	0.87	0.83	0.80	0.85
Hungary	0.93	69	0.71	0.87	0.89	0.89	0.83	0.80	0.83
Kazakhstan	0.91	65	0.66	0.81	0.88	0.86	0.85	0.76	0.82
Lebanon	-	-	-	-	-	-	-	-	-
Lithuania	0.92	67	0.69	0.86	0.87	0.87	0.85	0.77	0.80
Morocco	0.89	60	0.55	0.73	0.84	0.84	0.83	0.80	0.80
Portugal	0.90	62	0.63	0.82	0.85	0.87	0.75	0.77	0.80
Romania	0.90	64	0.63	0.86	0.86	0.85	0.80	0.78	0.82
Russian Federation	0.92	68	0.69	0.84	0.88	0.87	0.87	0.77	0.82
Sweden	-	-	-	-	-	-	-	-	-
<b>Benchmarking Participants</b>									
Moscow City, Russian Fed.	0.93	70	0.73	0.85	0.88	0.89	0.88	0.80	0.81

### Relationship Between the TIMSS 2019 *Instructional Clarity in Earth Science Lessons Scale* and *TIMSS 2019 Achievement – Grade 8*

Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
Cyprus	0.14	0.02	0.02
Finland	0.18	0.03	0.03
France	0.04	0.00	0.00
Georgia	0.10	0.01	0.01
Hungary	0.03	0.00	0.01
Kazakhstan	0.13	0.02	0.01
Lebanon	-	-	-
Lithuania	0.05	0.00	0.00
Morocco	0.12	0.02	0.02
Portugal	0.07	0.00	0.01
Romania	0.09	0.01	0.01
Russian Federation	0.02	0.00	0.00
Sweden	-	-	-
<b>International Median</b>	<b>0.09</b>	<b>0.01</b>	<b>0.01</b>
<b>Benchmarking Participants</b>			
Moscow City, Russian Fed.	0.05	0.00	0.00

Scale was created for TIMSS 2019 countries where science is taught as separate subjects.

A dash (-) indicates comparable data not available.

## Instructional Clarity in Mathematics Lessons – Grade 8

### About the Scale

The *Instructional Clarity in Mathematics Lessons* scale was created based on students' responses to seven items listed below.

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

	Agree a lot	Agree a little	Disagree a little	Disagree a lot
BSBM17A 1) I know what my teacher expects me to do - - - -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
BSBM17B 2) My teacher is easy to understand - - - - -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
BSBM17C 3) My teacher has clear answers to my questions - - - - -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
BSBM17D 4) My teacher is good at explaining mathematics -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
BSBM17E 5) My teacher does a variety of things to help us learn - - - - -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
BSBM17F 6) My teacher links new lessons to what I already know - - - - -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
BSBM17G 7) My teacher explains a topic again when we don't understand - - - - -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Scale Cut Scores**      10.3      7.8

### Item Parameters for the TIMSS 2019 *Instructional Clarity in Mathematics Lessons* Scale – Grade 8

Item	delta	tau_1	tau_2	tau_3	Infit
BSBM17A	0.05459	-1.49723	-0.59435	2.09158	1.43
BSBM17B	0.32080	-1.45404	-0.41713	1.87117	0.92
BSBM17C	0.00334	-1.36560	-0.33731	1.70291	0.81
BSBM17D	-0.11300	-1.01045	-0.39445	1.40490	0.77
BSBM17E	-0.03564	-1.22811	-0.35992	1.58803	0.93
BSBM17F	0.11754	-1.42524	-0.44389	1.86913	1.04
BSBM17G	-0.34763	-0.88348	-0.46134	1.34482	0.99

### Scale Transformation Constants for the TIMSS 2019 *Instructional Clarity in Mathematics Lessons* Scale – Grade 8

#### Scale Transformation Constants

$$A = 8.053331$$

$$B = 1.109981$$

$$\text{Transformed Scale Score} = 8.053331 + 1.109981 \cdot \text{Logit Scale Score}$$

### Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019 *Instructional Clarity in Mathematics Lessons* Scale – Grade 8

Raw Score	Transformed Scale Score	Cutpoint
0	3.69567	
1	4.93373	
2	5.53063	
3	5.94336	
4	6.27085	
5	6.55198	
6	6.80608	
7	7.04464	
8	7.27558	
9	7.50516	
10	7.73983	7.8
11	7.98224	
12	8.24029	
13	8.51896	
14	8.82274	
15	9.15605	
16	9.52219	
17	9.92675	
18	10.38390	10.3
19	10.92487	
20	11.65115	
21	13.01885	



### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Instructional Clarity in Mathematics Lessons* Scale – Grade 8

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item						
			BSBM17A	BSBM17B	BSBM17C	BSBM17D	BSBM17E	BSBM17F	BSBM17G
Australia	0.92	67	0.69	0.87	0.87	0.88	0.82	0.80	0.79
Bahrain	0.88	59	0.57	0.79	0.84	0.84	0.81	0.77	0.74
Chile	0.90	62	0.61	0.81	0.86	0.86	0.80	0.77	0.77
Chinese Taipei	0.91	65	0.73	0.80	0.81	0.81	0.83	0.85	0.82
Cyprus	0.90	62	0.63	0.78	0.85	0.88	0.83	0.72	0.80
Egypt	0.81	48	0.43	0.62	0.78	0.77	0.79	0.70	0.66
England	0.91	66	0.68	0.85	0.88	0.88	0.82	0.77	0.78
Finland	0.92	67	0.60	0.87	0.87	0.90	0.85	0.79	0.82
France	0.88	58	0.55	0.83	0.85	0.87	0.76	0.66	0.77
Georgia	0.87	58	0.52	0.80	0.83	0.85	0.80	0.71	0.77
Hong Kong SAR	0.94	73	0.75	0.86	0.89	0.88	0.86	0.88	0.83
Hungary	0.91	66	0.66	0.84	0.87	0.89	0.82	0.77	0.81
Iran, Islamic Rep. of	0.88	57	0.56	0.76	0.82	0.83	0.77	0.78	0.75
Ireland	0.91	64	0.63	0.87	0.86	0.89	0.80	0.76	0.77
Israel	0.89	60	0.61	0.83	0.85	0.86	0.76	0.72	0.74
Italy	0.86	54	0.46	0.73	0.84	0.84	0.77	0.73	0.72
Japan	0.90	64	0.55	0.85	0.84	0.88	0.85	0.77	0.80
Jordan	0.87	57	0.54	0.71	0.83	0.83	0.81	0.75	0.75
Kazakhstan	0.86	55	0.53	0.73	0.80	0.83	0.83	0.70	0.76
Korea, Rep. of	0.91	65	0.54	0.80	0.85	0.89	0.85	0.84	0.83
Kuwait	0.87	56	0.58	0.77	0.82	0.83	0.76	0.74	0.72
Lebanon	0.86	55	0.59	0.80	0.82	0.81	0.79	0.65	0.70
Lithuania	0.89	60	0.62	0.83	0.83	0.83	0.80	0.71	0.76
Malaysia	0.86	54	0.56	0.76	0.79	0.81	0.77	0.71	0.73
Morocco	0.88	59	0.52	0.70	0.83	0.85	0.85	0.78	0.79
New Zealand	0.92	66	0.67	0.86	0.87	0.87	0.83	0.77	0.80
Norway (9)	0.90	63	0.58	0.85	0.84	0.87	0.80	0.80	0.79
Oman	0.84	51	0.46	0.71	0.80	0.80	0.74	0.71	0.72
Portugal	0.90	64	0.63	0.83	0.85	0.88	0.79	0.78	0.81
Qatar	0.90	63	0.64	0.83	0.86	0.85	0.82	0.77	0.76
Romania	0.90	62	0.60	0.82	0.84	0.84	0.81	0.77	0.81
Russian Federation	0.87	58	0.59	0.75	0.82	0.83	0.82	0.73	0.75
Saudi Arabia	0.86	56	0.50	0.76	0.82	0.83	0.80	0.73	0.72
Singapore	0.90	62	0.67	0.84	0.85	0.86	0.76	0.76	0.75
South Africa (9)	0.83	49	0.54	0.76	0.76	0.80	0.68	0.62	0.71
Sweden	0.92	66	0.60	0.86	0.88	0.89	0.87	0.81	0.77
Turkey	0.85	54	0.57	0.78	0.78	0.82	0.72	0.73	0.70
United Arab Emirates	0.90	62	0.64	0.83	0.84	0.85	0.81	0.77	0.77
United States	0.91	66	0.67	0.86	0.86	0.88	0.82	0.77	0.80

**Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Instructional Clarity in Mathematics Lessons* Scale – Grade 8**

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item						
			BSBM17A	BSBM17B	BSBM17C	BSBM17D	BSBM17E	BSBM17F	BSBM17G
<b>Benchmarking Participants</b>									
Ontario, Canada	0.90	63	0.64	0.85	0.84	0.85	0.80	0.77	0.76
Quebec, Canada	0.90	63	0.62	0.86	0.85	0.87	0.80	0.77	0.75
Moscow City, Russian Fed.	0.88	59	0.58	0.79	0.83	0.85	0.84	0.72	0.74
Gauteng, RSA (9)	0.86	54	0.53	0.81	0.81	0.83	0.74	0.65	0.74
Western Cape, RSA (9)	0.87	55	0.56	0.80	0.80	0.82	0.75	0.70	0.72
Abu Dhabi, UAE	0.90	62	0.64	0.83	0.83	0.84	0.81	0.76	0.76
Dubai, UAE	0.89	61	0.64	0.83	0.84	0.85	0.79	0.76	0.74

**Relationship Between the TIMSS 2019 *Instructional Clarity in Mathematics Lessons* Scale and TIMSS 2019 Achievement – Grade 8**

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
Australia	0.23	0.05	0.05
Bahrain	0.15	0.02	0.02
Chile	0.12	0.01	0.01
Chinese Taipei	0.27	0.07	0.06
Cyprus	0.23	0.05	0.04
Egypt	0.13	0.02	0.02
England	0.10	0.01	0.01
Finland	0.23	0.05	0.05
France	0.11	0.01	0.02
Georgia	0.14	0.02	0.02
Hong Kong SAR	0.17	0.03	0.03
Hungary	0.21	0.05	0.04
Iran, Islamic Rep. of	0.15	0.02	0.02
Ireland	0.04	0.00	0.00
Israel	0.09	0.01	0.01
Italy	0.09	0.01	0.01
Japan	0.19	0.04	0.03
Jordan	0.16	0.03	0.02
Kazakhstan	0.17	0.03	0.02
Korea, Rep. of	0.31	0.10	0.07
Kuwait	0.12	0.01	0.01
Lebanon	0.20	0.04	0.04
Lithuania	0.18	0.03	0.03
Malaysia	0.14	0.02	0.01
Morocco	0.11	0.01	0.01
New Zealand	0.12	0.02	0.02
Norway (9)	0.22	0.05	0.05
Oman	0.22	0.05	0.05
Portugal	0.12	0.01	0.01
Qatar	0.15	0.02	0.02
Romania	0.16	0.03	0.02
Russian Federation	0.15	0.02	0.02
Saudi Arabia	0.16	0.03	0.02
Singapore	0.18	0.03	0.03
South Africa (9)	0.07	0.00	0.00
Sweden	0.11	0.01	0.01
Turkey	0.23	0.05	0.04
United Arab Emirates	0.23	0.05	0.05
United States	0.15	0.02	0.02
<b>International Median</b>	<b>0.15</b>	<b>0.02</b>	<b>0.02</b>

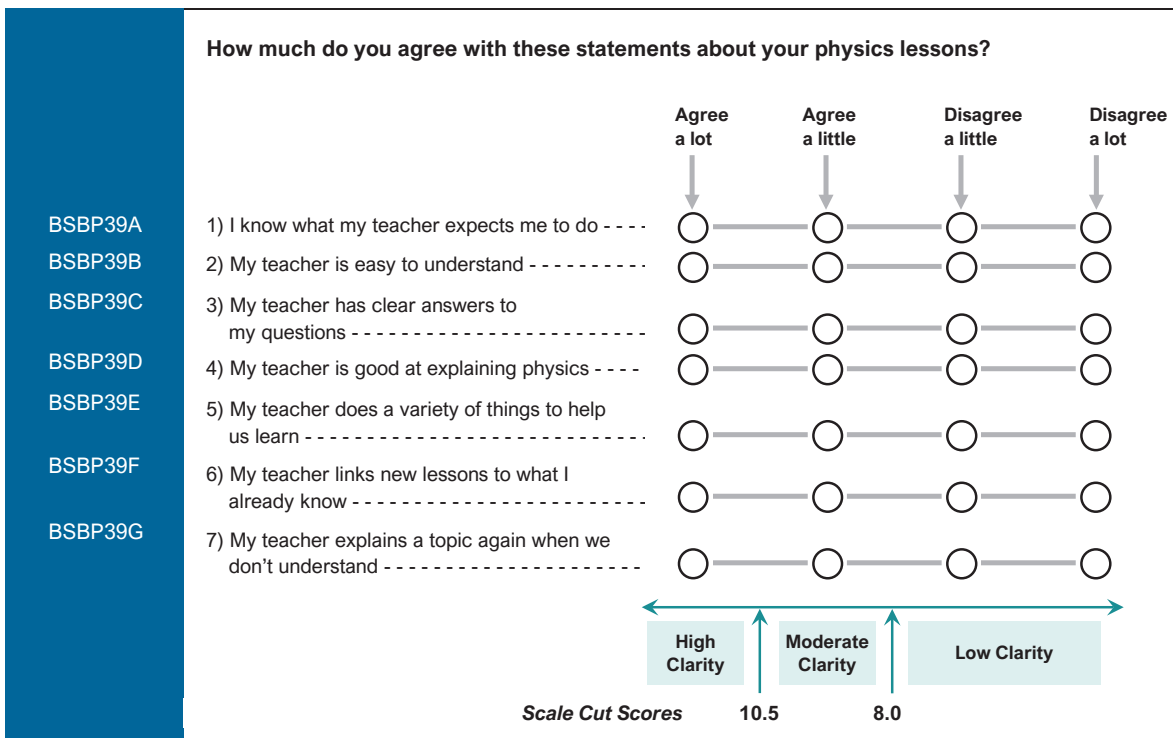
**Relationship Between the TIMSS 2019 *Instructional Clarity in Mathematics Lessons* Scale and TIMSS 2019 Achievement – Grade 8**

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
<b>Benchmarking Participants</b>			
Ontario, Canada	0.18	0.03	0.03
Quebec, Canada	0.13	0.02	0.02
Moscow City, Russian Fed.	0.17	0.03	0.02
Gauteng, RSA (9)	0.05	0.00	0.00
Western Cape, RSA (9)	-0.01	0.00	0.00
Abu Dhabi, UAE	0.25	0.06	0.06
Dubai, UAE	0.20	0.04	0.03

# Instructional Clarity in Physics Lessons – Grade 8

## About the Scale

The *Instructional Clarity in Physics Lessons* scale was created based on students’ responses to seven items listed below.



### Item Parameters for the TIMSS 2019 *Instructional Clarity in Physics Lessons* Scale – Grade 8

Item	delta	tau_1	tau_2	tau_3	Infit
BSBP39A	0.34432	-2.05050	-0.59666	2.64716	1.64
BSBP39B	0.27344	-1.97617	-0.55340	2.52957	0.91
BSBP39C	-0.08583	-1.79388	-0.54214	2.33602	0.76
BSBP39D	-0.22852	-1.61545	-0.60200	2.21745	0.78
BSBP39E	-0.13662	-1.86085	-0.51526	2.37611	0.89
BSBP39F	0.15357	-2.00034	-0.49510	2.49544	1.13
BSBP39G	-0.32036	-1.51653	-0.62527	2.14180	1.03

### Scale Transformation Constants for the TIMSS 2019 *Instructional Clarity in Physics Lessons* Scale – Grade 8

#### Scale Transformation Constants

A = 8.328119

B = 0.832906

Transformed Scale Score = 8.328119 + 0.832906 • Logit Scale Score

### Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019 *Instructional Clarity in Physics Lessons* Scale – Grade 8

Raw Score	Transformed Scale Score	Cutpoint
0	4.57593	
1	5.54107	
2	6.02148	
3	6.36159	
4	6.63685	
5	6.87705	
6	7.09773	
7	7.30766	
8	7.51670	
9	7.72934	
10	7.95209	8.0
11	8.19235	
12	8.45841	
13	8.75915	
14	9.09682	
15	9.45971	
16	9.82967	
17	10.20206	
18	10.59164	10.5
19	11.03337	
20	11.59772	
21	12.64074	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Instructional Clarity in Physics Lessons Scale* – Grade 8

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item						
			BSBP39A	BSBP39B	BSBP39C	BSBP39D	BSBP39E	BSBP39F	BSBP39G
Cyprus	0.94	73	0.74	0.85	0.91	0.91	0.90	0.80	0.87
Finland	0.95	77	0.72	0.91	0.92	0.93	0.91	0.86	0.88
France	0.93	70	0.69	0.89	0.90	0.90	0.87	0.77	0.82
Georgia	0.92	69	0.62	0.86	0.89	0.88	0.86	0.84	0.84
Hungary	0.94	72	0.72	0.86	0.90	0.90	0.86	0.83	0.85
Kazakhstan	0.92	68	0.67	0.83	0.89	0.89	0.86	0.79	0.83
Lebanon	0.92	67	0.68	0.85	0.88	0.88	0.84	0.79	0.78
Lithuania	0.93	69	0.70	0.87	0.90	0.89	0.87	0.77	0.82
Morocco	0.90	63	0.58	0.76	0.85	0.85	0.86	0.82	0.81
Portugal	0.92	68	0.67	0.86	0.88	0.89	0.83	0.82	0.81
Romania	0.93	71	0.66	0.87	0.90	0.88	0.87	0.84	0.86
Russian Federation	0.93	71	0.72	0.86	0.89	0.89	0.88	0.80	0.84
Sweden	0.94	74	0.71	0.89	0.91	0.90	0.90	0.85	0.83
<b>Benchmarking Participants</b>									
Moscow City, Russian Fed.	0.94	72	0.75	0.86	0.90	0.89	0.89	0.82	0.84

### Relationship Between the TIMSS 2019 *Instructional Clarity in Physics Lessons Scale* and TIMSS 2019 Achievement – Grade 8

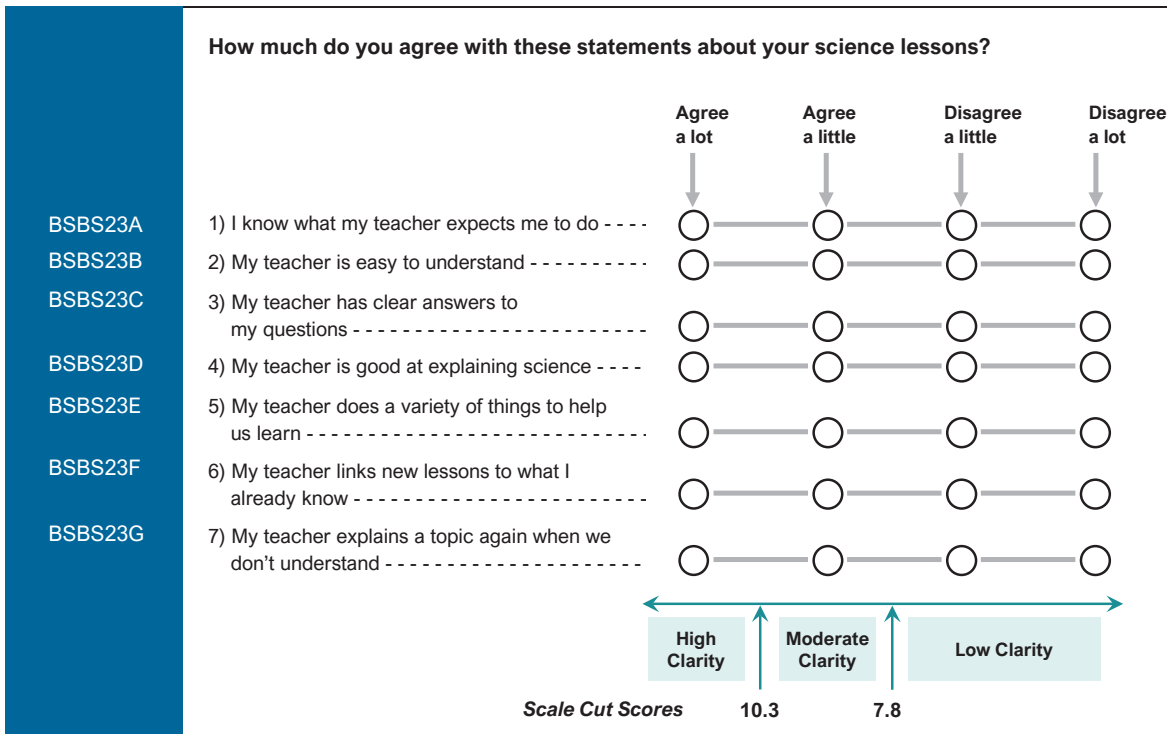
Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
Cyprus	0.20	0.04	0.04
Finland	0.25	0.06	0.05
France	0.05	0.00	0.00
Georgia	0.14	0.02	0.01
Hungary	0.12	0.02	0.01
Kazakhstan	0.18	0.03	0.02
Lebanon	0.17	0.03	0.03
Lithuania	0.05	0.00	0.00
Morocco	0.15	0.02	0.03
Portugal	0.12	0.01	0.01
Romania	0.09	0.01	0.01
Russian Federation	0.07	0.01	0.01
Sweden	0.13	0.02	0.02
<b>International Median</b>	<b>0.13</b>	<b>0.02</b>	<b>0.01</b>
<b>Benchmarking Participants</b>			
Moscow City, Russian Fed.	0.12	0.01	0.01

Scale was created for TIMSS 2019 countries where science is taught as separate subjects.

# Instructional Clarity in Science Lessons – Grade 8

## About the Scale

The *Instructional Clarity in Science Lessons* scale was created based on students’ responses to seven items listed below.





### Item Parameters for the TIMSS 2019 *Instructional Clarity in Science Lessons* Scale – Grade 8

Item	delta	tau_1	tau_2	tau_3	Infit
BSBS23A	0.15452	-1.66449	-0.56400	2.22849	1.45
BSBS23B	0.19752	-1.56622	-0.45528	2.02150	0.89
BSBS23C	-0.05676	-1.54981	-0.33550	1.88531	0.80
BSBS23D	-0.18594	-1.24450	-0.44753	1.69203	0.78
BSBS23E	-0.08849	-1.49870	-0.38792	1.88662	0.90
BSBS23F	0.18342	-1.66061	-0.41828	2.07889	1.02
BSBS23G	-0.20427	-1.21307	-0.48440	1.69747	1.00

### Scale Transformation Constants for the TIMSS 2019 *Instructional Clarity in Science Lessons* Scale – Grade 8

#### Scale Transformation Constants

$$A = 8.069663$$

$$B = 0.974947$$

$$\text{Transformed Scale Score} = 8.069663 + 0.974947 \cdot \text{Logit Scale Score}$$

### Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019 *Instructional Clarity in Science Lessons* Scale – Grade 8

Raw Score	Transformed Scale Score	Cutpoint
0	4.02273	
1	5.13310	
2	5.67786	
3	6.05827	
4	6.36240	
5	6.62529	
6	6.86434	
7	7.09012	
8	7.31015	
9	7.53057	
10	7.75780	7.8
11	7.99517	
12	8.25053	
13	8.52820	
14	8.83177	
15	9.16063	
16	9.51303	
17	9.89078	
18	10.30639	10.3
19	10.78969	
20	11.43106	
21	12.63386	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Instructional Clarity in Science Lessons* Scale – Grade 8

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item						
			BSBS23A	BSBS23B	BSBS23C	BSBS23D	BSBS23E	BSBS23F	BSBS23G
Australia	0.94	74	0.76	0.89	0.90	0.90	0.87	0.84	0.84
Bahrain	0.91	65	0.66	0.83	0.86	0.86	0.83	0.79	0.78
Chile	0.92	67	0.69	0.82	0.85	0.88	0.87	0.80	0.81
Chinese Taipei	0.92	69	0.75	0.83	0.83	0.86	0.85	0.85	0.83
Cyprus	-	-	-	-	-	-	-	-	-
Egypt	0.83	51	0.44	0.65	0.80	0.79	0.79	0.75	0.70
England	0.93	71	0.75	0.88	0.89	0.88	0.85	0.82	0.82
Finland	-	-	-	-	-	-	-	-	-
France	-	-	-	-	-	-	-	-	-
Georgia	-	-	-	-	-	-	-	-	-
Hong Kong SAR	0.95	77	0.81	0.90	0.91	0.90	0.89	0.87	0.86
Hungary	-	-	-	-	-	-	-	-	-
Iran, Islamic Rep. of	0.89	61	0.59	0.79	0.83	0.85	0.81	0.77	0.78
Ireland	0.93	71	0.71	0.89	0.89	0.90	0.85	0.82	0.81
Israel	0.93	70	0.74	0.88	0.89	0.89	0.83	0.80	0.81
Italy	0.88	58	0.49	0.78	0.86	0.83	0.79	0.76	0.76
Japan	0.91	67	0.58	0.86	0.86	0.89	0.87	0.80	0.83
Jordan	0.89	60	0.56	0.74	0.85	0.84	0.84	0.79	0.80
Kazakhstan	-	-	-	-	-	-	-	-	-
Korea, Rep. of	0.92	70	0.65	0.83	0.87	0.88	0.86	0.87	0.85
Kuwait	0.89	60	0.61	0.80	0.85	0.84	0.79	0.76	0.77
Lebanon	-	-	-	-	-	-	-	-	-
Lithuania	-	-	-	-	-	-	-	-	-
Malaysia	0.88	59	0.63	0.79	0.82	0.83	0.80	0.74	0.75
Morocco	-	-	-	-	-	-	-	-	-
New Zealand	0.93	71	0.73	0.88	0.89	0.89	0.87	0.81	0.83
Norway (9)	0.92	69	0.65	0.87	0.87	0.89	0.85	0.83	0.82
Oman	0.86	56	0.48	0.76	0.82	0.82	0.79	0.74	0.76
Portugal	-	-	-	-	-	-	-	-	-
Qatar	0.93	69	0.71	0.86	0.88	0.88	0.86	0.82	0.80
Romania	-	-	-	-	-	-	-	-	-
Russian Federation	-	-	-	-	-	-	-	-	-
Saudi Arabia	0.89	60	0.61	0.78	0.84	0.83	0.82	0.77	0.76
Singapore	0.91	65	0.71	0.86	0.86	0.86	0.79	0.77	0.78
South Africa (9)	0.86	54	0.60	0.79	0.78	0.80	0.72	0.68	0.72
Sweden	-	-	-	-	-	-	-	-	-
Turkey	0.90	63	0.65	0.84	0.85	0.86	0.80	0.78	0.77
United Arab Emirates	0.91	66	0.67	0.84	0.86	0.86	0.84	0.80	0.79
United States	0.93	71	0.73	0.87	0.89	0.90	0.86	0.81	0.83

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Instructional Clarity in Science Lessons* Scale – Grade 8

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item						
			BSBS23A	BSBS23B	BSBS23C	BSBS23D	BSBS23E	BSBS23F	BSBS23G
<b>Benchmarking Participants</b>									
Ontario, Canada	0.93	69	0.69	0.88	0.88	0.88	0.85	0.82	0.81
Quebec, Canada	0.92	69	0.65	0.87	0.89	0.88	0.85	0.81	0.82
Moscow City, Russian Fed.	-	-	-	-	-	-	-	-	-
Gauteng, RSA (9)	0.88	58	0.61	0.82	0.83	0.84	0.78	0.71	0.74
Western Cape, RSA (9)	0.89	60	0.63	0.82	0.83	0.83	0.79	0.75	0.76
Abu Dhabi, UAE	0.92	66	0.69	0.85	0.86	0.86	0.84	0.80	0.79
Dubai, UAE	0.91	65	0.68	0.85	0.86	0.86	0.82	0.79	0.79

A dash (-) indicates comparable data not available.

### Relationship Between the TIMSS 2019 *Instructional Clarity in Science Lessons* Scale and TIMSS 2019 Achievement – Grade 8

Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
Australia	0.19	0.04	0.03
Bahrain	0.20	0.04	0.04
Chile	0.06	0.00	0.00
Chinese Taipei	0.23	0.05	0.05
Cyprus	-	-	-
Egypt	0.24	0.06	0.06
England	0.17	0.03	0.03
Finland	-	-	-
France	-	-	-
Georgia	-	-	-
Hong Kong SAR	0.11	0.01	0.01
Hungary	-	-	-
Iran, Islamic Rep. of	0.14	0.02	0.02
Ireland	0.12	0.01	0.01
Israel	0.07	0.01	0.00
Italy	0.06	0.00	0.00
Japan	0.21	0.05	0.03
Jordan	0.20	0.04	0.04
Kazakhstan	-	-	-
Korea, Rep. of	0.31	0.09	0.09
Kuwait	0.16	0.02	0.02
Lebanon	-	-	-
Lithuania	-	-	-
Malaysia	0.22	0.05	0.04
Morocco	-	-	-
New Zealand	0.13	0.02	0.02
Norway (9)	0.15	0.02	0.03
Oman	0.24	0.06	0.06
Portugal	-	-	-
Qatar	0.14	0.02	0.02
Romania	-	-	-
Russian Federation	-	-	-
Saudi Arabia	0.17	0.03	0.03
Singapore	0.16	0.02	0.02
South Africa (9)	0.07	0.01	0.01
Sweden	-	-	-
Turkey	0.14	0.02	0.01
United Arab Emirates	0.23	0.05	0.05
United States	0.07	0.00	0.00
<b>International Median</b>	<b>0.16</b>	<b>0.02</b>	<b>0.02</b>

**Relationship Between the TIMSS 2019 *Instructional Clarity in Science Lessons* Scale and TIMSS 2019 Achievement – Grade 8**

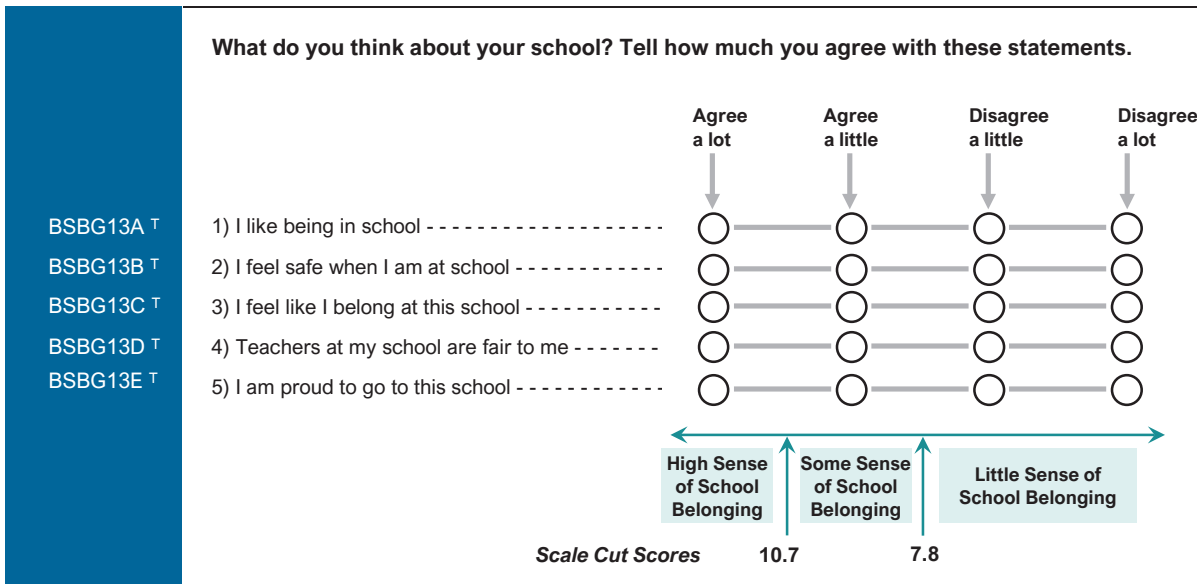
Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
<b>Benchmarking Participants</b>			
Ontario, Canada	0.09	0.01	0.01
Quebec, Canada	0.14	0.02	0.02
Moscow City, Russian Fed.	-	-	-
Gauteng, RSA (9)	0.03	0.00	0.00
Western Cape, RSA (9)	-0.02	0.00	0.00
Abu Dhabi, UAE	0.29	0.09	0.08
Dubai, UAE	0.13	0.02	0.01

A dash (–) indicates comparable data not available.

# Sense of School Belonging – Grade 8

## About the Scale

The *Sense of School Belonging* scale was created based on students’ responses to five items listed below.



<sup>T</sup> Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.

### Item Parameters for the TIMSS 2019 *Sense of School Belonging* Scale – Grade 8

Item	delta	tau_1	tau_2	tau_3	Infit
BSBG13A	0.32714	-1.10477	-0.73290	1.83767	1.01
BSBG13B	-0.22817	-1.02570	-0.55000	1.57570	0.98
BSBG13C	-0.06550	-0.90206	-0.56127	1.46333	0.95
BSBG13D	-0.07279	-1.03563	-0.53608	1.57171	1.13
BSBG13E	0.03932	-0.82245	-0.53816	1.36061	0.93

### Scale Transformation Constants for the TIMSS 2019 *Sense of School Belonging* Scale – Grade 8

#### Scale Transformation Constants

A = 8.156530

B = 1.281319

Transformed Scale Score = 8.156530 + 1.281319 • Logit Scale Score

### Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019 *Sense of School Belonging* Scale – Grade 8

Raw Score	Transformed Scale Score	Cutpoint
0	3.92440	
1	5.25880	
2	5.90263	
3	6.36071	
4	6.73999	
5	7.08155	
6	7.40784	
7	7.73555	7.8
8	8.08091	
9	8.46096	
10	8.89725	
11	9.40801	
12	10.00496	
13	10.70956	10.7
14	11.62252	
15	13.27199	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Sense of School Belonging* Scale – Grade 8

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item				
			BSBG13A	BSBG13B	BSBG13C	BSBG13D	BSBG13E
Australia	0.85	62	0.79	0.77	0.82	0.70	0.84
Bahrain	0.80	56	0.74	0.74	0.82	0.61	0.81
Chile	0.81	58	0.73	0.79	0.81	0.66	0.80
Chinese Taipei	0.81	58	0.73	0.79	0.80	0.68	0.79
Cyprus	0.80	55	0.74	0.77	0.74	0.66	0.80
Egypt	0.78	53	0.71	0.75	0.78	0.63	0.77
England	0.82	59	0.76	0.76	0.79	0.70	0.82
Finland	0.82	58	0.79	0.76	0.80	0.70	0.77
France	0.72	47	0.73	0.68	0.59	0.63	0.77
Georgia	0.76	51	0.68	0.67	0.76	0.65	0.79
Hong Kong SAR	0.86	65	0.81	0.84	0.87	0.67	0.81
Hungary	0.82	59	0.72	0.76	0.81	0.68	0.84
Iran, Islamic Rep. of	0.71	48	0.73	0.76	0.77	0.67	0.50
Ireland	0.81	58	0.74	0.77	0.78	0.67	0.82
Israel	0.82	58	0.77	0.74	0.80	0.69	0.82
Italy	0.77	53	0.71	0.73	0.73	0.65	0.80
Japan	0.85	63	0.80	0.82	0.83	0.68	0.83
Jordan	0.80	56	0.74	0.74	0.83	0.61	0.80
Kazakhstan	0.81	57	0.75	0.69	0.78	0.72	0.81
Korea, Rep. of	0.84	61	0.79	0.81	0.80	0.68	0.81
Kuwait	0.80	56	0.76	0.73	0.80	0.64	0.79
Lebanon	0.76	51	0.71	0.73	0.77	0.59	0.76
Lithuania	0.79	54	0.75	0.73	0.73	0.66	0.79
Malaysia	0.72	47	0.72	0.67	0.64	0.67	0.74
Morocco	0.77	53	0.73	0.72	0.77	0.60	0.79
New Zealand	0.81	57	0.76	0.74	0.81	0.66	0.79
Norway (9)	0.83	60	0.76	0.77	0.83	0.68	0.82
Oman	0.76	51	0.69	0.72	0.76	0.63	0.75
Portugal	0.78	53	0.76	0.73	0.73	0.63	0.79
Qatar	0.84	60	0.77	0.78	0.82	0.70	0.82
Romania	0.80	56	0.73	0.73	0.75	0.69	0.82
Russian Federation	0.80	55	0.74	0.75	0.75	0.67	0.81
Saudi Arabia	0.78	53	0.72	0.69	0.81	0.59	0.79
Singapore	0.83	59	0.76	0.76	0.84	0.66	0.81
South Africa (9)	0.70	46	0.68	0.69	0.77	0.48	0.75
Sweden	0.80	55	0.71	0.70	0.83	0.64	0.81
Turkey	0.76	51	0.70	0.75	0.77	0.58	0.75
United Arab Emirates	0.83	59	0.76	0.77	0.81	0.68	0.81
United States	0.83	59	0.74	0.75	0.81	0.68	0.84



**Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Sense of School Belonging* Scale – Grade 8**

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item				
			BSBG13A	BSBG13B	BSBG13C	BSBG13D	BSBG13E
<b>Benchmarking Participants</b>							
Ontario, Canada	0.82	58	0.75	0.73	0.79	0.69	0.83
Quebec, Canada	0.81	56	0.76	0.75	0.78	0.66	0.79
Moscow City, Russian Fed.	0.79	54	0.77	0.74	0.78	0.60	0.79
Gauteng, RSA (9)	0.73	49	0.67	0.69	0.80	0.53	0.78
Western Cape, RSA (9)	0.73	49	0.68	0.68	0.80	0.50	0.79
Abu Dhabi, UAE	0.81	56	0.74	0.76	0.80	0.64	0.80
Dubai, UAE	0.81	57	0.74	0.76	0.79	0.67	0.80

### Relationship Between the TIMSS 2019 Sense of School Belonging Scale and TIMSS 2019 Achievement – Grade 8

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
Australia	0.30	0.09	0.08	0.29	0.09	0.08
Bahrain	0.10	0.01	0.01	0.16	0.02	0.02
Chile	0.07	0.00	0.01	0.07	0.01	0.01
Chinese Taipei	0.08	0.01	0.01	0.06	0.00	0.01
Cyprus	0.18	0.03	0.03	0.18	0.03	0.03
Egypt	0.01	0.00	0.00	0.05	0.00	0.00
England	0.29	0.08	0.08	0.32	0.10	0.10
Finland	0.21	0.04	0.04	0.21	0.04	0.04
France	0.12	0.01	0.02	0.13	0.02	0.02
Georgia	0.01	0.00	0.00	0.01	0.00	0.00
Hong Kong SAR	0.16	0.02	0.03	0.14	0.02	0.03
Hungary	0.18	0.03	0.03	0.15	0.02	0.02
Iran, Islamic Rep. of	0.05	0.00	0.01	0.04	0.00	0.00
Ireland	0.27	0.07	0.07	0.25	0.06	0.06
Israel	0.02	0.00	0.01	0.04	0.00	0.00
Italy	0.07	0.00	0.01	0.04	0.00	0.00
Japan	0.10	0.01	0.01	0.06	0.00	0.01
Jordan	0.04	0.00	0.00	0.06	0.00	0.00
Kazakhstan	0.03	0.00	0.00	0.01	0.00	0.00
Korea, Rep. of	0.14	0.02	0.02	0.13	0.02	0.02
Kuwait	0.13	0.02	0.02	0.15	0.02	0.03
Lebanon	0.13	0.02	0.02	0.14	0.02	0.02
Lithuania	0.07	0.00	0.01	0.07	0.00	0.01
Malaysia	0.01	0.00	0.00	0.06	0.00	0.00
Morocco	-0.04	0.00	0.00	0.02	0.00	0.00
New Zealand	0.23	0.06	0.05	0.21	0.04	0.04
Norway (9)	0.16	0.03	0.03	0.15	0.02	0.03
Oman	0.11	0.01	0.01	0.13	0.02	0.02
Portugal	0.10	0.01	0.01	0.10	0.01	0.01
Qatar	0.15	0.02	0.03	0.15	0.02	0.03
Romania	0.05	0.00	0.00	0.04	0.00	0.00
Russian Federation	0.07	0.00	0.00	0.02	0.00	0.00
Saudi Arabia	0.04	0.00	0.00	0.03	0.00	0.00
Singapore	0.20	0.04	0.04	0.18	0.03	0.03
South Africa (9)	-0.01	0.00	0.00	-0.04	0.00	0.00
Sweden	0.17	0.03	0.03	0.16	0.03	0.02
Turkey	0.02	0.00	0.00	0.01	0.00	0.00
United Arab Emirates	0.18	0.03	0.03	0.19	0.04	0.04
United States	0.26	0.07	0.06	0.22	0.05	0.05
<b>International Median</b>	<b>0.10</b>	<b>0.01</b>	<b>0.01</b>	<b>0.13</b>	<b>0.02</b>	<b>0.02</b>

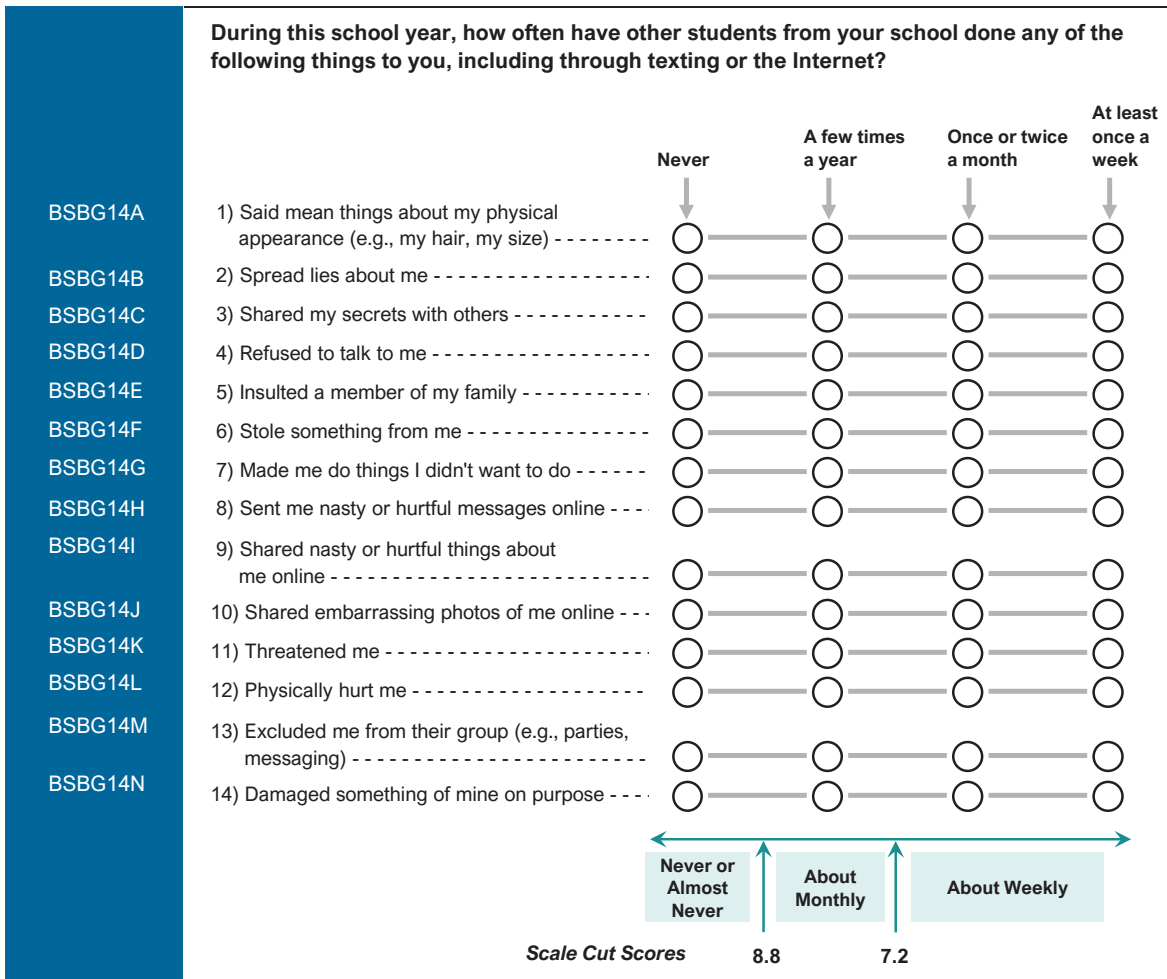
**Relationship Between the TIMSS 2019 *Sense of School Belonging* Scale and TIMSS 2019 Achievement – Grade 8**

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
<b>Benchmarking Participants</b>						
Ontario, Canada	0.18	0.03	0.03	0.18	0.03	0.03
Quebec, Canada	0.24	0.06	0.06	0.22	0.05	0.04
Moscow City, Russian Fed.	0.09	0.01	0.01	0.07	0.01	0.00
Gauteng, RSA (9)	-0.04	0.00	0.00	-0.06	0.00	0.00
Western Cape, RSA (9)	-0.01	0.00	0.00	-0.05	0.00	0.00
Abu Dhabi, UAE	0.19	0.04	0.03	0.19	0.03	0.03
Dubai, UAE	0.17	0.03	0.03	0.17	0.03	0.03

# Student Bullying – Grade 8

## About the Scale

The *Student Bullying* scale was created based on students’ responses to fourteen items listed below.



### Item Parameters for the TIMSS 2019 *Student Bullying* Scale – Grade 8

Item	delta	tau_1	tau_2	tau_3	Infit
BSBG14A	0.71305	0.04645	-0.26859	0.22214	1.10
BSBG14B	0.52658	-0.41912	-0.19205	0.61117	0.98
BSBG14C	0.39392	-0.22178	-0.15770	0.37948	1.10
BSBG14D	0.23331	-0.01799	-0.12110	0.13909	1.09
BSBG14E	0.07453	0.24301	0.02265	-0.26566	1.07
BSBG14F	0.08557	0.07582	-0.11162	0.03580	1.10
BSBG14G	-0.19467	0.10093	0.07979	-0.18072	0.99
BSBG14H	-0.11689	0.33415	0.03433	-0.36848	1.05
BSBG14I	-0.43644	0.39686	0.16165	-0.55851	0.81
BSBG14J	-0.43928	0.18892	0.08301	-0.27193	1.00
BSBG14K	-0.36957	0.31464	0.10156	-0.41620	0.82
BSBG14L	-0.27648	0.24465	-0.00493	-0.23972	0.91
BSBG14M	-0.02422	0.13198	-0.17425	0.04227	1.02
BSBG14N	-0.16941	0.20537	-0.10652	-0.09885	0.88

### Scale Transformation Constants for the TIMSS 2019 *Student Bullying* Scale – Grade 8

#### Scale Transformation Constants

$$A = 7.220866$$

$$B = 1.652921$$

$$\text{Transformed Scale Score} = 7.220866 + 1.652921 \cdot \text{Logit Scale Score}$$

**Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019  
Student Bullying Scale – Grade 8**

Raw Score	Transformed Scale Score	Cutpoint
0	1.95344	
1	3.57732	
2	4.25794	
3	4.68054	
4	4.98853	
5	5.23124	
6	5.43399	
7	5.60919	
8	5.76449	
9	5.90507	
10	6.03321	
11	6.15477	
12	6.26941	
13	6.37845	
14	6.48302	
15	6.58405	
16	6.68234	
17	6.77861	
18	6.87349	
19	6.96754	
20	7.06124	
21	7.15513	7.2
22	7.25088	
23	7.34528	
24	7.44254	
25	7.54198	
26	7.64418	
27	7.74978	
28	7.85954	
29	7.97425	
30	8.09367	
31	8.22128	
32	8.35784	
33	8.50552	
34	8.66719	
35	8.84686	8.8
36	9.05015	
37	9.28593	
38	9.56975	
39	9.92809	
40	10.41803	
41	11.18784	
42	12.93736	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 Student Bullying Scale – Grade 8

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item													
			BSBG14A	BSBG14B	BSBG14C	BSBG14D	BSBG14E	BSBG14F	BSBG14G	BSBG14H	BSBG14I	BSBG14J	BSBG14K	BSBG14L	BSBG14M	BSBG14N
Australia	0.91	47	0.67	0.77	0.68	0.69	0.67	0.61	0.68	0.74	0.74	0.56	0.74	0.64	0.67	0.72
Bahrain	0.90	44	0.61	0.67	0.62	0.62	0.68	0.58	0.67	0.72	0.69	0.66	0.73	0.70	0.66	0.70
Chile	0.87	40	0.64	0.65	0.63	0.62	0.63	0.51	0.64	0.73	0.62	0.54	0.68	0.68	0.58	0.68
Chinese Taipei	0.83	34	0.59	0.66	0.60	0.59	0.54	0.53	0.63	0.61	0.60	0.51	0.63	0.58	0.53	0.57
Cyprus	0.87	39	0.60	0.64	0.54	0.61	0.64	0.54	0.64	0.67	0.69	0.58	0.70	0.64	0.61	0.67
Egypt	0.92	50	0.64	0.63	0.58	0.62	0.72	0.66	0.73	0.74	0.78	0.78	0.76	0.78	0.72	0.74
England	0.90	44	0.67	0.73	0.68	0.66	0.66	0.57	0.63	0.75	0.73	0.54	0.73	0.64	0.64	0.66
Finland	0.88	43	0.67	0.70	0.63	0.62	0.61	0.61	0.61	0.72	0.72	0.58	0.70	0.64	0.62	0.68
France	0.83	33	0.63	0.68	0.43	0.59	0.62	0.49	0.53	0.62	0.56	0.39	0.65	0.63	0.56	0.59
Georgia	0.84	38	0.56	0.62	0.58	0.59	0.63	0.50	0.63	0.65	0.70	0.67	0.68	0.59	0.64	0.61
Hong Kong SAR	0.92	50	0.64	0.70	0.60	0.66	0.69	0.66	0.76	0.79	0.79	0.68	0.76	0.73	0.67	0.76
Hungary	0.84	35	0.64	0.67	0.57	0.53	0.63	0.50	0.59	0.69	0.59	0.45	0.63	0.60	0.54	0.64
Iran, Islamic Rep. of	0.85	38	0.58	0.64	0.59	0.38	0.67	0.55	0.67	0.59	0.66	0.68	0.72	0.66	0.49	0.66
Ireland	0.88	40	0.66	0.73	0.63	0.62	0.64	0.53	0.60	0.69	0.69	0.52	0.68	0.60	0.60	0.66
Israel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Italy	0.83	33	0.61	0.67	0.58	0.59	0.57	0.43	0.56	0.63	0.57	0.42	0.59	0.57	0.58	0.62
Japan	0.80	31	0.58	0.66	0.63	0.62	0.53	0.49	0.64	0.51	0.47	0.42	0.52	0.50	0.57	0.56
Jordan	0.92	51	0.65	0.63	0.60	0.67	0.74	0.64	0.75	0.70	0.79	0.76	0.78	0.78	0.75	0.75
Kazakhstan	0.78	34	0.56	0.61	0.55	0.59	0.59	0.47	0.55	0.28	0.66	0.55	0.61	0.63	0.66	0.68
Korea, Rep. of	0.82	35	0.53	0.67	0.61	0.48	0.55	0.50	-	0.69	0.66	0.57	0.63	0.60	0.57	0.62
Kuwait	0.89	44	0.62	0.61	0.63	0.62	0.67	0.56	0.65	0.67	0.72	0.65	0.73	0.72	0.69	0.69
Lebanon	0.88	41	0.62	0.59	0.43	0.58	0.64	0.58	0.64	0.69	0.72	0.67	0.72	0.71	0.63	0.65
Lithuania	0.85	35	0.66	0.67	0.60	0.60	0.63	0.45	0.52	0.65	0.57	0.48	0.63	0.64	0.56	0.58
Malaysia	0.82	30	0.46	0.56	0.46	0.48	0.53	0.51	0.58	0.63	0.64	0.50	0.58	0.54	0.56	0.58
Morocco	0.85	36	0.52	0.58	0.55	0.59	0.64	0.47	0.63	0.58	0.67	0.62	0.65	0.66	0.61	0.62
New Zealand	0.90	44	0.65	0.73	0.67	0.65	0.63	0.60	0.65	0.74	0.75	0.54	0.72	0.61	0.66	0.69
Norway (9)	0.89	42	0.68	0.73	0.67	0.63	0.59	0.55	0.62	0.72	0.72	0.58	0.68	0.59	0.61	0.64
Oman	0.88	41	0.62	0.60	0.61	0.55	0.63	0.53	0.64	0.69	0.71	0.67	0.70	0.67	0.62	0.68
Portugal	0.86	39	0.59	0.66	0.61	0.60	0.62	0.56	0.61	0.66	0.62	0.56	0.68	0.64	0.60	0.67
Qatar	0.92	52	0.66	0.70	0.67	0.68	0.72	0.65	0.72	0.74	0.78	0.73	0.78	0.75	0.70	0.75
Romania	0.90	44	0.66	0.68	0.63	0.63	0.67	0.58	0.62	0.76	0.71	0.60	0.72	0.68	0.65	0.69
Russian Federation	0.86	38	0.63	0.65	0.60	0.52	0.64	0.51	0.59	0.68	0.69	0.55	0.66	0.63	0.63	0.60
Saudi Arabia	0.90	46	0.64	0.65	0.63	0.66	0.73	0.58	0.70	0.62	0.69	0.69	0.75	0.73	0.70	0.71
Singapore	0.89	41	0.64	0.72	0.60	0.61	0.65	0.59	0.62	0.74	0.69	0.52	0.69	0.63	0.61	0.68
South Africa (9)	0.84	33	0.52	0.54	0.51	0.56	0.59	0.32	0.59	0.67	0.69	0.58	0.62	0.62	0.58	0.59
Sweden	0.89	44	0.67	0.70	0.64	0.65	0.62	0.56	0.64	0.74	0.76	0.57	0.69	0.64	0.65	0.71
Turkey	0.84	36	0.52	0.60	0.58	0.53	0.59	0.51	0.51	0.64	0.67	0.59	0.68	0.67	0.61	0.68
United Arab Emirates	0.92	51	0.67	0.70	0.64	0.66	0.72	0.66	0.72	0.76	0.76	0.70	0.77	0.74	0.70	0.75
United States	0.90	46	0.68	0.72	0.67	0.68	0.68	0.60	0.64	0.73	0.73	0.57	0.71	0.62	0.68	0.70

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 Student Bullying Scale – Grade 8

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item													
			BSBG14A	BSBG14B	BSBG14C	BSBG14D	BSBG14E	BSBG14F	BSBG14G	BSBG14H	BSBG14I	BSBG14J	BSBG14K	BSBG14L	BSBG14M	BSBG14N
<b>Benchmarking Participants</b>																
Ontario, Canada	0.89	43	0.68	0.73	0.66	0.65	0.65	0.55	0.64	0.73	0.72	0.59	0.66	0.61	0.64	0.66
Quebec, Canada	0.87	39	0.68	0.70	0.62	0.61	0.57	0.51	0.62	0.71	0.66	0.51	0.67	0.63	0.62	0.61
Moscow City, Russian Fed.	0.85	36	0.62	0.63	0.60	0.50	0.63	0.47	0.52	0.66	0.70	0.54	0.62	0.64	0.60	0.61
Gauteng, RSA (9)	0.83	33	0.55	0.59	0.53	0.55	0.56	0.37	0.56	0.67	0.65	0.53	0.63	0.62	0.53	0.62
Western Cape, RSA (9)	0.86	38	0.58	0.62	0.58	0.61	0.61	0.42	0.60	0.72	0.72	0.57	0.67	0.62	0.59	0.64
Abu Dhabi, UAE	0.93	54	0.71	0.72	0.66	0.68	0.73	0.69	0.74	0.79	0.80	0.74	0.79	0.75	0.73	0.76
Dubai, UAE	0.90	45	0.63	0.68	0.61	0.65	0.68	0.63	0.67	0.71	0.69	0.63	0.71	0.70	0.63	0.73

A dash (-) indicates comparable data not available.



### Relationship Between the TIMSS 2019 Student Bullying Scale and TIMSS 2019 Achievement – Grade 8

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
Australia	0.15	0.02	0.03	0.16	0.02	0.04
Bahrain	0.11	0.01	0.02	0.20	0.04	0.08
Chile	0.08	0.01	0.02	0.12	0.01	0.03
Chinese Taipei	-0.02	0.00	0.00	-0.01	0.00	0.00
Cyprus	0.09	0.01	0.01	0.10	0.01	0.02
Egypt	0.24	0.06	0.08	0.27	0.07	0.10
England	0.13	0.02	0.03	0.12	0.01	0.03
Finland	0.05	0.00	0.02	0.06	0.00	0.02
France	0.03	0.00	0.01	0.06	0.00	0.01
Georgia	0.04	0.00	0.01	0.04	0.00	0.02
Hong Kong SAR	0.03	0.00	0.01	0.04	0.00	0.01
Hungary	0.15	0.02	0.03	0.13	0.02	0.02
Iran, Islamic Rep. of	0.16	0.03	0.04	0.18	0.03	0.05
Ireland	0.08	0.01	0.02	0.09	0.01	0.02
Israel	-	-	-	-	-	-
Italy	0.07	0.01	0.02	0.09	0.01	0.01
Japan	-0.02	0.00	0.00	0.01	0.00	0.00
Jordan	0.20	0.04	0.06	0.27	0.07	0.11
Kazakhstan	-0.06	0.00	0.00	-0.10	0.01	0.00
Korea, Rep. of	-0.06	0.00	0.00	-0.03	0.00	0.00
Kuwait	0.07	0.00	0.02	0.12	0.01	0.05
Lebanon	0.11	0.01	0.02	0.14	0.02	0.03
Lithuania	0.03	0.00	0.01	0.02	0.00	0.01
Malaysia	0.12	0.02	0.01	0.12	0.02	0.02
Morocco	0.09	0.01	0.02	0.12	0.01	0.03
New Zealand	0.10	0.01	0.02	0.11	0.01	0.02
Norway (9)	0.06	0.00	0.02	0.05	0.00	0.02
Oman	0.17	0.03	0.06	0.21	0.04	0.08
Portugal	0.05	0.00	0.00	0.04	0.00	0.00
Qatar	0.12	0.01	0.06	0.20	0.04	0.09
Romania	0.08	0.01	0.02	0.07	0.01	0.02
Russian Federation	-0.01	0.00	0.00	-0.01	0.00	0.00
Saudi Arabia	0.14	0.02	0.04	0.21	0.04	0.08
Singapore	0.14	0.02	0.03	0.13	0.02	0.02
South Africa (9)	0.24	0.06	0.08	0.29	0.08	0.10
Sweden	0.10	0.01	0.02	0.08	0.01	0.02
Turkey	0.08	0.01	0.01	0.10	0.01	0.02
United Arab Emirates	0.20	0.04	0.09	0.26	0.07	0.13
United States	0.10	0.01	0.02	0.09	0.01	0.02
<b>International Median</b>	<b>0.09</b>	<b>0.01</b>	<b>0.02</b>	<b>0.11</b>	<b>0.01</b>	<b>0.02</b>

### Relationship Between the TIMSS 2019 Student Bullying Scale and TIMSS 2019 Achievement – Grade 8

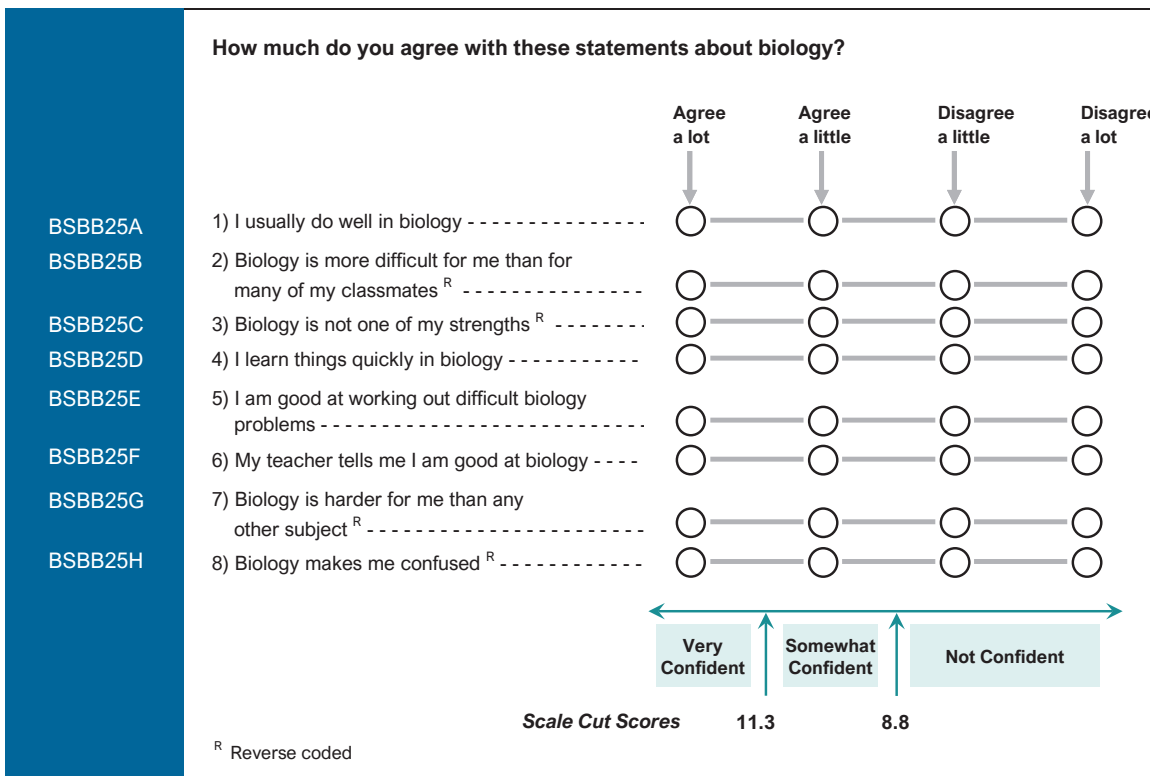
Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
<b>Benchmarking Participants</b>						
Ontario, Canada	0.07	0.00	0.01	0.09	0.01	0.01
Quebec, Canada	0.13	0.02	0.02	0.11	0.01	0.01
Moscow City, Russian Fed.	0.09	0.01	0.02	0.09	0.01	0.01
Gauteng, RSA (9)	0.26	0.07	0.07	0.31	0.10	0.10
Western Cape, RSA (9)	0.18	0.03	0.05	0.22	0.05	0.07
Abu Dhabi, UAE	0.27	0.07	0.13	0.31	0.10	0.18
Dubai, UAE	0.12	0.01	0.03	0.16	0.02	0.04

A dash (–) indicates comparable data not available.

# Students Confident in Biology – Grade 8

## About the Scale

The *Students Confident in Biology* scale was created based on students’ responses to eight items listed below.



**Item Parameters for the TIMSS 2019 Students Confident in Biology Scale – Grade 8**

Item	delta	tau_1	tau_2	tau_3	Infit
BSBB25A	-0.51693	-1.44764	-0.43643	1.88407	0.87
BSBB25B <sup>R</sup>	-0.10746	-1.36535	-0.13132	1.49667	1.08
BSBB25C <sup>R</sup>	0.40263	-1.44249	0.06347	1.37902	0.99
BSBB25D	-0.20096	-1.67008	-0.11982	1.78990	0.87
BSBB25E	0.43707	-1.79371	0.01706	1.77665	1.01
BSBB25F	0.49259	-1.57640	-0.09570	1.67210	1.12
BSBB25G <sup>R</sup>	-0.26525	-1.05911	-0.23902	1.29813	1.08
BSBB25H <sup>R</sup>	-0.24169	-1.02437	-0.19301	1.21738	1.06

<sup>R</sup> Reverse coded**Scale Transformation Constants for the TIMSS 2019 Students Confident in Biology Scale – Grade 8****Scale Transformation Constants**

A = 8.851451

B = 1.356973

Transformed Scale Score = 8.851451 + 1.356973 • Logit Scale Score

**Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019 Students Confident in Biology Scale – Grade 8**

Raw Score	Transformed Scale Score	Cutpoint
0	3.04975	
1	4.61732	
2	5.39034	
3	5.93525	
4	6.36886	
5	6.73771	
6	7.07124	
7	7.37840	
8	7.66831	
9	7.94767	
10	8.22161	
11	8.49411	
12	8.76836	8.8
13	9.04715	
14	9.33297	
15	9.62841	
16	9.93642	
17	10.25945	
18	10.60451	
19	10.97905	
20	11.39630	11.3
21	11.87989	
22	12.47348	
23	13.30261	
24	14.92563	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 Students Confident in Biology Scale – Grade 8

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item							
			BSBB25A	BSBB25B <sup>R</sup>	BSBB25C <sup>R</sup>	BSBB25D	BSBB25E	BSBB25F	BSBB25G <sup>R</sup>	BSBB25H <sup>R</sup>
Cyprus	0.89	57	0.79	0.71	0.75	0.80	0.78	0.73	0.74	0.75
Finland	0.86	51	0.81	0.71	0.77	0.80	0.71	0.67	0.65	0.55
France	0.88	55	0.80	0.66	0.76	0.83	0.76	0.60	0.71	0.80
Georgia	0.84	48	0.74	0.64	0.72	0.75	0.72	0.67	0.64	0.63
Hungary	0.89	56	0.80	0.69	0.81	0.80	0.74	0.74	0.74	0.67
Kazakhstan	0.87	53	0.76	0.67	0.78	0.77	0.77	0.69	0.69	0.67
Lebanon	0.80	42	0.69	0.59	0.51	0.76	0.74	0.71	0.61	0.53
Lithuania	0.87	54	0.81	0.71	0.76	0.79	0.75	0.60	0.74	0.66
Morocco	0.76	38	0.66	0.61	0.47	0.72	0.67	0.64	0.58	0.57
Portugal	0.84	48	0.74	0.61	0.68	0.80	0.74	0.62	0.63	0.70
Romania	0.80	43	0.73	0.62	0.66	0.73	0.58	0.62	0.60	0.67
Russian Federation	0.88	54	0.75	0.70	0.81	0.81	0.76	0.69	0.70	0.67
Sweden	0.87	53	0.78	0.72	0.76	0.80	0.74	0.66	0.69	0.70
<b>Benchmarking Participants</b>										
Moscow City, Russian Fed.	0.89	57	0.77	0.74	0.83	0.85	0.78	0.68	0.74	0.67

<sup>R</sup> Reverse coded

### Relationship Between the TIMSS 2019 Students Confident in Biology Scale and TIMSS 2019 Achievement – Grade 8

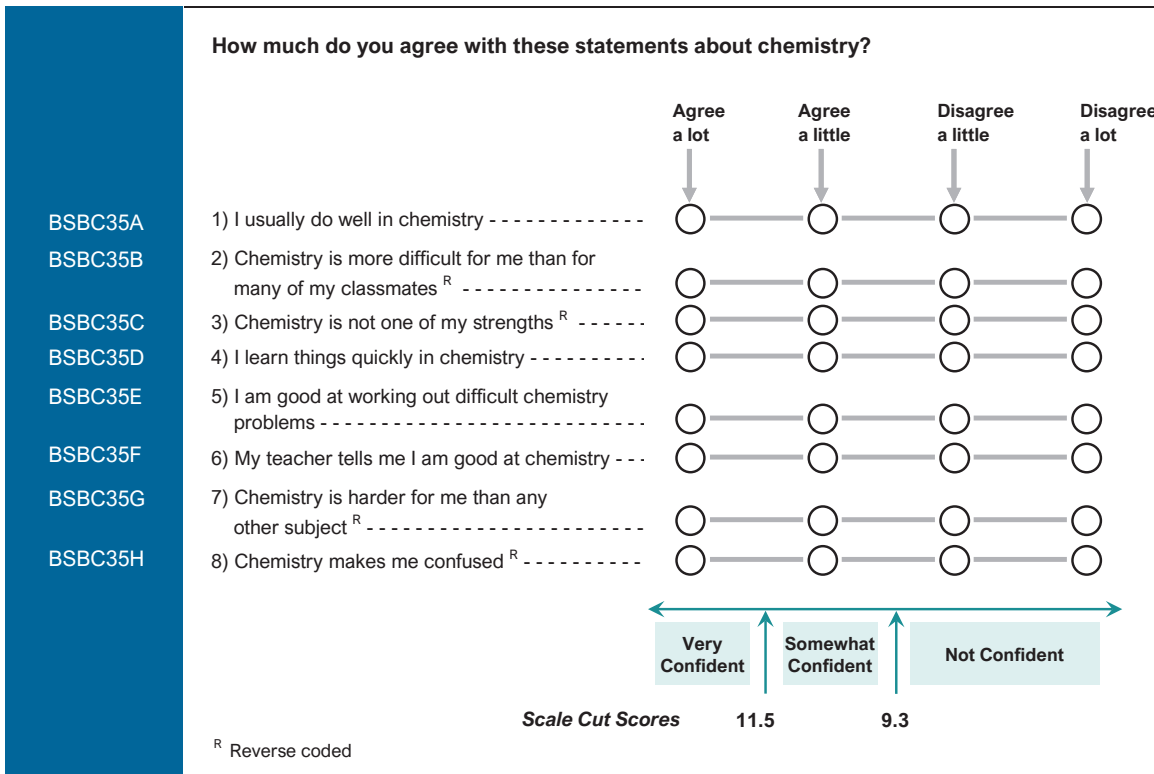
Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
Cyprus	0.34	0.12	0.13
Finland	0.32	0.11	0.12
France	0.33	0.11	0.11
Georgia	0.30	0.09	0.08
Hungary	0.24	0.06	0.06
Kazakhstan	0.19	0.04	0.03
Lebanon	0.34	0.12	0.12
Lithuania	0.23	0.05	0.05
Morocco	0.34	0.11	0.10
Portugal	0.36	0.13	0.13
Romania	0.20	0.04	0.05
Russian Federation	0.15	0.02	0.02
Sweden	0.33	0.11	0.11
<b>International Median</b>	<b>0.32</b>	<b>0.11</b>	<b>0.10</b>
<b>Benchmarking Participants</b>			
Moscow City, Russian Fed.	0.11	0.01	0.01

Scale was created for TIMSS 2019 countries where science is taught as separate subjects.

# Students Confident in Chemistry – Grade 8

## About the Scale

The *Students Confident in Chemistry* scale was created based on students’ responses to eight items listed below.



### Item Parameters for the TIMSS 2019 Students Confident in Chemistry Scale – Grade 8

Item	delta	tau_1	tau_2	tau_3	Infit
BSBC35A	-0.45681	-1.43599	-0.23074	1.66673	0.87
BSBC35B <sup>R</sup>	-0.20723	-1.36687	-0.01365	1.38052	1.11
BSBC35C <sup>R</sup>	0.30893	-1.38095	0.15716	1.22379	1.01
BSBC35D	-0.09496	-1.62194	0.02911	1.59283	0.87
BSBC35E	0.41467	-1.58287	0.08541	1.49746	0.97
BSBC35F	0.33594	-1.48997	-0.01839	1.50836	1.08
BSBC35G <sup>R</sup>	-0.12895	-1.14551	-0.09743	1.24294	1.14
BSBC35H <sup>R</sup>	-0.17159	-1.06641	-0.06190	1.12831	1.19

<sup>R</sup> Reverse coded

### Scale Transformation Constants for the TIMSS 2019 Students Confident in Chemistry Scale – Grade 8

#### Scale Transformation Constants

$$A = 9.287425$$

$$B = 1.273947$$

$$\text{Transformed Scale Score} = 9.287425 + 1.273947 \cdot \text{Logit Scale Score}$$

### Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019 Students Confident in Chemistry Scale – Grade 8

Raw Score	Transformed Scale Score	Cutpoint
0	3.89635	
1	5.37931	
2	6.11672	
3	6.63419	
4	7.04816	
5	7.40098	
6	7.71515	
7	8.00298	
8	8.27440	
9	8.53331	
10	8.78409	
11	9.03015	
12	9.27400	9.3
13	9.51933	
14	9.76754	
15	10.02173	
16	10.28517	
17	10.56193	
18	10.85539	
19	11.17623	
20	11.53629	11.5
21	11.95803	
22	12.48347	
23	13.22968	
24	14.72190	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 Students Confident in Chemistry Scale – Grade 8

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item							
			BSBC35A	BSBC35B <sup>R</sup>	BSBC35C <sup>R</sup>	BSBC35D	BSBC35E	BSBC35F	BSBC35G <sup>R</sup>	BSBC35H <sup>R</sup>
Cyprus	0.89	57	0.77	0.74	0.74	0.80	0.77	0.74	0.73	0.75
Finland	0.90	59	0.85	0.75	0.82	0.84	0.80	0.74	0.72	0.56
France	0.89	57	0.83	0.68	0.80	0.84	0.79	0.63	0.67	0.78
Georgia	0.86	51	0.77	0.67	0.72	0.78	0.75	0.73	0.65	0.65
Hungary	0.90	58	0.84	0.67	0.80	0.83	0.76	0.77	0.73	0.67
Kazakhstan	0.88	54	0.80	0.67	0.78	0.80	0.80	0.76	0.63	0.64
Lebanon	0.80	42	0.70	0.61	0.51	0.75	0.73	0.72	0.59	0.55
Lithuania	0.90	59	0.85	0.74	0.78	0.83	0.82	0.68	0.77	0.65
Morocco	0.73	36	0.68	0.53	0.42	0.74	0.68	0.70	0.44	0.49
Portugal	0.89	57	0.79	0.66	0.77	0.84	0.81	0.71	0.71	0.72
Romania	0.84	47	0.78	0.56	0.59	0.79	0.75	0.75	0.59	0.63
Russian Federation	0.90	60	0.80	0.74	0.83	0.85	0.81	0.79	0.73	0.63
Sweden	0.88	54	0.79	0.68	0.76	0.82	0.76	0.68	0.68	0.69
<b>Benchmarking Participants</b>										
Moscow City, Russian Fed.	0.91	62	0.82	0.77	0.84	0.85	0.83	0.75	0.74	0.67

<sup>R</sup> Reverse coded

### Relationship Between the TIMSS 2019 Students Confident in Chemistry Scale and TIMSS 2019 Achievement – Grade 8

Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
Cyprus	0.33	0.11	0.12
Finland	0.40	0.16	0.17
France	0.34	0.11	0.13
Georgia	0.34	0.11	0.12
Hungary	0.19	0.04	0.05
Kazakhstan	0.19	0.04	0.04
Lebanon	0.32	0.10	0.10
Lithuania	0.28	0.08	0.09
Morocco	0.34	0.12	0.10
Portugal	0.37	0.14	0.14
Romania	0.20	0.04	0.07
Russian Federation	0.24	0.06	0.06
Sweden	0.34	0.11	0.11
<b>International Median</b>	<b>0.33</b>	<b>0.11</b>	<b>0.10</b>
<b>Benchmarking Participants</b>			
Moscow City, Russian Fed.	0.24	0.06	0.06

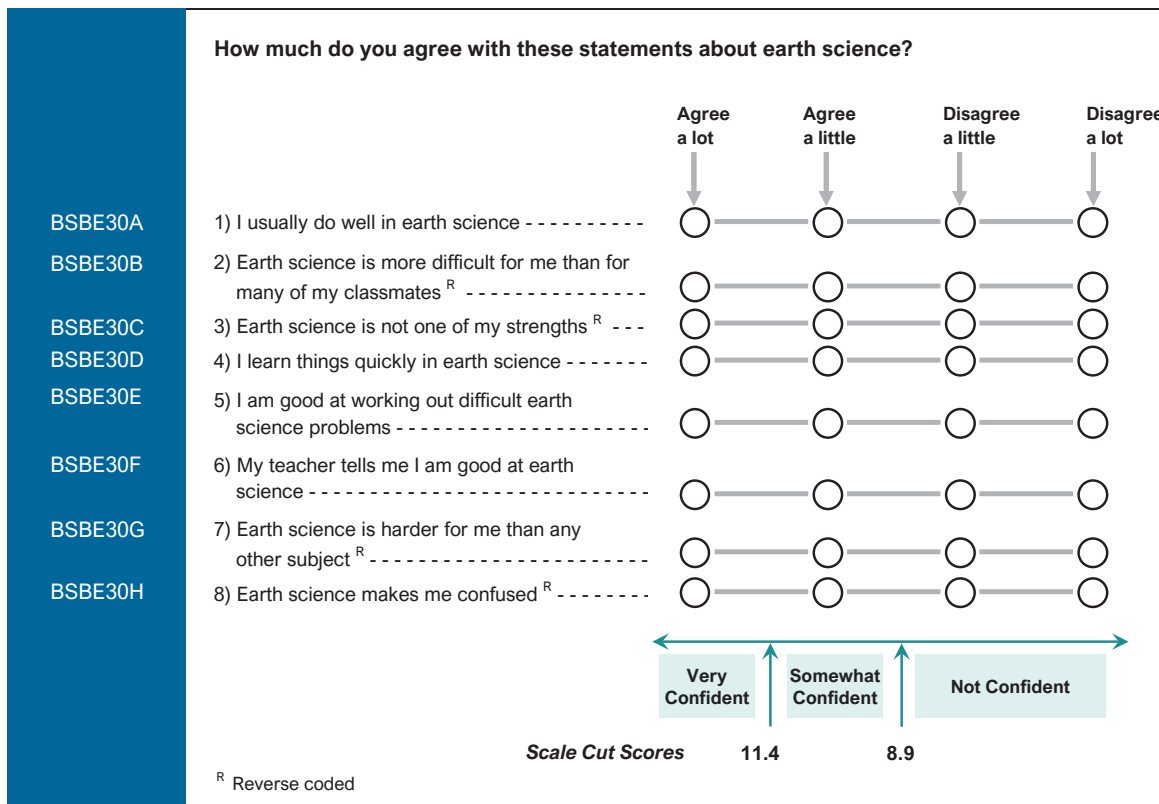
Scale was created for TIMSS 2019 countries where science is taught as separate subjects.



## Students Confident in Earth Science – Grade 8

### About the Scale

The *Students Confident in Earth Science* scale was created based on students' responses to nine items listed below.



### Item Parameters for the TIMSS 2019 *Students Confident in Earth Science* Scale – Grade 8

Item	delta	tau_1	tau_2	tau_3	Infit
BSBE30A	-0.46107	-1.41872	-0.43930	1.85802	0.87
BSBE30B <sup>R</sup>	-0.19875	-1.37648	-0.15004	1.52652	1.09
BSBE30C <sup>R</sup>	0.33686	-1.49366	0.07644	1.41722	0.96
BSBE30D	-0.12943	-1.65316	-0.17396	1.82712	0.88
BSBE30E	0.45259	-1.79586	0.02998	1.76588	1.01
BSBE30F	0.55212	-1.58204	-0.08004	1.66208	1.15
BSBE30G <sup>R</sup>	-0.24372	-1.06339	-0.29194	1.35533	1.10
BSBE30H <sup>R</sup>	-0.30860	-1.02496	-0.22507	1.25003	1.10

<sup>R</sup> Reverse coded

### Scale Transformation Constants for the TIMSS 2019 *Students Confident in Earth Science* Scale – Grade 8

#### Scale Transformation Constants

A = 8.904350

B = 1.335162

Transformed Scale Score = 8.904350 + 1.335162 • Logit Scale Score

### Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019 *Students Confident in Earth Science* Scale – Grade 8

Raw Score	Transformed Scale Score	Cutpoint
0	3.21094	
1	4.74712	
2	5.50216	
3	6.03282	
4	6.45453	
5	6.81430	
6	7.13915	
7	7.43625	
8	7.71978	
9	7.99591	
10	8.26570	
11	8.53520	
12	8.80751	8.9
13	9.08518	
14	9.37050	
15	9.66574	
16	9.97356	
17	10.29618	
18	10.64027	
19	11.01305	
20	11.42745	11.4
21	11.90664	
22	12.49348	
23	13.31156	
24	14.91022	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 Students Confident in Earth Science Scale – Grade 8

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item							
			BSBE30A	BSBE30B <sup>R</sup>	BSBE30C <sup>R</sup>	BSBE30D	BSBE30E	BSBE30F	BSBE30G <sup>R</sup>	BSBE30H <sup>R</sup>
Cyprus	0.88	55	0.79	0.69	0.73	0.80	0.76	0.73	0.70	0.74
Finland	0.86	50	0.81	0.72	0.78	0.81	0.73	0.65	0.62	0.52
France	0.88	55	0.80	0.66	0.76	0.83	0.76	0.60	0.71	0.80
Georgia	0.83	45	0.72	0.65	0.73	0.74	0.68	0.67	0.58	0.59
Hungary	0.89	57	0.82	0.68	0.81	0.81	0.74	0.75	0.74	0.66
Kazakhstan	0.86	51	0.79	0.64	0.79	0.76	0.76	0.68	0.63	0.61
Lebanon	-	-	-	-	-	-	-	-	-	-
Lithuania	0.89	56	0.83	0.71	0.78	0.81	0.78	0.66	0.76	0.64
Morocco	0.74	36	0.66	0.56	0.43	0.72	0.68	0.68	0.49	0.51
Portugal	0.84	48	0.74	0.61	0.68	0.80	0.74	0.62	0.63	0.70
Romania	0.77	39	0.65	0.59	0.63	0.70	0.52	0.62	0.60	0.66
Russian Federation	0.87	52	0.75	0.70	0.78	0.81	0.75	0.69	0.67	0.61
Sweden	-	-	-	-	-	-	-	-	-	-
<b>Benchmarking Participants</b>										
Moscow City, Russian Fed.	0.89	57	0.78	0.74	0.82	0.84	0.77	0.70	0.70	0.65

<sup>R</sup> Reverse coded

### Relationship Between the TIMSS 2019 Students Confident in Earth Science Scale and TIMSS 2019 Achievement – Grade 8

Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
Cyprus	0.31	0.10	0.10
Finland	0.32	0.10	0.11
France	0.33	0.11	0.11
Georgia	0.34	0.11	0.12
Hungary	0.24	0.06	0.06
Kazakhstan	0.20	0.04	0.04
Lebanon	-	-	-
Lithuania	0.21	0.05	0.05
Morocco	0.29	0.09	0.08
Portugal	0.36	0.13	0.13
Romania	0.23	0.05	0.06
Russian Federation	0.16	0.03	0.03
Sweden	-	-	-
<b>International Median</b>	<b>0.29</b>	<b>0.09</b>	<b>0.08</b>
<b>Benchmarking Participants</b>			
Moscow City, Russian Fed.	0.17	0.03	0.03

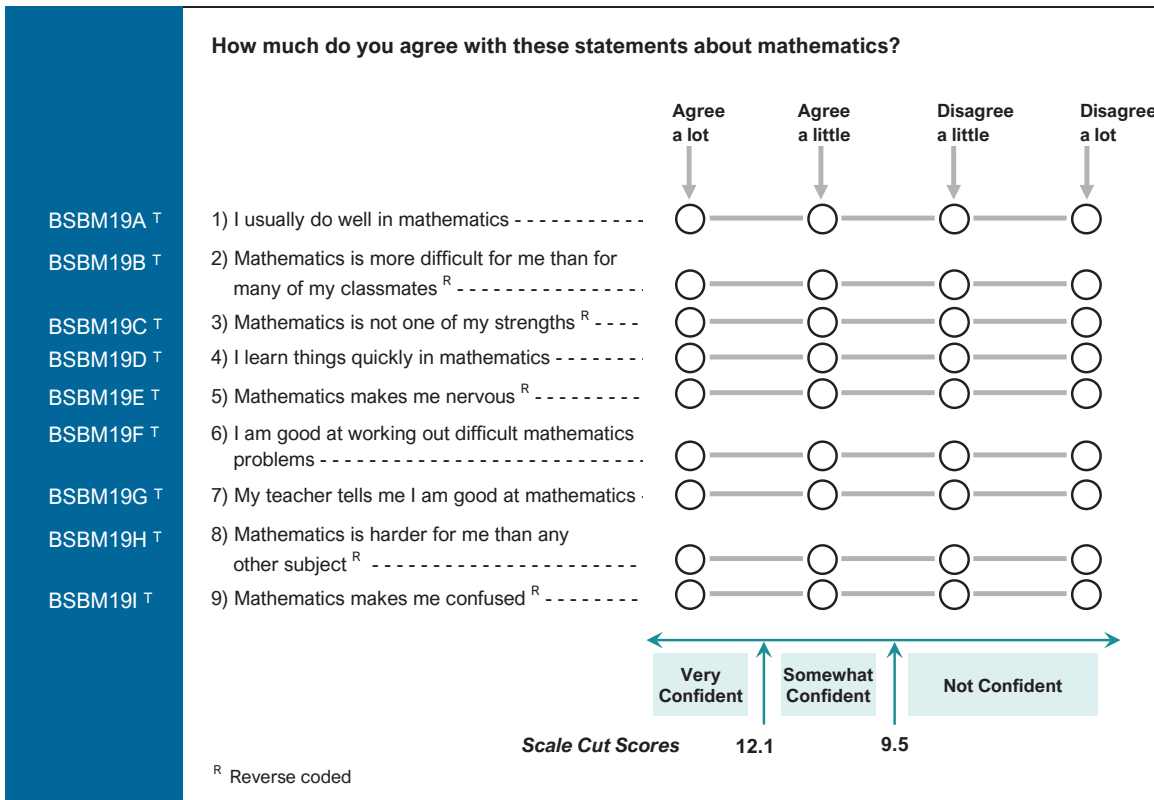
Scale was created for TIMSS 2019 countries where science is taught as separate subjects.

A dash (–) indicates comparable data not available.

# Students Confident in Mathematics – Grade 8

## About the Scale

The *Students Confident in Mathematics* scale was created based on students’ responses to nine items listed below.



<sup>T</sup> Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.

### Item Parameters for the TIMSS 2019 *Students Confident in Mathematics* Scale – Grade 8

Item	delta	tau_1	tau_2	tau_3	Infit
BSBM19A	-0.50049	-1.11873	-0.29405	1.41278	0.91
BSBM19B <sup>R</sup>	-0.00401	-1.14715	0.08367	1.06348	1.02
BSBM19C <sup>R</sup>	0.30051	-0.87683	0.15214	0.72469	0.91
BSBM19D	-0.22037	-1.32473	-0.05161	1.37634	0.90
BSBM19E <sup>R</sup>	-0.10393	-0.97276	0.03057	0.94219	1.26
BSBM19F	0.30742	-1.30327	-0.11911	1.42238	0.95
BSBM19G	0.07317	-1.04695	-0.15298	1.19993	1.13
BSBM19H <sup>R</sup>	0.07380	-0.69985	-0.01041	0.71026	0.93
BSBM19I <sup>R</sup>	0.07390	-0.96460	0.10241	0.86219	0.97

<sup>R</sup> Reverse coded

### Scale Transformation Constants for the TIMSS 2019 *Students Confident in Mathematics* Scale – Grade 8

#### Scale Transformation Constants

A = 9.553292

B = 1.562014

Transformed Scale Score = 9.553292 + 1.562014 • Logit Scale Score

**Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019  
Students Confident in Mathematics Scale – Grade 8**

Raw Score	Transformed Scale Score	Cutpoint
0	3.27793	
1	5.04751	
2	5.90622	
3	6.49606	
4	6.95612	
5	7.34181	
6	7.67800	
7	7.97991	
8	8.25602	
9	8.51577	
10	8.76168	
11	8.99736	
12	9.22591	
13	9.45004	9.5
14	9.67230	
15	9.89514	
16	10.12116	
17	10.35323	
18	10.59469	
19	10.84951	
20	11.12082	
21	11.41779	
22	11.75008	
23	12.13375	12.1
24	12.59517	
25	13.19086	
26	14.06165	
27	15.85188	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 Students Confident in Mathematics Scale – Grade 8

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item								
			BSBM19A	BSBM19B <sub>R</sub>	BSBM19C <sub>R</sub>	BSBM19D	BSBM19E <sub>R</sub>	BSBM19F	BSBM19G	BSBM19H <sub>R</sub>	BSBM19I <sub>R</sub>
Australia	0.90	56	0.78	0.76	0.84	0.80	0.58	0.80	0.53	0.79	0.78
Bahrain	0.85	45	0.58	0.64	0.69	0.70	0.63	0.66	0.59	0.76	0.73
Chile	0.87	49	0.75	0.61	0.72	0.76	0.54	0.75	0.64	0.73	0.75
Chinese Taipei	0.92	61	0.82	0.79	0.85	0.83	0.55	0.80	0.79	0.80	0.78
Cyprus	0.91	59	0.81	0.77	0.82	0.78	0.60	0.79	0.71	0.81	0.81
Egypt	0.75	33	0.31	0.65	0.55	0.49	0.68	0.47	0.44	0.73	0.70
England	0.88	51	0.74	0.73	0.82	0.75	0.58	0.74	0.44	0.80	0.77
Finland	0.91	58	0.84	0.76	0.86	0.82	0.63	0.79	0.67	0.77	0.66
France	0.91	59	0.84	0.72	0.84	0.84	0.57	0.76	0.67	0.80	0.85
Georgia	0.84	45	0.74	0.67	0.77	0.71	0.44	0.65	0.65	0.68	0.67
Hong Kong SAR	0.89	54	0.73	0.73	0.82	0.72	0.62	0.74	0.62	0.81	0.77
Hungary	0.91	58	0.84	0.70	0.82	0.83	0.57	0.79	0.77	0.78	0.75
Iran, Islamic Rep. of	0.87	49	0.76	0.55	0.68	0.75	0.68	0.73	0.70	0.70	0.74
Ireland	0.90	56	0.80	0.78	0.79	0.81	0.60	0.78	0.51	0.82	0.79
Israel	0.88	50	0.75	0.71	0.75	0.74	0.62	0.70	0.61	0.76	0.73
Italy	0.93	63	0.83	0.77	0.86	0.85	0.67	0.79	0.75	0.81	0.79
Japan	0.90	55	0.77	0.69	0.81	0.73	0.63	0.79	0.66	0.77	0.77
Jordan	0.79	36	0.34	0.67	0.67	0.55	0.64	0.54	0.50	0.72	0.71
Kazakhstan	0.89	54	0.79	0.73	0.79	0.81	0.54	0.76	0.73	0.71	0.72
Korea, Rep. of	0.90	56	0.85	0.77	0.78	0.75	0.38	0.83	0.78	0.77	0.72
Kuwait	0.79	37	0.45	0.62	0.61	0.62	0.61	0.64	0.55	0.68	0.69
Lebanon	0.83	42	0.69	0.59	0.57	0.70	0.60	0.68	0.66	0.68	0.62
Lithuania	0.90	57	0.83	0.73	0.82	0.81	0.66	0.79	0.66	0.80	0.68
Malaysia	0.81	39	0.62	0.53	0.67	0.58	0.62	0.66	0.57	0.66	0.71
Morocco	0.79	37	0.63	0.57	0.49	0.69	0.59	0.60	0.64	0.61	0.64
New Zealand	0.87	51	0.75	0.74	0.79	0.76	0.57	0.77	0.47	0.78	0.72
Norway (9)	0.92	61	0.81	0.78	0.87	0.84	0.69	0.82	0.63	0.81	0.76
Oman	0.79	37	0.42	0.70	0.64	0.56	0.68	0.44	0.45	0.74	0.71
Portugal	0.89	55	0.77	0.64	0.80	0.84	0.46	0.82	0.72	0.76	0.78
Qatar	0.82	40	0.61	0.64	0.66	0.63	0.60	0.61	0.55	0.73	0.67
Romania	0.84	46	0.73	0.69	0.66	0.76	0.27	0.74	0.68	0.73	0.69
Russian Federation	0.91	58	0.79	0.75	0.85	0.83	0.57	0.78	0.73	0.77	0.73
Saudi Arabia	0.81	39	0.43	0.67	0.60	0.65	0.64	0.60	0.56	0.74	0.70
Singapore	0.91	58	0.83	0.77	0.87	0.77	0.62	0.78	0.60	0.82	0.77
South Africa (9)	0.78	37	0.65	0.49	0.63	0.64	0.46	0.64	0.60	0.63	0.66
Sweden	0.91	58	0.81	0.77	0.83	0.82	0.54	0.81	0.63	0.82	0.78
Turkey	0.89	54	0.79	0.66	0.80	0.72	0.62	0.73	0.72	0.76	0.75
United Arab Emirates	0.84	43	0.64	0.67	0.70	0.64	0.62	0.63	0.55	0.74	0.69
United States	0.90	56	0.78	0.77	0.83	0.79	0.62	0.77	0.55	0.82	0.78

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Students Confident in Mathematics* Scale – Grade 8

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item									
			BSBM19A	BSBM19B <sup>R</sup>	BSBM19C <sup>R</sup>	BSBM19D	BSBM19E <sup>R</sup>	BSBM19F	BSBM19G	BSBM19H <sup>R</sup>	BSBM19I <sup>R</sup>	
<b>Benchmarking Participants</b>												
Ontario, Canada	0.91	60	0.81	0.81	0.86	0.81	0.64	0.78	0.52	0.85	0.81	
Quebec, Canada	0.92	62	0.85	0.81	0.89	0.84	0.65	0.81	0.59	0.81	0.83	
Moscow City, Russian Fed.	0.92	61	0.80	0.78	0.87	0.85	0.61	0.80	0.69	0.81	0.76	
Gauteng, RSA (9)	0.83	43	0.70	0.57	0.69	0.68	0.52	0.67	0.63	0.70	0.71	
Western Cape, RSA (9)	0.86	47	0.73	0.63	0.74	0.69	0.58	0.68	0.65	0.73	0.71	
Abu Dhabi, UAE	0.80	38	0.54	0.66	0.68	0.55	0.62	0.55	0.47	0.73	0.68	
Dubai, UAE	0.87	50	0.74	0.72	0.78	0.70	0.64	0.69	0.58	0.76	0.72	

<sup>R</sup> Reverse coded



### Relationship Between the TIMSS 2019 Students Confident in Mathematics Scale and TIMSS 2019 Achievement – Grade 8

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
Australia	0.49	0.24	0.23
Bahrain	0.32	0.10	0.09
Chile	0.36	0.13	0.13
Chinese Taipei	0.49	0.24	0.23
Cyprus	0.52	0.27	0.26
Egypt	0.28	0.08	0.08
England	0.43	0.18	0.16
Finland	0.55	0.30	0.29
France	0.56	0.31	0.30
Georgia	0.47	0.22	0.20
Hong Kong SAR	0.32	0.10	0.11
Hungary	0.55	0.30	0.30
Iran, Islamic Rep. of	0.43	0.19	0.18
Ireland	0.43	0.18	0.18
Israel	0.39	0.15	0.15
Italy	0.50	0.25	0.25
Japan	0.46	0.21	0.19
Jordan	0.37	0.14	0.13
Kazakhstan	0.29	0.08	0.09
Korea, Rep. of	0.49	0.24	0.22
Kuwait	0.30	0.09	0.08
Lebanon	0.37	0.14	0.13
Lithuania	0.49	0.24	0.24
Malaysia	0.23	0.05	0.07
Morocco	0.34	0.11	0.11
New Zealand	0.46	0.21	0.20
Norway (9)	0.62	0.39	0.36
Oman	0.38	0.15	0.13
Portugal	0.52	0.27	0.27
Qatar	0.35	0.12	0.13
Romania	0.46	0.21	0.21
Russian Federation	0.43	0.18	0.18
Saudi Arabia	0.37	0.14	0.12
Singapore	0.40	0.16	0.15
South Africa (9)	0.26	0.07	0.09
Sweden	0.56	0.31	0.29
Turkey	0.46	0.21	0.22
United Arab Emirates	0.31	0.10	0.10
United States	0.42	0.18	0.18
<b>International Median</b>	<b>0.43</b>	<b>0.18</b>	<b>0.18</b>

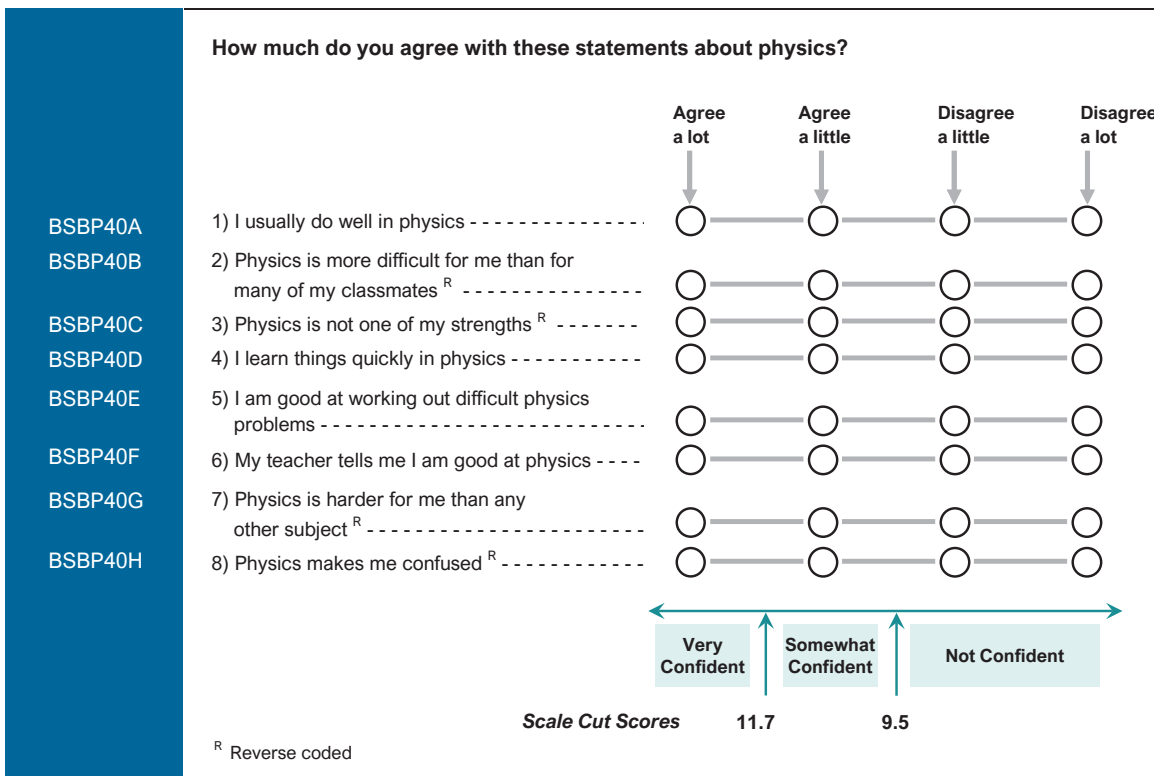
**Relationship Between the TIMSS 2019 *Students Confident in Mathematics* Scale and TIMSS 2019 Achievement – Grade 8**

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
<b>Benchmarking Participants</b>			
Ontario, Canada	0.56	0.32	0.31
Quebec, Canada	0.54	0.29	0.26
Moscow City, Russian Fed.	0.53	0.28	0.27
Gauteng, RSA (9)	0.33	0.11	0.12
Western Cape, RSA (9)	0.36	0.13	0.17
Abu Dhabi, UAE	0.34	0.11	0.12
Dubai, UAE	0.36	0.13	0.12

# Students Confident in Physics – Grade 8

## About the Scale

The *Students Confident in Physics* scale was created based on students’ responses to eight items listed below.



**Item Parameters for the TIMSS 2019 Students Confident in Physics Scale – Grade 8**

Item	delta	tau_1	tau_2	tau_3	Infit
BSBP40A	-0.39746	-1.37025	-0.24044	1.61069	0.88
BSBP40B <sup>R</sup>	-0.21128	-1.31428	-0.01234	1.32662	1.10
BSBP40C <sup>R</sup>	0.28620	-1.30084	0.14053	1.16031	0.98
BSBP40D	-0.07362	-1.58237	-0.00919	1.59156	0.86
BSBP40E	0.39820	-1.51916	0.09858	1.42058	0.96
BSBP40F	0.29764	-1.44459	-0.00874	1.45333	1.07
BSBP40G <sup>R</sup>	-0.11946	-1.11132	-0.09117	1.20249	1.14
BSBP40H <sup>R</sup>	-0.18022	-1.01891	-0.05197	1.07088	1.20

<sup>R</sup> Reverse coded**Scale Transformation Constants for the TIMSS 2019 Students Confident in Physics Scale – Grade 8****Scale Transformation Constants**

A = 9.428686

B = 1.324891

Transformed Scale Score = 9.428686 + 1.324891 • Logit Scale Score

**Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019 Students Confident in Physics Scale – Grade 8**

Raw Score	Transformed Scale Score	Cutpoint
0	3.90479	
1	5.44008	
2	6.20005	
3	6.73122	
4	7.15482	
5	7.51483	
6	7.83462	
7	8.12702	
8	8.40231	
9	8.66453	
10	8.91821	
11	9.16694	
12	9.41328	9.5
13	9.66135	
14	9.91242	
15	10.16987	
16	10.43713	
17	10.71844	
18	11.01730	
19	11.34485	
20	11.71341	11.7
21	12.14624	
22	12.68694	
23	13.45737	
24	15.00359	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 Students Confident in Physics Scale – Grade 8

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item							
			BSBP40A	BSBP40B <sup>R</sup>	BSBP40C <sup>R</sup>	BSBP40D	BSBP40E	BSBP40F	BSBP40G <sup>R</sup>	BSBP40H <sup>R</sup>
Cyprus	0.91	61	0.81	0.74	0.75	0.83	0.82	0.76	0.75	0.75
Finland	0.89	58	0.85	0.76	0.81	0.84	0.81	0.75	0.70	0.53
France	0.89	57	0.83	0.68	0.80	0.84	0.79	0.63	0.67	0.78
Georgia	0.85	49	0.77	0.64	0.70	0.78	0.75	0.73	0.60	0.58
Hungary	0.89	57	0.83	0.68	0.79	0.83	0.76	0.76	0.72	0.66
Kazakhstan	0.87	52	0.79	0.65	0.79	0.79	0.79	0.74	0.61	0.60
Lebanon	0.78	41	0.73	0.54	0.49	0.77	0.77	0.74	0.50	0.46
Lithuania	0.90	58	0.85	0.73	0.76	0.84	0.82	0.72	0.76	0.63
Morocco	0.72	34	0.68	0.49	0.36	0.76	0.69	0.72	0.40	0.42
Portugal	0.89	57	0.79	0.66	0.77	0.84	0.81	0.71	0.71	0.72
Romania	0.81	44	0.78	0.50	0.56	0.77	0.73	0.74	0.54	0.59
Russian Federation	0.88	55	0.78	0.71	0.80	0.83	0.78	0.73	0.68	0.61
Sweden	0.88	54	0.80	0.70	0.78	0.82	0.77	0.68	0.67	0.68
<b>Benchmarking Participants</b>										
Moscow City, Russian Fed.	0.90	59	0.81	0.76	0.83	0.85	0.80	0.73	0.74	0.63

<sup>R</sup> Reverse coded

### Relationship Between the TIMSS 2019 Students Confident in Physics Scale and TIMSS 2019 Achievement – Grade 8

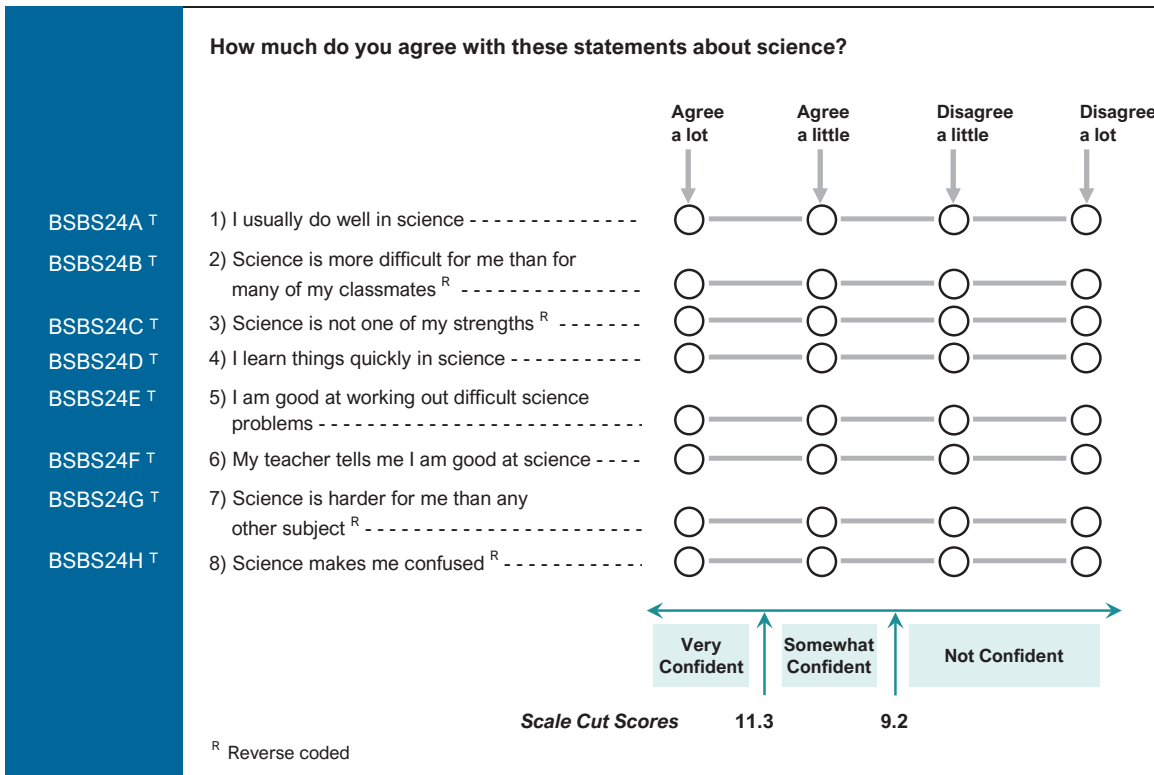
Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
Cyprus	0.34	0.12	0.13
Finland	0.35	0.12	0.15
France	0.34	0.11	0.13
Georgia	0.29	0.08	0.10
Hungary	0.31	0.10	0.11
Kazakhstan	0.18	0.03	0.04
Lebanon	0.29	0.08	0.10
Lithuania	0.25	0.06	0.08
Morocco	0.32	0.11	0.10
Portugal	0.37	0.14	0.14
Romania	0.17	0.03	0.06
Russian Federation	0.22	0.05	0.05
Sweden	0.37	0.13	0.15
<b>International Median</b>	<b>0.31</b>	<b>0.10</b>	<b>0.10</b>
<b>Benchmarking Participants</b>			
Moscow City, Russian Fed.	0.28	0.08	0.08

Scale was created for TIMSS 2019 countries where science is taught as separate subjects.

# Students Confident in Science – Grade 8

## About the Scale

The *Students Confident in Science* scale was created based on students’ responses to eight items listed below.



<sup>T</sup> Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.

### Item Parameters for the TIMSS 2019 *Students Confident in Science* Scale – Grade 8

Item	delta	tau_1	tau_2	tau_3	Infit
BSBS24A	-0.46541	-1.14798	-0.28032	1.42830	0.92
BSBS24B <sup>R</sup>	0.03957	-1.24140	0.10527	1.13613	1.04
BSBS24C <sup>R</sup>	0.31928	-1.10283	0.16654	0.93629	1.02
BSBS24D	-0.30224	-1.38866	0.03271	1.35595	0.89
BSBS24E	0.16257	-1.43808	0.06778	1.37030	0.99
BSBS24F	0.14256	-1.20554	0.05071	1.15483	1.10
BSBS24G <sup>R</sup>	0.01606	-0.96248	-0.04795	1.01043	1.02
BSBS24H <sup>R</sup>	0.08761	-1.03184	0.12933	0.90251	1.05

<sup>R</sup> Reverse coded

### Scale Transformation Constants for the TIMSS 2019 *Students Confident in Science* Scale – Grade 8

#### Scale Transformation Constants

A = 9.091884

B = 1.446981

Transformed Scale Score = 9.091884 + 1.446981 • Logit Scale Score

### Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019 *Students Confident in Science* Scale – Grade 8

Raw Score	Transformed Scale Score	Cutpoint
0	3.24992	
1	4.91876	
2	5.74112	
3	6.31300	
4	6.76777	
5	7.15260	
6	7.49248	
7	7.80038	
8	8.08863	
9	8.36075	
10	8.62122	
11	8.87381	
12	9.12286	9.2
13	9.36803	
14	9.61581	
15	9.86849	
16	10.13014	
17	10.40580	
18	10.70197	
19	11.02414	
20	11.39185	11.3
21	11.82899	
22	12.38397	
23	13.18921	
24	14.84182	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Students Confident in Science* Scale – Grade 8

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item							
			BSBS24A	BSBS24B <sub>R</sub>	BSBS24C <sub>R</sub>	BSBS24D	BSBS24E	BSBS24F	BSBS24G <sub>R</sub>	BSBS24H <sub>R</sub>
Australia	0.89	56	0.77	0.72	0.79	0.80	0.79	0.62	0.74	0.75
Bahrain	0.82	44	0.54	0.67	0.67	0.71	0.65	0.64	0.71	0.68
Chile	0.82	44	0.75	0.55	0.64	0.77	0.73	0.62	0.58	0.66
Chinese Taipei	0.92	63	0.82	0.78	0.82	0.83	0.80	0.78	0.77	0.75
Cyprus	-	-	-	-	-	-	-	-	-	-
Egypt	0.73	35	0.31	0.74	0.61	0.53	0.46	0.52	0.72	0.70
England	0.89	57	0.79	0.73	0.80	0.81	0.79	0.61	0.75	0.76
Finland	-	-	-	-	-	-	-	-	-	-
France	-	-	-	-	-	-	-	-	-	-
Georgia	-	-	-	-	-	-	-	-	-	-
Hong Kong SAR	0.85	49	0.74	0.69	0.75	0.73	0.71	0.56	0.71	0.68
Hungary	-	-	-	-	-	-	-	-	-	-
Iran, Islamic Rep. of	0.84	48	0.73	0.61	0.63	0.75	0.73	0.71	0.66	0.68
Ireland	0.90	60	0.81	0.77	0.79	0.83	0.79	0.65	0.78	0.78
Israel	0.85	50	0.76	0.70	0.65	0.78	0.76	0.67	0.66	0.65
Italy	0.86	52	0.78	0.69	0.74	0.79	0.67	0.67	0.68	0.71
Japan	0.89	57	0.78	0.74	0.82	0.76	0.77	0.67	0.76	0.73
Jordan	0.75	36	0.32	0.73	0.67	0.54	0.50	0.52	0.72	0.70
Kazakhstan	-	-	-	-	-	-	-	-	-	-
Korea, Rep. of	0.92	64	0.86	0.76	0.84	0.82	0.84	0.80	0.78	0.72
Kuwait	0.76	38	0.40	0.67	0.59	0.69	0.61	0.59	0.66	0.65
Lebanon	-	-	-	-	-	-	-	-	-	-
Lithuania	-	-	-	-	-	-	-	-	-	-
Malaysia	0.77	38	0.60	0.52	0.64	0.66	0.67	0.57	0.64	0.63
Morocco	-	-	-	-	-	-	-	-	-	-
New Zealand	0.86	50	0.75	0.68	0.74	0.77	0.75	0.61	0.69	0.67
Norway (9)	0.88	55	0.77	0.72	0.80	0.80	0.76	0.62	0.73	0.70
Oman	0.74	36	0.38	0.74	0.65	0.56	0.43	0.47	0.74	0.69
Portugal	-	-	-	-	-	-	-	-	-	-
Qatar	0.79	41	0.62	0.64	0.61	0.70	0.66	0.62	0.64	0.61
Romania	-	-	-	-	-	-	-	-	-	-
Russian Federation	-	-	-	-	-	-	-	-	-	-
Saudi Arabia	0.76	38	0.46	0.72	0.60	0.64	0.52	0.56	0.69	0.68
Singapore	0.91	60	0.82	0.78	0.84	0.79	0.79	0.66	0.78	0.74
South Africa (9)	0.76	37	0.68	0.52	0.59	0.70	0.68	0.57	0.55	0.58
Sweden	-	-	-	-	-	-	-	-	-	-
Turkey	0.85	49	0.75	0.68	0.74	0.70	0.69	0.65	0.69	0.70
United Arab Emirates	0.81	43	0.63	0.67	0.66	0.70	0.66	0.60	0.67	0.64
United States	0.87	52	0.73	0.72	0.74	0.79	0.74	0.58	0.74	0.73



### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Students Confident in Science* Scale – Grade 8

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item							
			BSBS24A	BSBS24B <sup>R</sup>	BSBS24C <sup>R</sup>	BSBS24D	BSBS24E	BSBS24F	BSBS24G <sup>R</sup>	BSBS24H <sup>R</sup>
<b>Benchmarking Participants</b>										
Ontario, Canada	0.89	57	0.79	0.76	0.81	0.79	0.78	0.59	0.77	0.75
Quebec, Canada	0.89	58	0.80	0.73	0.82	0.83	0.76	0.59	0.74	0.77
Moscow City, Russian Fed.	-	-	-	-	-	-	-	-	-	-
Gauteng, RSA (9)	0.82	45	0.72	0.60	0.68	0.73	0.71	0.59	0.63	0.67
Western Cape, RSA (9)	0.82	44	0.73	0.59	0.64	0.73	0.70	0.63	0.62	0.66
Abu Dhabi, UAE	0.77	38	0.58	0.63	0.58	0.67	0.64	0.58	0.63	0.60
Dubai, UAE	0.85	50	0.73	0.69	0.76	0.73	0.72	0.61	0.71	0.69

<sup>R</sup> Reverse coded

A dash (-) indicates comparable data not available.

### Relationship Between the TIMSS 2019 Students Confident in Science Scale and TIMSS 2019 Achievement – Grade 8

Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
Australia	0.34	0.12	0.13
Bahrain	0.36	0.13	0.14
Chile	0.22	0.05	0.07
Chinese Taipei	0.35	0.13	0.19
Cyprus	-	-	-
Egypt	0.37	0.14	0.14
England	0.36	0.13	0.15
Finland	-	-	-
France	-	-	-
Georgia	-	-	-
Hong Kong SAR	0.29	0.09	0.13
Hungary	-	-	-
Iran, Islamic Rep. of	0.37	0.14	0.14
Ireland	0.43	0.19	0.18
Israel	0.39	0.15	0.17
Italy	0.32	0.10	0.10
Japan	0.37	0.14	0.15
Jordan	0.43	0.18	0.18
Kazakhstan	-	-	-
Korea, Rep. of	0.42	0.18	0.22
Kuwait	0.32	0.10	0.10
Lebanon	-	-	-
Lithuania	-	-	-
Malaysia	0.21	0.04	0.06
Morocco	-	-	-
New Zealand	0.33	0.11	0.13
Norway (9)	0.38	0.15	0.16
Oman	0.39	0.15	0.15
Portugal	-	-	-
Qatar	0.35	0.12	0.15
Romania	-	-	-
Russian Federation	-	-	-
Saudi Arabia	0.34	0.12	0.11
Singapore	0.28	0.08	0.09
South Africa (9)	0.23	0.05	0.07
Sweden	-	-	-
Turkey	0.46	0.21	0.22
United Arab Emirates	0.37	0.13	0.16
United States	0.32	0.10	0.11
<b>International Median</b>	<b>0.36</b>	<b>0.13</b>	<b>0.14</b>

**Relationship Between the TIMSS 2019 *Students Confident in Science* Scale and TIMSS 2019 Achievement – Grade 8**

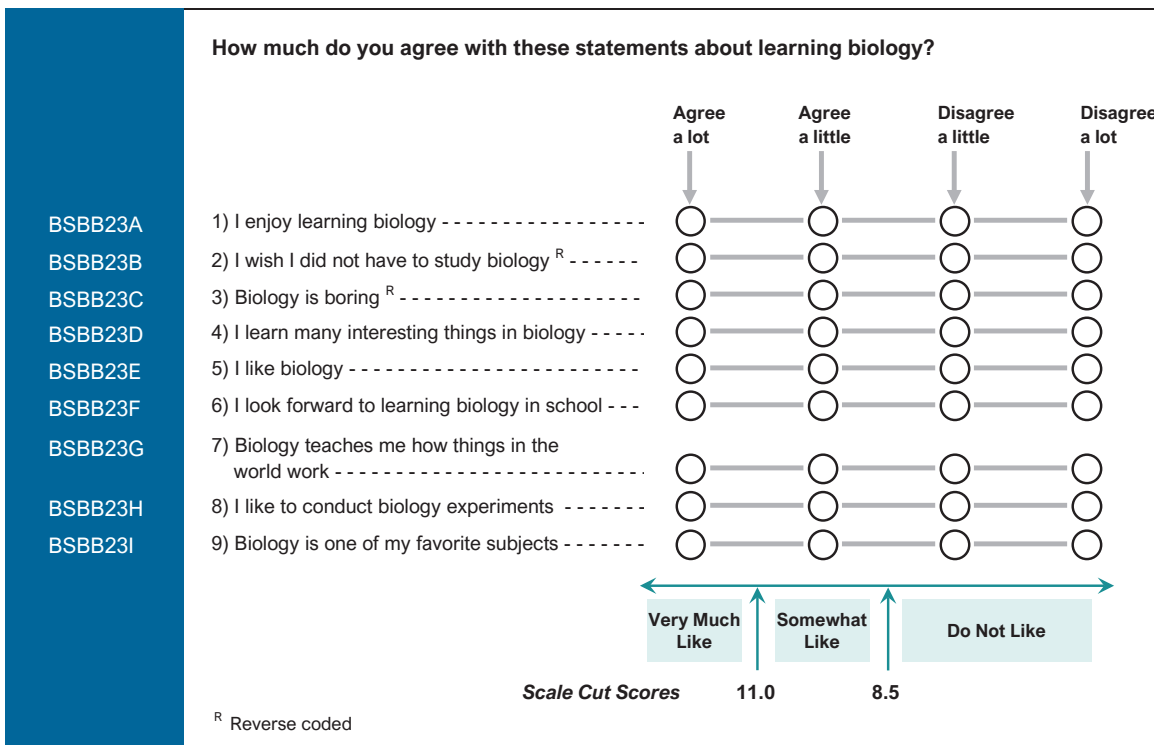
Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
<b>Benchmarking Participants</b>			
Ontario, Canada	0.34	0.11	0.10
Quebec, Canada	0.37	0.14	0.13
Moscow City, Russian Fed.	-	-	-
Gauteng, RSA (9)	0.20	0.04	0.05
Western Cape, RSA (9)	0.18	0.03	0.05
Abu Dhabi, UAE	0.42	0.17	0.20
Dubai, UAE	0.31	0.10	0.11

A dash (–) indicates comparable data not available.

# Students Like Learning Biology – Grade 8

## About the Scale

The *Students Like Learning Biology* scale was created based on students’ responses to nine items listed below.



### Item Parameters for the TIMSS 2019 *Students Like Learning Biology* Scale – Grade 8

Item	delta	tau_1	tau_2	tau_3	Infit
BSBB23A	-0.16212	-1.47892	-0.46297	1.94189	0.75
BSBB23B <sup>R</sup>	0.20512	-1.24042	-0.29613	1.53655	1.45
BSBB23C <sup>R</sup>	0.20601	-1.47581	-0.19591	1.67172	1.21
BSBB23D	-0.77117	-1.31189	-0.49265	1.80454	0.88
BSBB23E	-0.08618	-1.39978	-0.31230	1.71208	0.64
BSBB23F	0.71997	-1.80718	0.05532	1.75186	0.90
BSBB23G	-0.76337	-1.31194	-0.65352	1.96546	1.21
BSBB23H	-0.19527	-0.99360	-0.40491	1.39851	1.48
BSBB23I	0.84701	-1.40607	0.05039	1.35568	0.85

<sup>R</sup> Reverse coded

### Scale Transformation Constants for the TIMSS 2019 *Students Like Learning Biology* Scale – Grade 8

#### Scale Transformation Constants

A = 8.641623

B = 1.107618

Transformed Scale Score = 8.641623 + 1.107618 • Logit Scale Score

**Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019  
Students Like Learning Biology Scale – Grade 8**

Raw Score	Transformed Scale Score	Cutpoint
0	3.77033	
1	5.00936	
2	5.61016	
3	6.03106	
4	6.36568	
5	6.65211	
6	6.90865	
7	7.14591	
8	7.37038	
9	7.58667	
10	7.79825	
11	8.00863	
12	8.21825	
13	8.43038	8.5
14	8.64675	
15	8.86844	
16	9.09669	
17	9.33234	
18	9.57605	
19	9.82964	
20	10.09524	
21	10.37666	
22	10.68028	
23	11.01688	11.0
24	11.40423	
25	11.88207	
26	12.54999	
27	13.86476	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Students Like Learning Biology* Scale – Grade 8

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item									
			BSBB23A	BSBB23B <sup>R</sup>	BSBB23C <sup>R</sup>	BSBB23D	BSBB23E	BSBB23F	BSBB23G	BSBB23H	BSBB23I	
Cyprus	0.92	62	0.87	0.68	0.73	0.81	0.91	0.85	0.67	0.63	0.86	
Finland	0.93	63	0.86	0.70	0.75	0.82	0.91	0.87	0.70	0.69	0.83	
France	0.91	59	0.87	0.70	0.76	0.79	0.90	0.83	0.64	0.54	0.84	
Georgia	0.89	54	0.83	0.62	0.64	0.72	0.89	0.83	0.56	0.62	0.84	
Hungary	0.91	60	0.88	0.67	0.76	0.79	0.91	0.86	0.63	0.57	0.85	
Kazakhstan	0.90	56	0.83	0.49	0.72	0.79	0.88	0.83	0.64	0.68	0.82	
Lebanon	0.86	50	0.81	0.41	0.44	0.77	0.88	0.61	0.73	0.75	0.83	
Lithuania	0.92	61	0.87	0.78	0.80	0.77	0.90	0.79	0.64	0.56	0.84	
Morocco	0.88	53	0.77	0.43	0.54	0.79	0.86	0.84	0.68	0.69	0.83	
Portugal	0.91	59	0.86	0.73	0.73	0.80	0.90	0.84	0.70	0.50	0.81	
Romania	0.88	54	0.86	0.38	0.59	0.78	0.89	0.85	0.68	0.60	0.83	
Russian Federation	0.90	58	0.86	0.61	0.71	0.77	0.89	0.82	0.67	0.60	0.84	
Sweden	0.92	61	0.87	0.68	0.77	0.83	0.91	0.88	0.65	0.57	0.81	
<b>Benchmarking Participants</b>												
Moscow City, Russian Fed.	0.92	61	0.87	0.72	0.77	0.80	0.90	0.83	0.65	0.54	0.87	

<sup>R</sup> Reverse coded

### Relationship Between the TIMSS 2019 *Students Like Learning Biology* Scale and TIMSS 2019 Achievement – Grade 8

Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale
	$r$	$r^2$	
Cyprus	0.22	0.05	0.04
Finland	0.22	0.05	0.03
France	0.18	0.03	0.03
Georgia	0.13	0.02	0.02
Hungary	0.09	0.01	0.01
Kazakhstan	0.09	0.01	0.00
Lebanon	0.28	0.08	0.07
Lithuania	0.12	0.01	0.01
Morocco	0.23	0.05	0.04
Portugal	0.16	0.03	0.02
Romania	0.08	0.01	0.01
Russian Federation	0.06	0.00	0.00
Sweden	0.17	0.03	0.02
<b>International Median</b>	<b>0.16</b>	<b>0.03</b>	<b>0.02</b>
<b>Benchmarking Participants</b>			
Moscow City, Russian Fed.	0.03	0.00	0.00

Scale was created for TIMSS 2019 countries where science is taught as separate subjects.

## Students Like Learning Chemistry – Grade 8

### About the Scale

The *Students Like Learning Chemistry* scale was created based on students' responses to nine items listed below.

		How much do you agree with these statements about learning chemistry?			
		Agree a lot	Agree a little	Disagree a little	Disagree a lot
BSBC33A	1) I enjoy learning chemistry -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
BSBC33B	2) I wish I did not have to study chemistry <sup>R</sup> -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
BSBC33C	3) Chemistry is boring <sup>R</sup> -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
BSBC33D	4) I learn many interesting things in chemistry ---	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
BSBC33E	5) I like chemistry -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
BSBC33F	6) I look forward to learning chemistry in school -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
BSBC33G	7) Chemistry teaches me how things in the world work -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
BSBC33H	8) I like to conduct chemistry experiments -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
BSBC33I	9) Chemistry is one of my favorite subjects -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Scale Cut Scores**      11.1      8.8

<sup>R</sup> Reverse coded



### Item Parameters for the TIMSS 2019 *Students Like Learning Chemistry* Scale – Grade 8

Item	delta	tau_1	tau_2	tau_3	Infit
BSBC33A	-0.14307	-1.46743	-0.25973	1.72716	0.73
BSBC33B <sup>R</sup>	0.23803	-1.27441	-0.19417	1.46858	1.66
BSBC33C <sup>R</sup>	0.14201	-1.45492	-0.16456	1.61948	1.36
BSBC33D	-0.61457	-1.44666	-0.41712	1.86378	0.86
BSBC33E	0.01742	-1.41770	-0.19178	1.60948	0.63
BSBC33F	0.68268	-1.77504	0.14928	1.62576	0.91
BSBC33G	-0.28919	-1.51200	-0.36951	1.88151	1.20
BSBC33H	-0.74644	-0.84521	-0.55612	1.40133	1.37
BSBC33I	0.71313	-1.44581	0.09000	1.35581	0.82

<sup>R</sup> Reverse coded

### Scale Transformation Constants for the TIMSS 2019 *Students Like Learning Chemistry* Scale – Grade 8

#### Scale Transformation Constants

A = 8.951511

B = 1.041262

Transformed Scale Score = 8.951511 + 1.041262 • Logit Scale Score

**Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019  
Students Like Learning Chemistry Scale – Grade 8**

Raw Score	Transformed Scale Score	Cutpoint
0	4.38181	
1	5.56044	
2	6.13177	
3	6.52970	
4	6.84408	
5	7.11089	
6	7.35187	
7	7.57186	
8	7.78125	
9	7.98339	
10	8.18235	
11	8.37833	
12	8.57458	
13	8.77259	8.8
14	8.97386	
15	9.17852	
16	9.38835	
17	9.60400	
18	9.82660	
19	10.05696	
20	10.29850	
21	10.55457	
22	10.83124	
23	11.13865	11.1
24	11.49497	
25	11.93332	
26	12.55122	
27	13.77684	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Students Like Learning Chemistry* Scale – Grade 8

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item									
			BSBC33A	BSBC33B <sup>R</sup>	BSBC33C <sup>R</sup>	BSBC33D	BSBC33E	BSBC33F	BSBC33G	BSBC33H	BSBC33I	
Cyprus	0.92	63	0.87	0.61	0.67	0.84	0.91	0.85	0.74	0.72	0.86	
Finland	0.94	67	0.90	0.74	0.76	0.85	0.92	0.88	0.74	0.70	0.86	
France	0.92	60	0.87	0.63	0.73	0.81	0.91	0.82	0.69	0.59	0.85	
Georgia	0.91	59	0.86	0.57	0.62	0.80	0.90	0.84	0.68	0.67	0.86	
Hungary	0.92	61	0.88	0.66	0.70	0.81	0.91	0.87	0.70	0.59	0.86	
Kazakhstan	0.92	61	0.85	0.50	0.76	0.82	0.90	0.85	0.68	0.75	0.86	
Lebanon	0.86	51	0.81	0.34	0.42	0.81	0.88	0.61	0.75	0.75	0.84	
Lithuania	0.92	62	0.88	0.76	0.78	0.80	0.91	0.80	0.67	0.60	0.86	
Morocco	0.88	55	0.77	0.38	0.45	0.81	0.88	0.86	0.76	0.78	0.83	
Portugal	0.93	64	0.89	0.74	0.74	0.83	0.91	0.86	0.76	0.57	0.84	
Romania	0.90	58	0.89	0.31	0.53	0.82	0.91	0.86	0.77	0.67	0.85	
Russian Federation	0.91	60	0.88	0.61	0.67	0.81	0.90	0.85	0.69	0.65	0.86	
Sweden	0.93	64	0.87	0.64	0.77	0.85	0.92	0.89	0.69	0.67	0.82	
<b>Benchmarking Participants</b>												
Moscow City, Russian Fed.	0.93	64	0.89	0.68	0.73	0.83	0.91	0.86	0.72	0.62	0.88	

<sup>R</sup> Reverse coded

### Relationship Between the TIMSS 2019 *Students Like Learning Chemistry* Scale and TIMSS 2019 Achievement – Grade 8

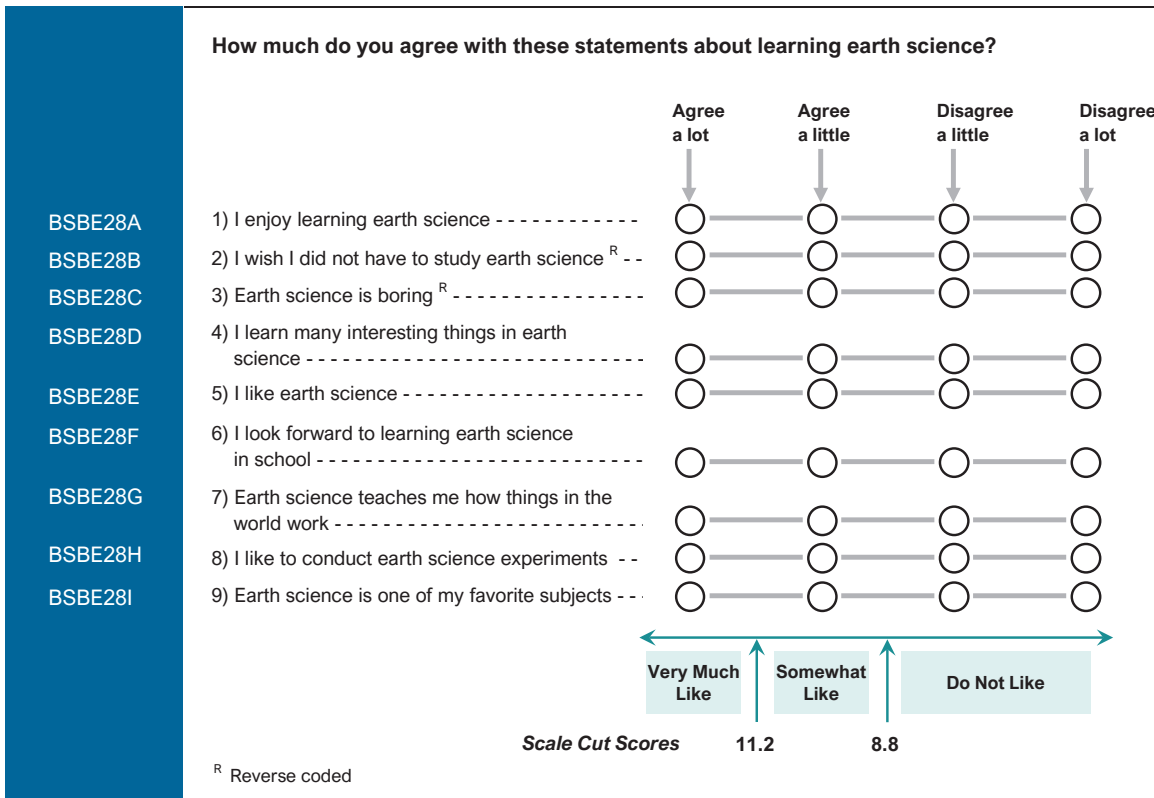
Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale
	<i>r</i>	<i>r</i> <sup>2</sup>	
Cyprus	0.22	0.05	0.04
Finland	0.36	0.13	0.10
France	0.21	0.04	0.04
Georgia	0.20	0.04	0.04
Hungary	0.11	0.01	0.02
Kazakhstan	0.16	0.03	0.02
Lebanon	0.25	0.06	0.07
Lithuania	0.23	0.05	0.04
Morocco	0.25	0.06	0.05
Portugal	0.24	0.06	0.06
Romania	0.18	0.03	0.03
Russian Federation	0.17	0.03	0.03
Sweden	0.20	0.04	0.03
<b>International Median</b>	<b>0.21</b>	<b>0.04</b>	<b>0.04</b>
<b>Benchmarking Participants</b>			
Moscow City, Russian Fed.	0.18	0.03	0.03

Scale was created for TIMSS 2019 countries where science is taught as separate subjects.

# Students Like Learning Earth Science – Grade 8

## About the Scale

The *Students Like Learning Earth Science* scale was created based on students’ responses to nine items listed below.



### Item Parameters for the TIMSS 2019 *Students Like Learning Earth Science* Scale – Grade 8

Item	delta	tau_1	tau_2	tau_3	Infit
BSBE28A	-0.22224	-1.55381	-0.36522	1.91903	0.75
BSBE28B <sup>R</sup>	0.08027	-1.31109	-0.29421	1.60530	1.56
BSBE28C <sup>R</sup>	0.08661	-1.54312	-0.20119	1.74431	1.29
BSBE28D	-0.72581	-1.46248	-0.48855	1.95103	0.87
BSBE28E	-0.12416	-1.50925	-0.28124	1.79049	0.64
BSBE28F	0.66218	-1.87680	0.10256	1.77424	0.84
BSBE28G	-0.84329	-1.28030	-0.70858	1.98888	1.11
BSBE28H	0.27811	-0.98803	-0.30562	1.29365	1.52
BSBE28I	0.80833	-1.46329	0.03245	1.43084	0.85

<sup>R</sup> Reverse coded

### Scale Transformation Constants for the TIMSS 2019 *Students Like Learning Earth Science* Scale – Grade 8

#### Scale Transformation Constants

A = 8.903182

B = 1.089155

Transformed Scale Score = 8.903182 + 1.089155 • Logit Scale Score

**Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019  
Students Like Learning Earth Science Scale – Grade 8**

Raw Score	Transformed Scale Score	Cutpoint
0	4.02015	
1	5.24902	
2	5.84858	
3	6.27182	
4	6.61042	
5	6.90196	
6	7.16441	
7	7.40916	
8	7.64056	
9	7.86305	
10	8.07990	
11	8.29368	
12	8.50651	
13	8.72026	8.8
14	8.93707	
15	9.15692	
16	9.38258	
17	9.61474	
18	9.85461	
19	10.10305	
20	10.36341	
21	10.63911	
22	10.93638	
23	11.26581	11.2
24	11.64644	
25	12.11289	
26	12.76721	
27	14.05738	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 Students Like Learning Earth Science Scale – Grade 8

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item								
			BSBE28A	BSBE28B <sup>R</sup>	BSBE28C <sup>R</sup>	BSBE28D	BSBE28E	BSBE28F	BSBE28G	BSBE28H	BSBE28I
Cyprus	0.92	61	0.87	0.61	0.66	0.82	0.91	0.86	0.70	0.70	0.85
Finland	0.93	64	0.87	0.69	0.74	0.83	0.91	0.86	0.73	0.71	0.82
France	0.91	59	0.87	0.70	0.75	0.79	0.90	0.83	0.64	0.54	0.84
Georgia	0.87	52	0.80	0.42	0.49	0.75	0.87	0.81	0.70	0.69	0.81
Hungary	0.92	61	0.89	0.61	0.71	0.81	0.92	0.87	0.68	0.64	0.86
Kazakhstan	0.90	57	0.81	0.43	0.73	0.78	0.88	0.83	0.68	0.70	0.84
Lebanon	-	-	-	-	-	-	-	-	-	-	-
Lithuania	0.91	61	0.88	0.75	0.79	0.79	0.90	0.79	0.66	0.55	0.85
Morocco	0.88	55	0.79	0.40	0.49	0.81	0.87	0.85	0.72	0.75	0.83
Portugal	0.91	59	0.86	0.73	0.73	0.80	0.90	0.84	0.70	0.50	0.81
Romania	0.85	51	0.84	0.16	0.36	0.80	0.89	0.85	0.76	0.61	0.81
Russian Federation	0.90	57	0.84	0.57	0.67	0.79	0.89	0.83	0.72	0.62	0.83
Sweden	-	-	-	-	-	-	-	-	-	-	-
<b>Benchmarking Participants</b>											
Moscow City, Russian Fed.	0.91	60	0.86	0.66	0.73	0.81	0.89	0.84	0.69	0.62	0.85

<sup>R</sup> Reverse coded

### Relationship Between the TIMSS 2019 Students Like Learning Earth Science Scale and TIMSS 2019 Achievement – Grade 8

Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale
	$r$	$r^2$	
Cyprus	0.10	0.01	0.01
Finland	0.19	0.04	0.03
France	0.18	0.03	0.03
Georgia	0.08	0.01	0.01
Hungary	0.03	0.00	0.01
Kazakhstan	0.07	0.00	0.00
Lebanon	-	-	-
Lithuania	0.06	0.00	0.00
Morocco	0.19	0.04	0.03
Portugal	0.16	0.03	0.02
Romania	0.09	0.01	0.02
Russian Federation	0.01	0.00	0.00
Sweden	-	-	-
<b>International Median</b>	<b>0.09</b>	<b>0.01</b>	<b>0.01</b>
<b>Benchmarking Participants</b>			
Moscow City, Russian Fed.	0.02	0.00	0.00

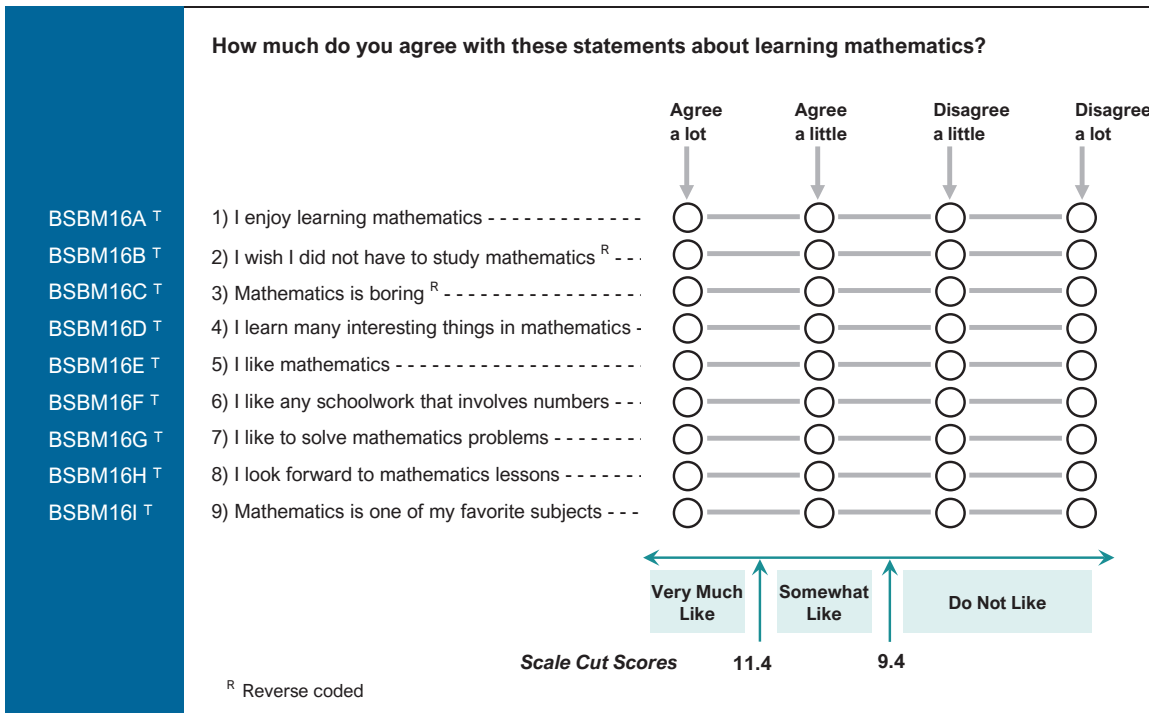
Scale was created for TIMSS 2019 countries where science is taught as separate subjects.

A dash (-) indicates comparable data not available.

# Students Like Learning Mathematics – Grade 8

## About the Scale

The *Students Like Learning Mathematics* scale was created based on students’ responses to nine items listed below.



<sup>T</sup> Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.



### Item Parameters for the TIMSS 2019 *Students Like Learning Mathematics* Scale – Grade 8

Item	delta	tau_1	tau_2	tau_3	Infit
BSBM16A	-0.52075	-1.52420	-0.44716	1.97136	0.80
BSBM16B <sup>R</sup>	-0.16493	-1.27666	0.02387	1.25279	1.68
BSBM16C <sup>R</sup>	0.08233	-1.70726	0.11045	1.59681	1.34
BSBM16D	-0.67768	-1.75407	-0.23907	1.99314	1.13
BSBM16E	-0.20808	-1.32239	-0.32723	1.64962	0.66
BSBM16F	0.24118	-1.93026	0.06299	1.86727	1.03
BSBM16G	0.07107	-1.61719	-0.15594	1.77313	0.85
BSBM16H	0.65566	-1.77947	-0.05548	1.83495	0.93
BSBM16I	0.52120	-1.07237	-0.04864	1.12101	0.81

<sup>R</sup> Reverse coded

### Scale Transformation Constants for the TIMSS 2019 *Students Like Learning Mathematics* Scale – Grade 8

#### Scale Transformation Constants

A = 9.42706

B = 0.94246

Transformed Scale Score = 9.42706 + 0.94246 • Logit Scale Score

**Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019  
Students Like Learning Mathematics Scale – Grade 8**

Raw Score	Transformed Scale Score	Cutpoint
0	5.09484	
1	6.19800	
2	6.74882	
3	7.13627	
4	7.44727	
5	7.71308	
6	7.95043	
7	8.16805	
8	8.37412	
9	8.57095	
10	8.76139	
11	8.94763	
12	9.13133	
13	9.31385	9.4
14	9.49640	
15	9.68014	
16	9.86638	
17	10.05658	
18	10.25252	
19	10.45644	
20	10.67004	
21	10.89898	
22	11.14859	
23	11.42832	11.4
24	11.75478	
25	12.15847	
26	12.72711	
27	13.84849	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Students Like Learning Mathematics* Scale – Grade 8

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item								
			BSBM16A	BSBM16B R	BSBM16C R	BSBM16D	BSBM16E	BSBM16F	BSBM16G	BSBM16H	BSBM16I
Australia	0.94	67	0.89	0.72	0.75	0.73	0.91	0.81	0.86	0.83	0.86
Bahrain	0.94	66	0.85	0.66	0.74	0.79	0.91	0.79	0.85	0.84	0.87
Chile	0.93	64	0.85	0.64	0.74	0.71	0.90	0.80	0.87	0.84	0.85
Chinese Taipei	0.94	70	0.90	0.69	0.76	0.83	0.92	0.85	0.89	0.79	0.87
Cyprus	0.94	67	0.88	0.73	0.73	0.77	0.91	0.79	0.83	0.84	0.88
Egypt	0.88	53	0.74	0.41	0.49	0.74	0.86	0.71	0.86	0.82	0.82
England	0.93	65	0.86	0.72	0.75	0.72	0.90	0.79	0.84	0.82	0.84
Finland	0.94	67	0.87	0.72	0.77	0.80	0.92	0.79	0.81	0.83	0.85
France	0.93	63	0.86	0.71	0.78	0.71	0.90	0.73	0.74	0.82	0.85
Georgia	0.92	60	0.85	0.59	0.59	0.68	0.89	0.77	0.84	0.84	0.86
Hong Kong SAR	0.93	67	0.88	0.58	0.64	0.83	0.92	0.85	0.90	0.81	0.88
Hungary	0.93	65	0.88	0.64	0.71	0.74	0.91	0.83	0.83	0.83	0.85
Iran, Islamic Rep. of	0.93	64	0.84	0.71	0.69	0.74	0.89	0.77	0.84	0.82	0.88
Ireland	0.94	66	0.88	0.73	0.76	0.74	0.91	0.78	0.82	0.82	0.86
Israel	0.93	65	0.85	0.65	0.74	0.78	0.91	0.78	0.86	0.80	0.88
Italy	0.95	71	0.91	0.78	0.82	0.71	0.92	0.85	0.84	0.86	0.89
Japan	0.94	69	0.89	0.62	0.73	0.82	0.92	0.85	0.88	0.84	0.88
Jordan	0.91	60	0.82	0.43	0.54	0.78	0.89	0.80	0.85	0.85	0.87
Kazakhstan	0.92	62	0.81	0.58	0.73	0.74	0.88	0.77	0.87	0.84	0.85
Korea, Rep. of	0.94	69	0.89	0.59	0.74	0.82	0.92	0.88	0.91	0.76	0.89
Kuwait	0.92	62	0.83	0.45	0.63	0.79	0.90	0.80	0.84	0.85	0.87
Lebanon	0.89	53	0.83	0.51	0.52	0.71	0.88	0.69	0.82	0.64	0.86
Lithuania	0.93	64	0.86	0.70	0.74	0.70	0.90	0.80	0.87	0.80	0.83
Malaysia	0.90	57	0.82	0.65	0.71	0.69	0.87	0.73	0.78	0.71	0.81
Morocco	0.91	59	0.82	0.52	0.63	0.77	0.89	0.75	0.75	0.86	0.85
New Zealand	0.93	66	0.88	0.74	0.73	0.70	0.90	0.81	0.85	0.83	0.85
Norway (9)	0.94	69	0.88	0.69	0.77	0.79	0.91	0.83	0.89	0.86	0.86
Oman	0.88	53	0.80	0.35	0.55	0.77	0.87	0.69	0.82	0.71	0.85
Portugal	0.95	71	0.89	0.75	0.79	0.79	0.91	0.81	0.88	0.88	0.85
Qatar	0.92	63	0.84	0.54	0.58	0.78	0.91	0.82	0.87	0.84	0.88
Romania	0.92	61	0.85	0.52	0.63	0.75	0.89	0.72	0.88	0.84	0.86
Russian Federation	0.92	63	0.85	0.60	0.72	0.72	0.89	0.79	0.84	0.82	0.85
Saudi Arabia	0.93	64	0.82	0.55	0.75	0.78	0.89	0.80	0.85	0.86	0.87
Singapore	0.94	67	0.88	0.75	0.74	0.72	0.90	0.77	0.86	0.81	0.88
South Africa (9)	0.89	55	0.80	0.56	0.62	0.64	0.87	0.72	0.81	0.75	0.81
Sweden	0.94	70	0.88	0.69	0.81	0.78	0.92	0.87	0.86	0.84	0.86
Turkey	0.92	62	0.81	0.65	0.76	0.61	0.89	0.76	0.84	0.83	0.88
United Arab Emirates	0.92	62	0.83	0.60	0.63	0.76	0.89	0.78	0.84	0.83	0.87
United States	0.94	67	0.88	0.67	0.71	0.73	0.91	0.81	0.89	0.85	0.86

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Students Like Learning Mathematics* Scale – Grade 8

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item									
			BSBM16A	BSBM16B <sup>R</sup>	BSBM16C <sup>R</sup>	BSBM16D	BSBM16E	BSBM16F	BSBM16G	BSBM16H	BSBM16I	
<b>Benchmarking Participants</b>												
Ontario, Canada	0.94	68	0.89	0.71	0.76	0.71	0.91	0.81	0.87	0.87	0.87	
Quebec, Canada	0.93	65	0.88	0.60	0.79	0.75	0.91	0.82	0.83	0.81	0.86	
Moscow City, Russian Fed.	0.93	65	0.88	0.68	0.76	0.75	0.90	0.76	0.83	0.82	0.86	
Gauteng, RSA (9)	0.91	59	0.83	0.64	0.68	0.67	0.88	0.73	0.82	0.78	0.83	
Western Cape, RSA (9)	0.91	60	0.83	0.61	0.66	0.69	0.88	0.77	0.84	0.81	0.85	
Abu Dhabi, UAE	0.90	57	0.82	0.51	0.53	0.72	0.88	0.78	0.83	0.80	0.85	
Dubai, UAE	0.93	65	0.83	0.69	0.71	0.77	0.89	0.78	0.85	0.83	0.87	

<sup>R</sup> Reverse coded

### Relationship Between the TIMSS 2019 *Students Like Learning Mathematics* Scale and TIMSS 2019 Achievement – Grade 8

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
Australia	0.39	0.15	0.12
Bahrain	0.20	0.04	0.04
Chile	0.21	0.05	0.04
Chinese Taipei	0.42	0.17	0.16
Cyprus	0.37	0.13	0.13
Egypt	0.17	0.03	0.04
England	0.24	0.06	0.05
Finland	0.44	0.19	0.16
France	0.35	0.12	0.11
Georgia	0.26	0.07	0.06
Hong Kong SAR	0.30	0.09	0.08
Hungary	0.38	0.14	0.14
Iran, Islamic Rep. of	0.25	0.06	0.07
Ireland	0.32	0.11	0.10
Israel	0.17	0.03	0.02
Italy	0.35	0.12	0.12
Japan	0.40	0.16	0.13
Jordan	0.16	0.02	0.03
Kazakhstan	0.16	0.03	0.03
Korea, Rep. of	0.39	0.15	0.13
Kuwait	0.17	0.03	0.03
Lebanon	0.22	0.05	0.05
Lithuania	0.26	0.07	0.07
Malaysia	0.21	0.04	0.05
Morocco	0.25	0.06	0.05
New Zealand	0.29	0.08	0.07
Norway (9)	0.42	0.18	0.13
Oman	0.27	0.07	0.08
Portugal	0.37	0.14	0.13
Qatar	0.25	0.06	0.05
Romania	0.30	0.09	0.09
Russian Federation	0.28	0.08	0.08
Saudi Arabia	0.14	0.02	0.02
Singapore	0.33	0.11	0.09
South Africa (9)	0.11	0.01	0.02
Sweden	0.34	0.12	0.10
Turkey	0.25	0.06	0.07
United Arab Emirates	0.23	0.05	0.05
United States	0.27	0.07	0.07
<b>International Median</b>	<b>0.27</b>	<b>0.07</b>	<b>0.07</b>

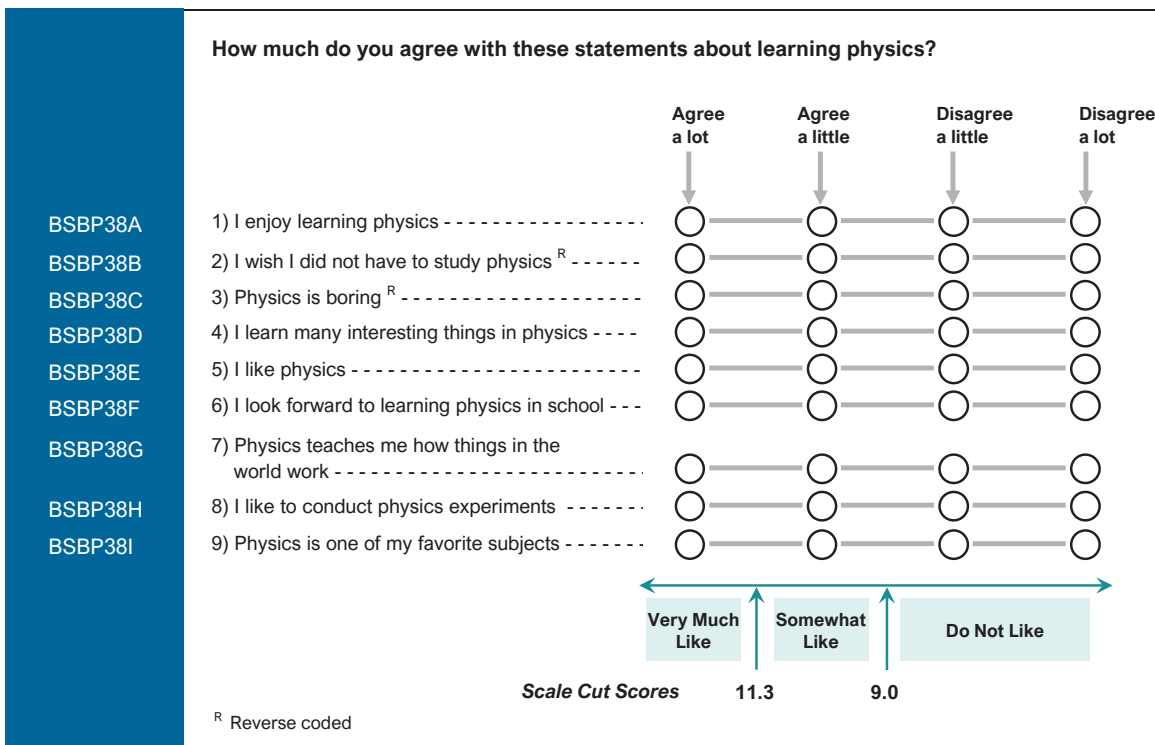
**Relationship Between the TIMSS 2019 *Students Like Learning Mathematics* Scale and TIMSS 2019 Achievement – Grade 8**

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
<b>Benchmarking Participants</b>			
Ontario, Canada	0.40	0.16	0.14
Quebec, Canada	0.36	0.13	0.11
Moscow City, Russian Fed.	0.39	0.15	0.15
Gauteng, RSA (9)	0.09	0.01	0.01
Western Cape, RSA (9)	0.06	0.00	0.01
Abu Dhabi, UAE	0.21	0.05	0.07
Dubai, UAE	0.27	0.07	0.07

# Students Like Learning Physics – Grade 8

## About the Scale

The *Students Like Learning Physics* scale was created based on students’ responses to nine items listed below.



### Item Parameters for the TIMSS 2019 *Students Like Learning Physics* Scale – Grade 8

Item	delta	tau_1	tau_2	tau_3	Infit
BSBP38A	-0.09991	-1.44455	-0.24740	1.69195	0.76
BSBP38B <sup>R</sup>	0.21221	-1.24941	-0.18976	1.43917	1.65
BSBP38C <sup>R</sup>	0.16331	-1.45914	-0.11608	1.57522	1.41
BSBP38D	-0.60437	-1.42950	-0.41629	1.84579	0.88
BSBP38E	0.06539	-1.42600	-0.16967	1.59567	0.63
BSBP38F	0.66918	-1.74385	0.15965	1.58420	0.90
BSBP38G	-0.58101	-1.34701	-0.48738	1.83439	1.17
BSBP38H	-0.57636	-0.98606	-0.45642	1.44248	1.27
BSBP38I	0.75156	-1.40132	0.07443	1.32689	0.83

<sup>R</sup> Reverse coded

### Scale Transformation Constants for the TIMSS 2019 *Students Like Learning Physics* Scale – Grade 8

#### Scale Transformation Constants

A = 9.112372

B = 1.052564

Transformed Scale Score = 9.112372 + 1.052564 • Logit Scale Score



**Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019  
Students Like Learning Physics Scale – Grade 8**

Raw Score	Transformed Scale Score	Cutpoint
0	4.50052	
1	5.69131	
2	6.27071	
3	6.67290	
4	6.99227	
5	7.26430	
6	7.50753	
7	7.73282	
8	7.94527	
9	8.14964	
10	8.34943	
11	8.54716	
12	8.74474	
13	8.94365	9.0
14	9.14548	
15	9.34993	
16	9.55919	
17	9.77382	
18	9.99507	
19	10.22382	
20	10.46372	
21	10.71828	
22	10.99372	
23	11.30039	11.3
24	11.65666	
25	12.09616	
26	12.71724	
27	13.95282	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Students Like Learning Physics* Scale – Grade 8

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item									
			BSBP38A	BSBP38B <sup>R</sup>	BSBP38C <sup>R</sup>	BSBP38D	BSBP38E	BSBP38F	BSBP38G	BSBP38H	BSBP38I	
Cyprus	0.93	65	0.89	0.64	0.68	0.85	0.92	0.87	0.74	0.76	0.88	
Finland	0.94	67	0.89	0.72	0.74	0.84	0.92	0.88	0.74	0.75	0.85	
France	0.92	60	0.87	0.63	0.73	0.81	0.91	0.82	0.69	0.59	0.85	
Georgia	0.89	55	0.84	0.53	0.54	0.78	0.89	0.83	0.67	0.68	0.85	
Hungary	0.92	62	0.88	0.64	0.70	0.80	0.91	0.86	0.68	0.72	0.85	
Kazakhstan	0.91	59	0.83	0.44	0.74	0.79	0.89	0.83	0.70	0.77	0.84	
Lebanon	0.86	52	0.83	0.21	0.31	0.82	0.90	0.67	0.78	0.79	0.84	
Lithuania	0.93	63	0.88	0.78	0.76	0.80	0.91	0.78	0.68	0.67	0.86	
Morocco	0.88	56	0.79	0.35	0.41	0.82	0.88	0.87	0.77	0.80	0.83	
Portugal	0.93	64	0.89	0.74	0.74	0.83	0.91	0.86	0.76	0.57	0.84	
Romania	0.89	55	0.86	0.28	0.45	0.81	0.90	0.85	0.76	0.70	0.83	
Russian Federation	0.91	59	0.84	0.57	0.66	0.80	0.89	0.82	0.70	0.71	0.84	
Sweden	0.93	65	0.88	0.65	0.75	0.86	0.92	0.90	0.72	0.70	0.82	
<b>Benchmarking Participants</b>												
Moscow City, Russian Fed.	0.92	63	0.87	0.66	0.71	0.81	0.91	0.83	0.71	0.71	0.86	

<sup>R</sup> Reverse coded

### Relationship Between the TIMSS 2019 *Students Like Learning Physics* Scale and TIMSS 2019 Achievement – Grade 8

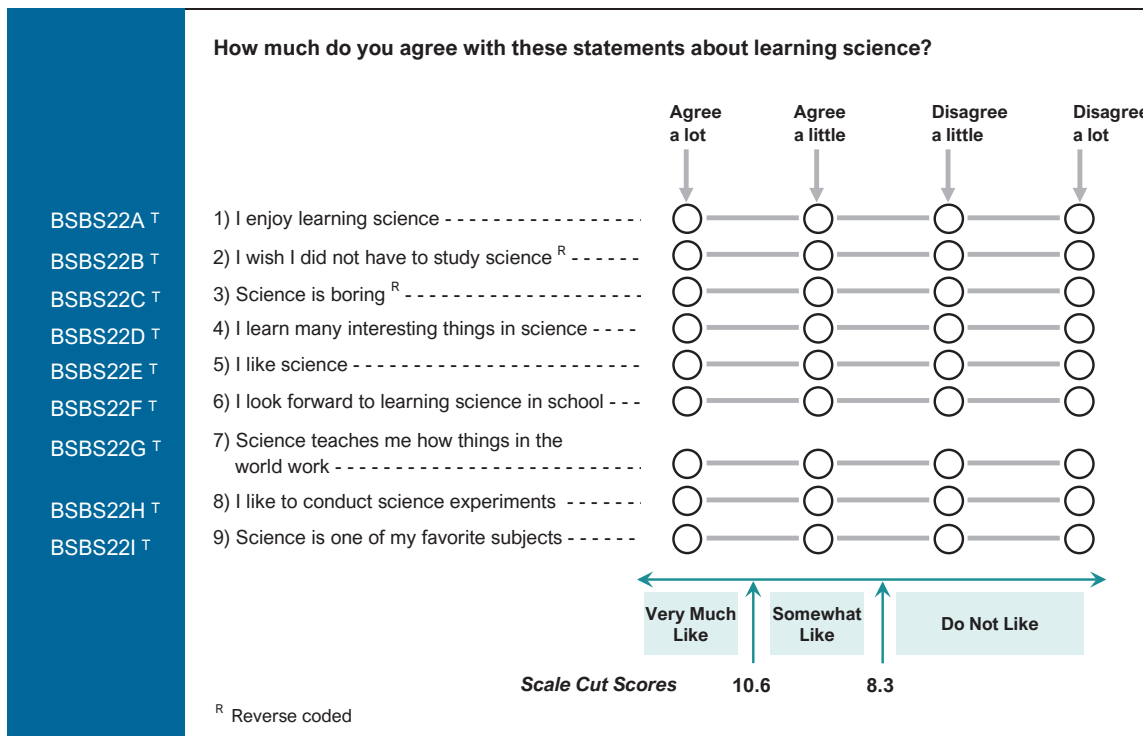
Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale
	$r$	$r^2$	
Cyprus	0.27	0.07	0.06
Finland	0.31	0.10	0.08
France	0.21	0.04	0.04
Georgia	0.17	0.03	0.04
Hungary	0.19	0.04	0.03
Kazakhstan	0.15	0.02	0.02
Lebanon	0.20	0.04	0.05
Lithuania	0.17	0.03	0.03
Morocco	0.25	0.06	0.06
Portugal	0.24	0.06	0.06
Romania	0.15	0.02	0.03
Russian Federation	0.17	0.03	0.02
Sweden	0.25	0.06	0.05
<b>International Median</b>	<b>0.20</b>	<b>0.04</b>	<b>0.04</b>
<b>Benchmarking Participants</b>			
Moscow City, Russian Fed.	0.20	0.04	0.03

Scale was created for TIMSS 2019 countries where science is taught as separate subjects.

## Students Like Learning Science – Grade 8

### About the Scale

The *Students Like Learning Science* scale was created based on students’ responses to nine items listed below.



<sup>T</sup> Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.

### Item Parameters for the TIMSS 2019 *Students Like Learning Science* Scale – Grade 8

Item	delta	tau_1	tau_2	tau_3	Infit
BSBS22A	-0.18816	-1.12110	-0.51287	1.63397	0.77
BSBS22B <sup>R</sup>	0.51905	-1.21205	-0.09407	1.30612	1.56
BSBS22C <sup>R</sup>	0.45459	-1.38086	-0.07300	1.45386	1.35
BSBS22D	-0.51760	-1.05343	-0.51799	1.57142	0.88
BSBS22E	-0.00730	-1.17719	-0.29690	1.47409	0.64
BSBS22F	0.40936	-1.50803	-0.05340	1.56143	0.81
BSBS22G	-0.58381	-1.04270	-0.57925	1.62195	1.08
BSBS22H	-0.60801	-0.85093	-0.44646	1.29739	1.35
BSBS22I	0.52188	-1.21442	0.00714	1.20728	0.80

<sup>R</sup> Reverse coded

### Scale Transformation Constants for the TIMSS 2019 *Students Like Learning Science* Scale – Grade 8

#### Scale Transformation Constants

A = 8.489044

B = 1.125793

Transformed Scale Score = 8.489044 + 1.125793 • Logit Scale Score

**Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019  
Students Like Learning Science Scale – Grade 8**

Raw Score	Transformed Scale Score	Cutpoint
0	3.84650	
1	5.07484	
2	5.65807	
3	6.06022	
4	6.37614	
5	6.64332	
6	6.88421	
7	7.10319	
8	7.31154	
9	7.51243	
10	7.71018	
11	7.90450	
12	8.09896	
13	8.29500	8.3
14	8.49394	
15	8.69661	
16	8.90441	
17	9.11856	
18	9.34076	
19	9.57219	
20	9.81723	
21	10.07979	
22	10.36663	
23	10.68878	10.6
24	11.06414	
25	11.53300	
26	12.19630	
27	13.51778	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Students Like Learning Science* Scale – Grade 8

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item									
			BSBS22A	BSBS22B <sup>R</sup>	BSBS22C <sup>R</sup>	BSBS22D	BSBS22E	BSBS22F	BSBS22G	BSBS22H	BSBS22I	
Australia	0.93	64	0.88	0.70	0.76	0.80	0.92	0.90	0.74	0.57	0.87	
Bahrain	0.90	58	0.81	0.54	0.62	0.82	0.89	0.85	0.74	0.62	0.86	
Chile	0.90	57	0.85	0.50	0.66	0.80	0.90	0.85	0.71	0.62	0.84	
Chinese Taipei	0.92	62	0.87	0.63	0.66	0.82	0.90	0.86	0.74	0.69	0.87	
Cyprus	-	-	-	-	-	-	-	-	-	-	-	
Egypt	0.83	47	0.66	0.33	0.41	0.75	0.83	0.82	0.73	0.70	0.79	
England	0.93	63	0.88	0.75	0.75	0.81	0.91	0.89	0.70	0.53	0.86	
Finland	-	-	-	-	-	-	-	-	-	-	-	
France	-	-	-	-	-	-	-	-	-	-	-	
Georgia	-	-	-	-	-	-	-	-	-	-	-	
Hong Kong SAR	0.92	61	0.87	0.54	0.58	0.83	0.90	0.88	0.75	0.76	0.87	
Hungary	-	-	-	-	-	-	-	-	-	-	-	
Iran, Islamic Rep. of	0.89	56	0.82	0.63	0.62	0.73	0.87	0.81	0.67	0.63	0.86	
Ireland	0.93	64	0.90	0.73	0.75	0.80	0.92	0.89	0.71	0.57	0.87	
Israel	0.91	59	0.86	0.59	0.64	0.82	0.90	0.82	0.72	0.63	0.88	
Italy	0.91	59	0.86	0.77	0.77	0.77	0.89	0.83	0.62	0.43	0.84	
Japan	0.92	63	0.87	0.67	0.73	0.82	0.90	0.86	0.69	0.65	0.87	
Jordan	0.86	55	0.78	0.28	0.38	0.82	0.88	0.86	0.79	0.76	0.84	
Kazakhstan	-	-	-	-	-	-	-	-	-	-	-	
Korea, Rep. of	0.93	64	0.89	0.67	0.75	0.81	0.91	0.84	0.72	0.69	0.90	
Kuwait	0.89	56	0.79	0.39	0.53	0.82	0.89	0.87	0.73	0.66	0.86	
Lebanon	-	-	-	-	-	-	-	-	-	-	-	
Lithuania	-	-	-	-	-	-	-	-	-	-	-	
Malaysia	0.88	52	0.80	0.58	0.63	0.76	0.85	0.73	0.68	0.63	0.78	
Morocco	-	-	-	-	-	-	-	-	-	-	-	
New Zealand	0.92	61	0.88	0.71	0.66	0.78	0.91	0.89	0.70	0.56	0.85	
Norway (9)	0.92	60	0.88	0.70	0.75	0.81	0.91	0.87	0.66	0.50	0.83	
Oman	0.84	49	0.73	0.28	0.48	0.77	0.85	0.78	0.74	0.68	0.81	
Portugal	-	-	-	-	-	-	-	-	-	-	-	
Qatar	0.89	57	0.83	0.39	0.45	0.82	0.90	0.86	0.78	0.70	0.87	
Romania	-	-	-	-	-	-	-	-	-	-	-	
Russian Federation	-	-	-	-	-	-	-	-	-	-	-	
Saudi Arabia	0.89	55	0.80	0.44	0.58	0.82	0.87	0.85	0.69	0.68	0.84	
Singapore	0.91	60	0.86	0.73	0.73	0.76	0.90	0.87	0.68	0.52	0.86	
South Africa (9)	0.86	50	0.79	0.45	0.52	0.69	0.85	0.81	0.64	0.68	0.80	
Sweden	-	-	-	-	-	-	-	-	-	-	-	
Turkey	0.87	52	0.80	0.57	0.67	0.60	0.86	0.78	0.68	0.62	0.84	
United Arab Emirates	0.90	56	0.81	0.49	0.55	0.80	0.89	0.85	0.75	0.68	0.85	
United States	0.91	60	0.87	0.58	0.66	0.78	0.90	0.88	0.72	0.65	0.86	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Students Like Learning Science* Scale – Grade 8

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item									
			BSBS22A	BSBS22B <sup>R</sup>	BSBS22C <sup>R</sup>	BSBS22D	BSBS22E	BSBS22F	BSBS22G	BSBS22H	BSBS22I	
<b>Benchmarking Participants</b>												
Ontario, Canada	0.92	61	0.88	0.68	0.76	0.76	0.91	0.88	0.67	0.57	0.87	
Quebec, Canada	0.91	60	0.88	0.58	0.76	0.80	0.91	0.87	0.63	0.57	0.86	
Moscow City, Russian Fed.	-	-	-	-	-	-	-	-	-	-	-	
Gauteng, RSA (9)	0.89	54	0.82	0.56	0.64	0.70	0.88	0.84	0.66	0.63	0.83	
Western Cape, RSA (9)	0.89	54	0.84	0.52	0.59	0.71	0.88	0.85	0.64	0.65	0.84	
Abu Dhabi, UAE	0.88	54	0.80	0.39	0.41	0.80	0.88	0.84	0.76	0.71	0.84	
Dubai, UAE	0.91	58	0.82	0.63	0.71	0.76	0.89	0.84	0.72	0.60	0.84	

<sup>R</sup> Reverse coded

A dash (-) indicates comparable data not available.

### Relationship Between the TIMSS 2019 *Students Like Learning Science* Scale and TIMSS 2019 Achievement – Grade 8

Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
Australia	0.33	0.11	0.09
Bahrain	0.26	0.07	0.06
Chile	0.16	0.02	0.02
Chinese Taipei	0.32	0.10	0.09
Cyprus	-	-	-
Egypt	0.34	0.12	0.11
England	0.31	0.09	0.08
Finland	-	-	-
France	-	-	-
Georgia	-	-	-
Hong Kong SAR	0.26	0.07	0.06
Hungary	-	-	-
Iran, Islamic Rep. of	0.22	0.05	0.05
Ireland	0.34	0.11	0.09
Israel	0.22	0.05	0.04
Italy	0.20	0.04	0.03
Japan	0.31	0.10	0.09
Jordan	0.26	0.07	0.08
Kazakhstan	-	-	-
Korea, Rep. of	0.39	0.15	0.15
Kuwait	0.24	0.06	0.04
Lebanon	-	-	-
Lithuania	-	-	-
Malaysia	0.28	0.08	0.08
Morocco	-	-	-
New Zealand	0.26	0.07	0.06
Norway (9)	0.27	0.07	0.06
Oman	0.34	0.12	0.10
Portugal	-	-	-
Qatar	0.28	0.08	0.07
Romania	-	-	-
Russian Federation	-	-	-
Saudi Arabia	0.22	0.05	0.04
Singapore	0.30	0.09	0.08
South Africa (9)	0.22	0.05	0.05
Sweden	-	-	-
Turkey	0.24	0.06	0.05
United Arab Emirates	0.36	0.13	0.13
United States	0.21	0.05	0.04
<b>International Median</b>	<b>0.27</b>	<b>0.07</b>	<b>0.07</b>



**Relationship Between the TIMSS 2019 *Students Like Learning Science* Scale and TIMSS 2019 Achievement – Grade 8**

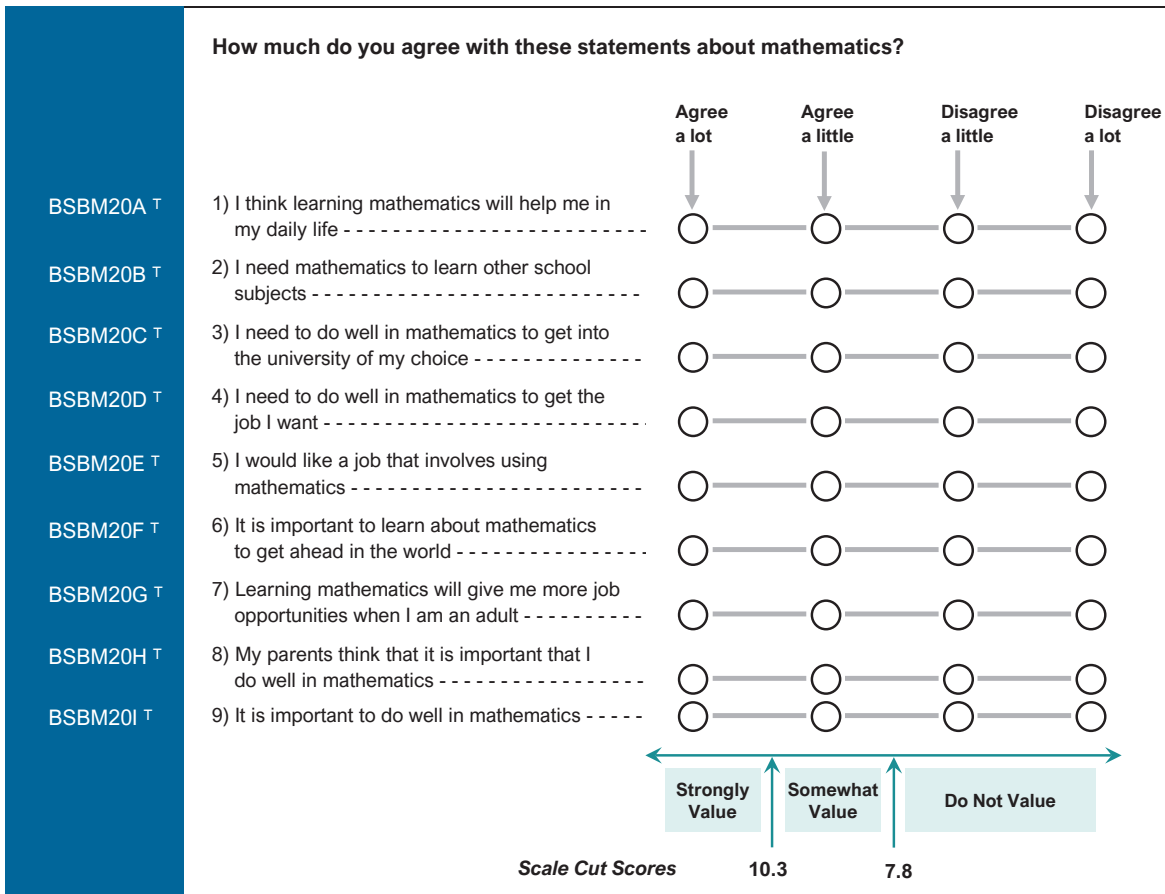
Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
<b>Benchmarking Participants</b>			
Ontario, Canada	0.24	0.06	0.04
Quebec, Canada	0.26	0.07	0.06
Moscow City, Russian Fed.	-	-	-
Gauteng, RSA (9)	0.13	0.02	0.02
Western Cape, RSA (9)	0.14	0.02	0.02
Abu Dhabi, UAE	0.42	0.17	0.17
Dubai, UAE	0.27	0.07	0.08

A dash (–) indicates comparable data not available.

# Students Value Mathematics – Grade 8

## About the Scale

The *Students Value Mathematics* scale was created based on students’ responses to nine items listed below.



<sup>T</sup> Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.

### Item Parameters for the TIMSS 2019 *Students Value Mathematics* Scale – Grade 8

Item	delta	tau_1	tau_2	tau_3	Infit
BSBM20A	-0.07683	-0.97955	-0.48401	1.46356	1.08
BSBM20B	0.21444	-1.41743	-0.41427	1.83170	1.14
BSBM20C	-0.21179	-1.03293	-0.24434	1.27727	0.96
BSBM20D	0.00026	-1.16359	-0.12444	1.28803	0.89
BSBM20E	1.46285	-1.34979	-0.01893	1.36872	1.28
BSBM20F	0.08173	-1.23148	-0.32418	1.55566	0.88
BSBM20G	-0.27682	-1.09839	-0.44615	1.54454	0.86
BSBM20H	-0.61122	-1.07802	-0.36012	1.43814	1.19
BSBM20I	-0.58262	-0.91732	-0.52093	1.43825	0.89

### Scale Transformation Constants for the TIMSS 2019 *Students Value Mathematics* Scale – Grade 8

#### Scale Transformation Constants

A = 7.964227

B = 1.193777

Transformed Scale Score = 7.964227 + 1.193777 • Logit Scale Score

**Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019  
Students Value Mathematics Scale – Grade 8**

Raw Score	Transformed Scale Score	Cutpoint
0	3.03682	
1	4.34723	
2	4.96949	
3	5.39638	
4	5.72855	
5	6.01079	
6	6.25944	
7	6.48714	
8	6.70110	
9	6.90631	
10	7.10653	
11	7.30474	
12	7.50425	
13	7.70526	7.8
14	7.91135	
15	8.12441	
16	8.34615	
17	8.57829	
18	8.82228	
19	9.08085	
20	9.35676	
21	9.65438	
22	9.98068	
23	10.34734	10.3
24	10.77308	
25	11.30190	
26	12.04145	
27	13.48294	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 Students Value Mathematics Scale – Grade 8

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	0.76	0.74	0.78	0.80	0.66	0.83	0.82	0.63	0.81	
Bahrain	0.90	56	0.74	0.73	0.78	0.77	0.64	0.80	0.81	0.63	0.77	
Chile	0.89	54	0.71	0.69	0.78	0.79	0.58	0.81	0.81	0.67	0.75	
Chinese Taipei	0.91	57	0.68	0.68	0.79	0.82	0.72	0.81	0.84	0.65	0.79	
Cyprus	0.88	52	0.70	0.64	0.79	0.81	0.67	0.77	0.73	0.59	0.77	
Egypt	0.87	49	0.65	0.69	0.74	0.75	0.61	0.73	0.73	0.66	0.71	
England	0.88	53	0.69	0.70	0.72	0.77	0.63	0.80	0.79	0.63	0.76	
Finland	0.91	58	0.72	0.70	0.80	0.82	0.68	0.83	0.81	0.69	0.81	
France	0.88	53	0.71	0.68	0.74	0.78	0.60	0.79	0.77	0.64	0.80	
Georgia	0.89	54	0.72	0.63	0.76	0.78	0.65	0.81	0.80	0.67	0.79	
Hong Kong SAR	0.92	61	0.70	0.75	0.81	0.84	0.70	0.84	0.87	0.67	0.81	
Hungary	0.88	52	0.72	0.68	0.69	0.78	0.68	0.77	0.76	0.67	0.76	
Iran, Islamic Rep. of	0.89	53	0.68	0.65	0.77	0.80	0.73	0.80	0.78	0.56	0.76	
Ireland	0.88	52	0.70	0.70	0.74	0.78	0.63	0.80	0.76	0.59	0.77	
Israel	0.88	52	0.70	0.68	0.73	0.79	0.63	0.82	0.78	0.54	0.75	
Italy	0.88	52	0.75	0.67	0.69	0.76	0.66	0.80	0.80	0.55	0.74	
Japan	0.87	49	0.66	0.68	0.70	0.76	0.60	0.81	0.79	0.59	0.66	
Jordan	0.89	54	0.67	0.72	0.79	0.78	0.57	0.80	0.79	0.71	0.77	
Kazakhstan	0.90	56	0.72	0.65	0.79	0.82	0.73	0.77	0.83	0.66	0.77	
Korea, Rep. of	0.90	55	0.65	0.70	0.79	0.82	0.60	0.80	0.83	0.65	0.82	
Kuwait	0.89	53	0.70	0.69	0.79	0.78	0.62	0.80	0.79	0.60	0.76	
Lebanon	0.88	51	0.70	0.69	0.75	0.75	0.62	0.79	0.77	0.62	0.73	
Lithuania	0.88	51	0.74	0.65	0.73	0.79	0.67	0.72	0.77	0.56	0.78	
Malaysia	0.87	50	0.64	0.60	0.75	0.76	0.57	0.75	0.76	0.70	0.77	
Morocco	0.89	53	0.69	0.71	0.78	0.79	0.65	0.77	0.77	0.62	0.78	
New Zealand	0.90	57	0.75	0.72	0.77	0.79	0.65	0.82	0.80	0.67	0.80	
Norway (9)	0.90	57	0.73	0.73	0.79	0.80	0.68	0.82	0.81	0.63	0.76	
Oman	0.87	49	0.66	0.69	0.73	0.73	0.58	0.76	0.76	0.66	0.74	
Portugal	0.89	55	0.70	0.66	0.79	0.81	0.66	0.82	0.78	0.63	0.79	
Qatar	0.91	59	0.74	0.74	0.81	0.81	0.67	0.83	0.84	0.67	0.80	
Romania	0.90	56	0.74	0.71	0.74	0.79	0.69	0.78	0.80	0.69	0.79	
Russian Federation	0.90	56	0.72	0.70	0.78	0.82	0.70	0.79	0.81	0.61	0.77	
Saudi Arabia	0.87	50	0.70	0.66	0.68	0.75	0.60	0.81	0.79	0.61	0.75	
Singapore	0.86	49	0.67	0.64	0.73	0.76	0.60	0.79	0.78	0.58	0.73	
South Africa (9)	0.84	46	0.67	0.57	0.75	0.76	0.55	0.73	0.72	0.58	0.70	
Sweden	0.87	50	0.64	0.65	0.79	0.80	0.68	0.75	0.76	0.59	0.68	
Turkey	0.88	51	0.62	0.64	0.76	0.79	0.67	0.81	0.79	0.58	0.74	
United Arab Emirates	0.90	55	0.70	0.71	0.78	0.78	0.65	0.82	0.80	0.66	0.76	
United States	0.89	54	0.74	0.70	0.75	0.78	0.63	0.82	0.81	0.63	0.76	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Students Value Mathematics* Scale – Grade 8

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item									
			BSBM20A	BSBM20B	BSBM20C	BSBM20D	BSBM20E	BSBM20F	BSBM20G	BSBM20H	BSBM20I	
<b>Benchmarking Participants</b>												
Ontario, Canada	0.87	50	0.72	0.67	0.74	0.75	0.64	0.80	0.77	0.55	0.73	
Quebec, Canada	0.87	51	0.73	0.66	0.75	0.77	0.64	0.73	0.77	0.62	0.76	
Moscow City, Russian Fed.	0.90	55	0.73	0.64	0.80	0.83	0.74	0.78	0.81	0.55	0.75	
Gauteng, RSA (9)	0.83	46	0.66	0.60	0.74	0.78	0.58	0.75	0.74	0.52	0.68	
Western Cape, RSA (9)	0.85	48	0.67	0.63	0.74	0.77	0.60	0.77	0.74	0.53	0.73	
Abu Dhabi, UAE	0.89	54	0.68	0.71	0.77	0.78	0.63	0.80	0.79	0.66	0.76	
Dubai, UAE	0.88	53	0.69	0.65	0.77	0.75	0.66	0.81	0.79	0.64	0.73	

### Relationship Between the TIMSS 2019 Students Value Mathematics Scale and TIMSS 2019 Achievement – Grade 8

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
Australia	0.22	0.05	0.05
Bahrain	0.12	0.02	0.01
Chile	0.07	0.01	0.01
Chinese Taipei	0.36	0.13	0.12
Cyprus	0.25	0.06	0.06
Egypt	0.12	0.02	0.02
England	0.07	0.01	0.01
Finland	0.33	0.11	0.09
France	0.16	0.02	0.03
Georgia	0.14	0.02	0.02
Hong Kong SAR	0.23	0.05	0.05
Hungary	0.24	0.06	0.04
Iran, Islamic Rep. of	0.12	0.02	0.01
Ireland	0.20	0.04	0.04
Israel	0.09	0.01	0.01
Italy	0.16	0.02	0.02
Japan	0.25	0.06	0.05
Jordan	0.15	0.02	0.03
Kazakhstan	0.05	0.00	0.00
Korea, Rep. of	0.41	0.17	0.16
Kuwait	0.13	0.02	0.02
Lebanon	0.21	0.04	0.04
Lithuania	0.13	0.02	0.01
Malaysia	0.24	0.06	0.05
Morocco	0.21	0.04	0.03
New Zealand	0.13	0.02	0.01
Norway (9)	0.23	0.05	0.05
Oman	0.20	0.04	0.04
Portugal	0.30	0.09	0.07
Qatar	0.16	0.03	0.03
Romania	0.17	0.03	0.03
Russian Federation	0.15	0.02	0.02
Saudi Arabia	0.09	0.01	0.01
Singapore	0.14	0.02	0.02
South Africa (9)	0.17	0.03	0.03
Sweden	0.13	0.02	0.02
Turkey	0.23	0.05	0.05
United Arab Emirates	0.18	0.03	0.04
United States	0.13	0.02	0.02
<b>International Median</b>	<b>0.16</b>	<b>0.03</b>	<b>0.03</b>

**Relationship Between the TIMSS 2019 *Students Value Mathematics* Scale and TIMSS 2019 Achievement – Grade 8**

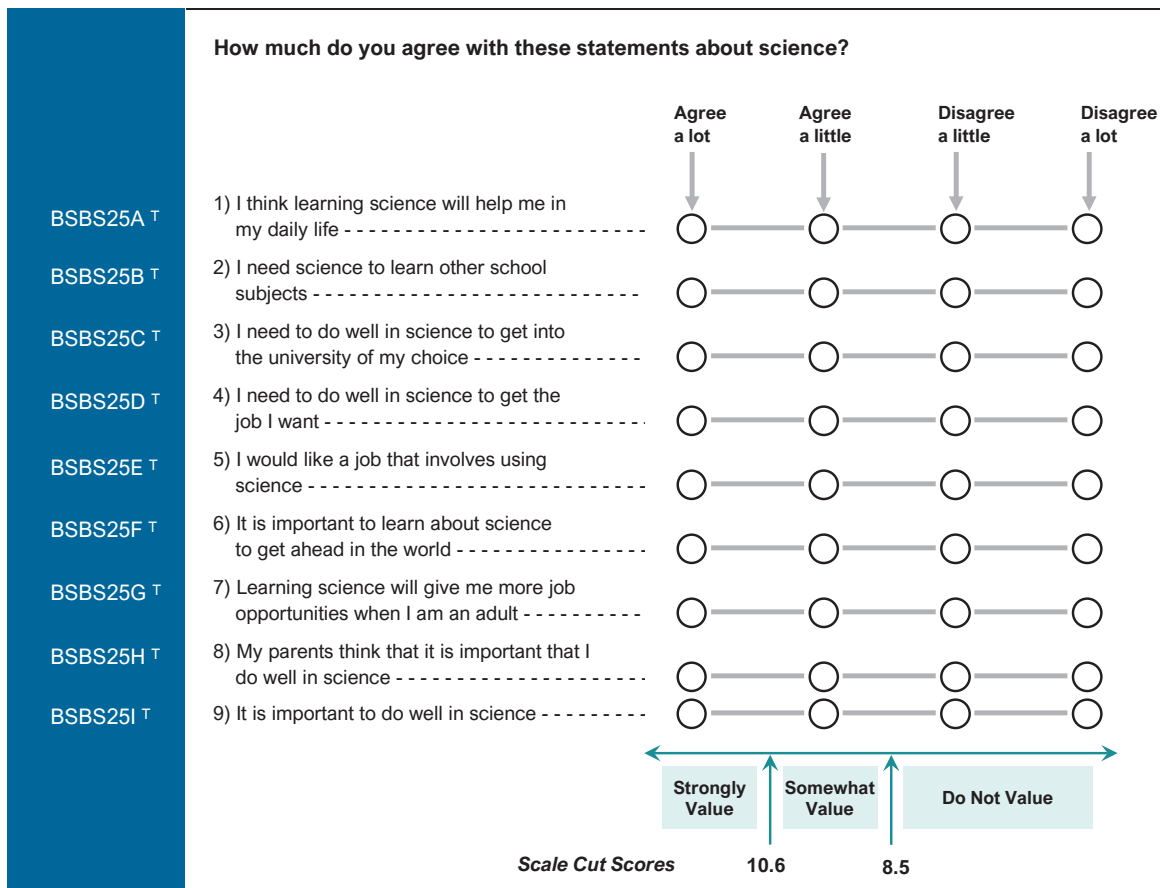
Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
<b>Benchmarking Participants</b>			
Ontario, Canada	0.22	0.05	0.05
Quebec, Canada	0.20	0.04	0.04
Moscow City, Russian Fed.	0.27	0.07	0.06
Gauteng, RSA (9)	0.06	0.00	0.00
Western Cape, RSA (9)	0.04	0.00	0.00
Abu Dhabi, UAE	0.21	0.05	0.05
Dubai, UAE	0.17	0.03	0.03



## Students Value Science – Grade 8

### About the Scale

The *Students Value Science* scale was created based on students' responses to nine items listed below.



<sup>T</sup> Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.

### Item Parameters for the TIMSS 2019 *Students Value Science* Scale – Grade 8

Item	delta	tau_1	tau_2	tau_3	Infit
BSBS25A	-0.54895	-1.70374	-0.44149	2.14523	1.15
BSBS25B	0.21327	-2.19431	-0.06708	2.26139	1.21
BSBS25C	-0.00218	-1.78502	-0.01869	1.80371	0.91
BSBS25D	0.28699	-1.77451	0.08479	1.68972	0.87
BSBS25E	1.01281	-1.78405	0.20415	1.57990	1.16
BSBS25F	0.03247	-1.87630	-0.18356	2.05986	0.95
BSBS25G	-0.09115	-1.79872	-0.19220	1.99092	0.92
BSBS25H	-0.29541	-1.89534	-0.18736	2.08270	1.29
BSBS25I	-0.60785	-1.66485	-0.36766	2.03251	1.02

### Scale Transformation Constants for the TIMSS 2019 *Students Value Science* Scale – Grade 8

#### Scale Transformation Constants

A = 8.556049

B = 0.883354

Transformed Scale Score = 8.556049 + 0.883354 • Logit Scale Score

**Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019  
Students Value Science Scale – Grade 8**

Raw Score	Transformed Scale Score	Cutpoint
0	4.28340	
1	5.31763	
2	5.83503	
3	6.20452	
4	6.50215	
5	6.75863	
6	6.99286	
7	7.21075	
8	7.41821	
9	7.61946	
10	7.81751	
11	8.01452	
12	8.21205	
13	8.41123	8.5
14	8.61280	
15	8.81725	
16	9.02481	
17	9.23574	
18	9.45051	
19	9.66950	
20	9.89532	
21	10.13091	
22	10.38161	
23	10.65629	10.6
24	10.97071	
25	11.35416	
26	11.88785	
27	12.93670	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 Students Value Science Scale – Grade 8

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item									
			BSBS25A	BSBS25B	BSBS25C	BSBS25D	BSBS25E	BSBS25F	BSBS25G	BSBS25H	BSBS25I	
Australia	0.94	67	0.82	0.79	0.87	0.86	0.81	0.84	0.84	0.70	0.81	
Bahrain	0.92	60	0.74	0.73	0.83	0.83	0.76	0.80	0.82	0.70	0.76	
Chile	0.92	62	0.76	0.75	0.85	0.85	0.79	0.82	0.85	0.69	0.72	
Chinese Taipei	0.93	65	0.72	0.76	0.85	0.87	0.81	0.83	0.87	0.72	0.81	
Cyprus	0.92	63	0.76	0.75	0.85	0.85	0.75	0.82	0.81	0.72	0.81	
Egypt	0.90	54	0.64	0.72	0.80	0.79	0.73	0.76	0.75	0.70	0.74	
England	0.93	63	0.79	0.77	0.83	0.82	0.76	0.83	0.84	0.71	0.80	
Finland	0.94	66	0.77	0.78	0.86	0.86	0.77	0.86	0.83	0.76	0.84	
France	0.92	62	0.76	0.75	0.81	0.84	0.74	0.80	0.82	0.73	0.82	
Georgia	0.91	58	0.68	0.69	0.78	0.81	0.73	0.81	0.82	0.75	0.79	
Hong Kong SAR	0.94	69	0.71	0.80	0.88	0.89	0.83	0.87	0.89	0.74	0.83	
Hungary	0.92	61	0.70	0.73	0.81	0.84	0.76	0.80	0.80	0.73	0.81	
Iran, Islamic Rep. of	0.92	60	0.72	0.71	0.84	0.84	0.81	0.83	0.83	0.64	0.75	
Ireland	0.93	63	0.78	0.75	0.84	0.84	0.78	0.82	0.83	0.69	0.81	
Israel	0.94	66	0.81	0.83	0.85	0.86	0.80	0.88	0.84	0.64	0.78	
Italy	0.91	58	0.76	0.69	0.79	0.81	0.78	0.82	0.82	0.62	0.74	
Japan	0.90	56	0.70	0.74	0.79	0.82	0.66	0.84	0.82	0.65	0.65	
Jordan	0.92	61	0.71	0.78	0.82	0.82	0.73	0.83	0.81	0.73	0.77	
Kazakhstan	0.92	62	0.67	0.71	0.84	0.86	0.80	0.81	0.86	0.77	0.77	
Korea, Rep. of	0.92	62	0.74	0.77	0.85	0.85	0.70	0.79	0.86	0.68	0.84	
Kuwait	0.91	59	0.72	0.72	0.84	0.83	0.76	0.81	0.82	0.66	0.73	
Lebanon	0.92	60	0.73	0.72	0.82	0.82	0.75	0.81	0.82	0.71	0.80	
Lithuania	0.90	57	0.72	0.71	0.81	0.84	0.74	0.73	0.78	0.68	0.80	
Malaysia	0.91	57	0.70	0.68	0.81	0.82	0.72	0.73	0.80	0.75	0.77	
Morocco	0.92	60	0.70	0.76	0.81	0.82	0.76	0.81	0.80	0.72	0.76	
New Zealand	0.93	65	0.81	0.80	0.83	0.84	0.77	0.83	0.83	0.73	0.82	
Norway (9)	0.93	64	0.79	0.79	0.85	0.85	0.79	0.82	0.84	0.68	0.79	
Oman	0.89	54	0.69	0.72	0.80	0.78	0.68	0.77	0.78	0.69	0.71	
Portugal	0.92	62	0.72	0.69	0.83	0.85	0.79	0.85	0.84	0.71	0.80	
Qatar	0.94	67	0.77	0.77	0.87	0.86	0.79	0.86	0.86	0.75	0.82	
Romania	0.93	65	0.73	0.76	0.83	0.84	0.79	0.82	0.84	0.79	0.84	
Russian Federation	0.92	60	0.71	0.70	0.83	0.84	0.78	0.80	0.82	0.68	0.78	
Saudi Arabia	0.92	61	0.75	0.76	0.83	0.83	0.76	0.83	0.83	0.69	0.75	
Singapore	0.91	60	0.74	0.63	0.83	0.83	0.76	0.82	0.84	0.68	0.79	
South Africa (9)	0.91	58	0.73	0.71	0.83	0.83	0.77	0.76	0.80	0.68	0.76	
Sweden	0.92	59	0.70	0.72	0.85	0.85	0.81	0.79	0.79	0.68	0.72	
Turkey	0.90	56	0.64	0.68	0.81	0.83	0.77	0.81	0.81	0.65	0.71	
United Arab Emirates	0.92	61	0.74	0.73	0.83	0.83	0.77	0.82	0.82	0.72	0.77	
United States	0.92	62	0.77	0.74	0.83	0.83	0.76	0.84	0.84	0.69	0.76	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Students Value Science* Scale – Grade 8

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item									
			BSBS25A	BSBS25B	BSBS25C	BSBS25D	BSBS25E	BSBS25F	BSBS25G	BSBS25H	BSBS25I	
<b>Benchmarking Participants</b>												
Ontario, Canada	0.92	61	0.78	0.72	0.84	0.83	0.78	0.82	0.81	0.69	0.76	
Quebec, Canada	0.92	61	0.79	0.74	0.85	0.83	0.74	0.76	0.83	0.70	0.79	
Moscow City, Russian Fed.	0.92	60	0.71	0.70	0.84	0.85	0.81	0.81	0.81	0.66	0.78	
Gauteng, RSA (9)	0.93	63	0.76	0.74	0.86	0.86	0.81	0.77	0.83	0.72	0.78	
Western Cape, RSA (9)	0.92	62	0.73	0.73	0.85	0.85	0.80	0.79	0.81	0.71	0.78	
Abu Dhabi, UAE	0.92	61	0.73	0.74	0.83	0.82	0.76	0.82	0.81	0.73	0.78	
Dubai, UAE	0.91	60	0.74	0.72	0.84	0.84	0.80	0.81	0.82	0.67	0.73	

### Relationship Between the TIMSS 2019 Students Value Science Scale and TIMSS 2019 Achievement – Grade 8

Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
Australia	0.28	0.08	0.07
Bahrain	0.22	0.05	0.04
Chile	0.05	0.00	0.00
Chinese Taipei	0.30	0.09	0.07
Cyprus	0.28	0.08	0.06
Egypt	0.23	0.05	0.06
England	0.20	0.04	0.04
Finland	0.33	0.11	0.09
France	0.24	0.06	0.06
Georgia	0.11	0.01	0.01
Hong Kong SAR	0.18	0.03	0.03
Hungary	0.15	0.02	0.02
Iran, Islamic Rep. of	0.15	0.02	0.02
Ireland	0.30	0.09	0.07
Israel	0.15	0.02	0.02
Italy	0.15	0.02	0.02
Japan	0.28	0.08	0.06
Jordan	0.17	0.03	0.03
Kazakhstan	0.07	0.00	0.00
Korea, Rep. of	0.40	0.16	0.15
Kuwait	0.15	0.02	0.02
Lebanon	0.25	0.06	0.05
Lithuania	0.12	0.02	0.01
Malaysia	0.36	0.13	0.12
Morocco	0.15	0.02	0.02
New Zealand	0.18	0.03	0.03
Norway (9)	0.16	0.03	0.02
Oman	0.26	0.07	0.06
Portugal	0.23	0.05	0.04
Qatar	0.20	0.04	0.04
Romania	0.12	0.01	0.01
Russian Federation	0.02	0.00	0.00
Saudi Arabia	0.11	0.01	0.01
Singapore	0.27	0.07	0.07
South Africa (9)	0.05	0.00	0.02
Sweden	0.14	0.02	0.02
Turkey	0.13	0.02	0.02
United Arab Emirates	0.25	0.06	0.06
United States	0.13	0.02	0.02
<b>International Median</b>	<b>0.18</b>	<b>0.03</b>	<b>0.03</b>

**Relationship Between the TIMSS 2019 Students Value Science Scale and TIMSS 2019 Achievement – Grade 8**

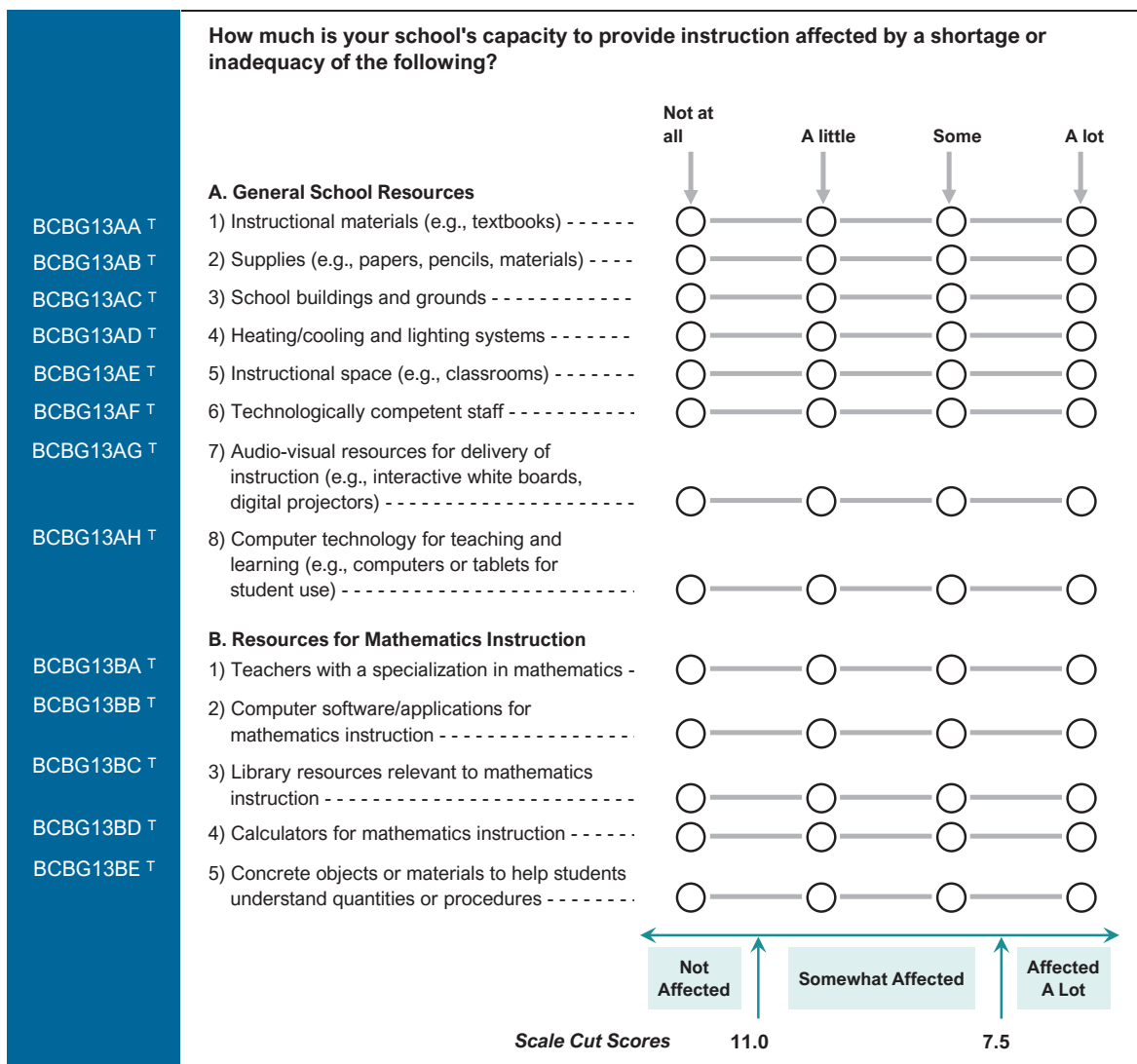
Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
<b>Benchmarking Participants</b>			
Ontario, Canada	0.21	0.04	0.04
Quebec, Canada	0.28	0.08	0.07
Moscow City, Russian Fed.	0.02	0.00	0.00
Gauteng, RSA (9)	-0.06	0.00	0.02
Western Cape, RSA (9)	-0.01	0.00	0.01
Abu Dhabi, UAE	0.29	0.09	0.08
Dubai, UAE	0.19	0.04	0.04

### Scales Based on Principals' Reports

## Instruction Affected by Mathematics Resource Shortages – Grade 8

### About the Scale

The *Instruction Affected by Mathematics Resource Shortages* scale was created based on principals' responses to thirteen items listed below.



<sup>T</sup> Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.



**Item Parameters for the TIMSS 2019 *Instruction Affected by Mathematics*  
Resource Shortages Scale – Grade 8**

Item	delta	tau_1	tau_2	tau_3	Infit
BCBG13AA	-0.08523	-0.29202	0.01436	0.27766	0.91
BCBG13AB	-0.31466	-0.30062	0.24458	0.05604	0.91
BCBG13AC	0.24178	-0.75472	0.05376	0.70096	1.06
BCBG13AD	-0.07941	-0.62905	0.03772	0.59133	1.08
BCBG13AE	0.29495	-0.47671	-0.14092	0.61763	0.99
BCBG13AF	0.08339	-1.41713	-0.02038	1.43751	0.98
BCBG13AG	0.05752	-1.15114	0.03387	1.11727	0.92
BCBG13AH	0.22037	-1.21651	0.06667	1.14984	1.06
BCBG13BA	0.12749	0.03139	-0.10299	0.07160	1.10
BCBG13BB	0.00156	-1.56949	0.12923	1.44026	1.01
BCBG13BC	-0.14676	-1.50055	0.10438	1.39617	1.17
BCBG13BD	-0.38067	-0.76280	0.07944	0.68336	1.15
BCBG13BE	-0.02033	-1.41394	-0.03525	1.44919	0.90

**Scale Transformation Constants for the TIMSS 2019 *Instruction Affected by Mathematics*  
Resource Shortages Scale – Grade 8**

**Scale Transformation Constants**

A = 9.262831

B = 1.171716

Transformed Scale Score = 9.262831 + 1.171716 • Logit Scale Score

**Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS  
2019 Instruction Affected by Mathematics Resource Shortages Scale – Grade 8**

Raw Score	Transformed Scale Score	Cutpoint
0	4.23486	
1	5.57102	
2	6.21558	
3	6.65270	
4	6.98745	
5	7.26025	
6	7.49129	7.5
7	7.69254	
8	7.87145	
9	8.03304	
10	8.18097	
11	8.31802	
12	8.44578	
13	8.56742	
14	8.68343	
15	8.79492	
16	8.90286	
17	9.00816	
18	9.11164	
19	9.21409	
20	9.31621	
21	9.41874	
22	9.52239	
23	9.62794	
24	9.73618	
25	9.84801	
26	9.96435	
27	10.08629	
28	10.21426	
29	10.35137	
30	10.49907	
31	10.66003	
32	10.83775	
33	11.03708	11.0
34	11.26511	
35	11.53380	
36	11.86315	
37	12.29366	
38	12.92960	
39	14.25596	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Instruction Affected by Mathematics Resource Shortages* Scale – Grade 8

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	0.94	58	0.84	0.85	0.70	0.71	0.71	0.75	0.77	0.81	0.69	0.74	0.74	0.81	0.75
Bahrain	0.97	73	0.92	0.89	0.89	0.87	0.91	0.80	0.93	0.76	0.87	0.80	0.74	0.78	0.90
Chile	0.92	53	0.69	0.72	0.71	0.55	0.76	0.79	0.79	0.81	0.66	0.73	0.73	0.72	0.76
Chinese Taipei	0.90	46	0.55	0.62	0.71	0.70	0.71	0.76	0.79	0.79	0.50	0.67	0.67	0.55	0.68
Cyprus	0.92	53	0.84	0.77	0.70	0.79	0.71	0.79	0.72	0.64	0.76	0.69	0.75	0.63	0.68
Egypt	0.89	43	0.66	0.69	0.70	0.55	0.69	0.74	0.55	0.69	0.63	0.66	0.61	0.68	0.70
England	0.91	48	0.72	0.62	0.72	0.63	0.70	0.66	0.78	0.69	0.66	0.69	0.70	0.66	0.74
Finland	0.90	46	0.75	0.64	0.61	0.63	0.72	0.69	0.71	0.69	0.62	0.74	0.46	0.68	0.78
France	0.86	40	0.68	0.56	0.61	0.56	0.68	0.58	0.77	0.68	0.49	0.74	0.74	0.45	0.62
Georgia	0.89	45	0.67	0.62	0.58	0.62	0.67	0.67	0.80	0.78	0.69	0.77	0.74	0.18	0.71
Hong Kong SAR	0.96	70	0.86	0.88	0.78	0.91	0.76	0.78	0.82	0.83	0.84	0.83	0.84	0.86	0.85
Hungary	0.89	44	0.68	0.57	0.65	0.68	0.73	0.55	0.72	0.73	0.56	0.66	0.67	0.59	0.75
Iran, Islamic Rep. of	0.89	44	0.68	0.75	0.67	0.79	0.77	0.74	0.72	0.50	0.69	0.65	0.46	0.53	0.58
Ireland	0.85	40	0.48	0.47	0.73	0.61	0.65	0.72	0.76	0.68	0.54	0.64	0.42	0.66	0.77
Israel	0.90	46	0.71	0.72	0.58	0.71	0.66	0.68	0.70	0.60	0.71	0.69	0.61	0.74	0.73
Italy	0.85	37	0.46	0.48	0.59	0.47	0.59	0.61	0.66	0.73	0.60	0.66	0.57	0.63	0.72
Japan	0.90	48	0.69	0.73	0.69	0.59	0.81	0.71	0.73	0.73	0.71	0.62	0.71	0.39	0.78
Jordan	0.88	43	0.76	0.80	0.77	0.54	0.79	0.68	0.51	0.71	0.76	0.59	0.41	0.46	0.60
Kazakhstan	0.93	55	0.78	0.68	0.67	0.76	0.75	0.80	0.81	0.80	0.78	0.77	0.76	0.55	0.73
Korea, Rep. of	0.95	64	0.81	0.83	0.79	0.87	0.85	0.74	0.81	0.81	0.84	0.77	0.77	0.72	0.75
Kuwait	0.95	61	0.86	0.83	0.71	0.80	0.83	0.74	0.82	0.78	0.80	0.73	0.61	0.75	0.86
Lebanon	0.94	59	0.84	0.85	0.85	0.70	0.87	0.82	0.81	0.39	0.78	0.72	0.65	0.84	0.73
Lithuania	0.88	43	0.74	0.62	0.49	0.54	0.53	0.58	0.73	0.73	0.52	0.68	0.75	0.71	0.77
Malaysia	0.91	47	0.74	0.77	0.72	0.63	0.71	0.72	0.59	0.49	0.74	0.67	0.66	0.76	0.67
Morocco	0.79	32	0.20	0.24	-0.06	0.42	-0.12	0.74	0.73	0.76	-0.11	0.80	0.79	0.67	0.70
New Zealand	0.95	64	0.85	0.84	0.76	0.80	0.70	0.76	0.86	0.75	0.74	0.88	0.83	0.80	0.84
Norway (9)	0.82	33	0.59	0.41	0.65	0.66	0.76	0.73	0.71	0.51	0.31	0.62	0.55	0.36	0.38
Oman	0.95	61	0.79	0.79	0.83	0.81	0.80	0.84	0.79	0.81	0.83	0.78	0.72	0.58	0.74
Portugal	0.90	47	0.58	0.63	0.72	0.63	0.77	0.71	0.79	0.67	0.60	0.69	0.70	0.70	0.66
Qatar	0.98	85	0.95	0.92	0.91	0.95	0.95	0.95	0.94	0.95	0.93	0.85	0.91	0.89	0.91
Romania	0.89	45	0.79	0.79	0.73	0.74	0.70	0.70	0.57	0.60	0.66	0.50	0.67	0.50	0.69
Russian Federation	0.91	49	0.76	0.66	0.59	0.72	0.61	0.73	0.77	0.71	0.66	0.74	0.75	0.63	0.77
Saudi Arabia	0.92	51	0.72	0.80	0.59	0.80	0.78	0.77	0.78	0.74	0.69	0.66	0.45	0.72	0.69
Singapore	0.98	82	0.95	0.94	0.91	0.87	0.91	0.86	0.93	0.94	0.93	0.89	0.82	0.91	0.90
South Africa (9)	0.84	35	0.58	0.41	0.67	0.64	0.52	0.69	0.69	0.57	0.32	0.63	0.53	0.65	0.65
Sweden	0.86	40	0.78	0.74	0.61	0.60	0.61	0.66	0.71	0.74	0.56	0.63	0.27	0.52	0.63
Turkey	0.93	53	0.84	0.82	0.73	0.80	0.80	0.57	0.77	0.67	0.73	0.73	0.64	0.55	0.76
United Arab Emirates	0.97	76	0.88	0.87	0.89	0.92	0.90	0.91	0.91	0.89	0.87	0.82	0.78	0.81	0.85
United States	0.94	58	0.79	0.82	0.68	0.71	0.67	0.76	0.82	0.78	0.74	0.82	0.72	0.76	0.83

**Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Instruction Affected by Mathematics Resource Shortages* Scale – Grade 8**

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
<b>Benchmarking Participants</b>															
Ontario, Canada	0.90	46	0.75	0.72	0.64	0.63	0.63	0.65	0.79	0.76	0.51	0.69	0.69	0.63	0.71
Quebec, Canada	0.93	54	0.80	0.81	0.74	0.62	0.78	0.71	0.79	0.61	0.77	0.69	0.75	0.74	0.74
Moscow City, Russian Fed.	0.95	66	0.82	0.78	0.77	0.81	0.82	0.84	0.84	0.83	0.82	0.85	0.90	0.59	0.85
Gauteng, RSA (9)	0.87	39	0.73	0.71	0.77	0.50	0.75	0.73	0.58	0.27	0.62	0.44	0.33	0.74	0.66
Western Cape, RSA (9)	0.90	45	0.74	0.66	0.70	0.69	0.60	0.73	0.78	0.67	0.67	0.68	0.46	0.67	0.61
Abu Dhabi, UAE	0.98	78	0.89	0.86	0.92	0.92	0.92	0.93	0.93	0.87	0.92	0.85	0.74	0.87	0.84
Dubai, UAE	0.98	80	0.90	0.93	0.85	0.94	0.88	0.90	0.92	0.92	0.91	0.85	0.86	0.84	0.90

**Relationship Between the TIMSS 2019 *Instruction Affected by Mathematics Resource Shortages* Scale and TIMSS 2019 Achievement – Grade 8**

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
Australia	0.28	0.08	0.05
Bahrain	0.05	0.00	0.01
Chile	0.24	0.06	0.06
Chinese Taipei	0.06	0.00	0.00
Cyprus	0.00	0.00	0.01
Egypt	0.08	0.01	0.02
England	0.11	0.01	0.01
Finland	0.04	0.00	0.00
France	0.10	0.01	0.02
Georgia	0.14	0.02	0.01
Hong Kong SAR	0.09	0.01	0.04
Hungary	-0.02	0.00	0.00
Iran, Islamic Rep. of	0.09	0.01	0.03
Ireland	0.14	0.02	0.01
Israel	0.14	0.02	0.01
Italy	0.07	0.01	0.00
Japan	0.08	0.01	0.01
Jordan	-0.12	0.01	0.02
Kazakhstan	0.05	0.00	0.00
Korea, Rep. of	0.03	0.00	0.00
Kuwait	0.03	0.00	0.02
Lebanon	0.20	0.04	0.08
Lithuania	-0.02	0.00	0.00
Malaysia	-0.09	0.01	0.03
Morocco	-0.06	0.00	0.04
New Zealand	0.20	0.04	0.02
Norway (9)	0.02	0.00	0.00
Oman	0.10	0.01	0.02
Portugal	0.11	0.01	0.01
Qatar	0.28	0.08	0.10
Romania	0.18	0.03	0.03
Russian Federation	0.12	0.01	0.01
Saudi Arabia	-0.04	0.00	0.01
Singapore	0.05	0.00	0.00
South Africa (9)	0.21	0.04	0.09
Sweden	0.03	0.00	0.01
Turkey	0.17	0.03	0.03
United Arab Emirates	0.21	0.04	0.05
United States	0.11	0.01	0.02
<b>International Median</b>	<b>0.09</b>	<b>0.01</b>	<b>0.01</b>

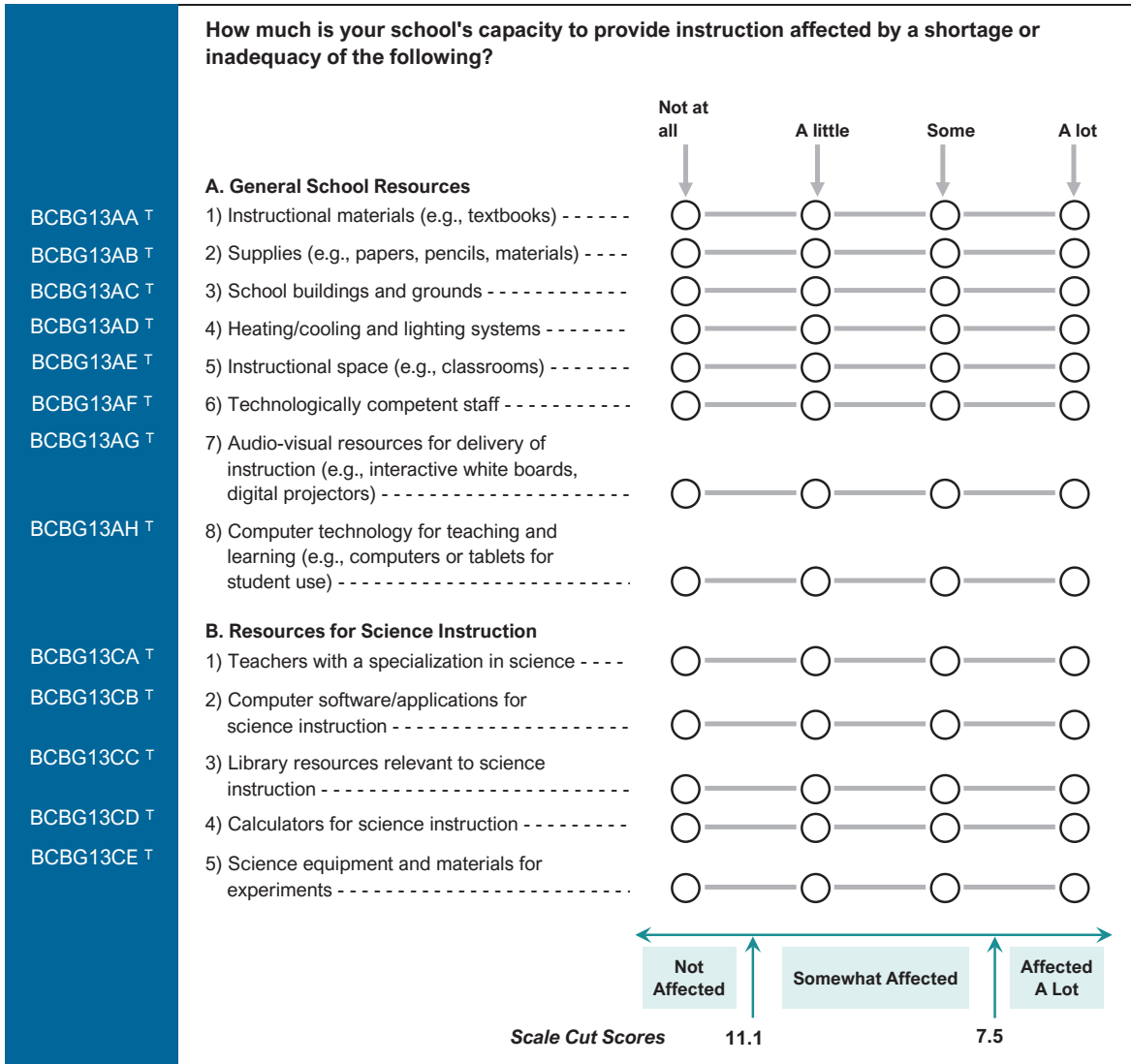
**Relationship Between the TIMSS 2019 *Instruction Affected by Mathematics Resource Shortages* Scale and TIMSS 2019 Achievement – Grade 8**

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
<b>Benchmarking Participants</b>			
Ontario, Canada	0.12	0.01	0.02
Quebec, Canada	0.01	0.00	0.00
Moscow City, Russian Fed.	-0.02	0.00	0.00
Gauteng, RSA (9)	0.30	0.09	0.13
Western Cape, RSA (9)	0.47	0.22	0.21
Abu Dhabi, UAE	0.19	0.04	0.04
Dubai, UAE	0.19	0.04	0.05

# Instruction Affected by Science Resource Shortages – Grade 8

## About the Scale

The *Instruction Affected by Science Resource Shortages* scale was created based on students' responses to thirteen items listed below.



<sup>T</sup> Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.

**Item Parameters for the TIMSS 2019 *Instruction Affected by Science Resource Shortages* Scale – Grade 8**

Item	delta	tau_1	tau_2	tau_3	Infit
BCBG13AA	-0.11528	-0.33350	0.01422	0.31928	0.92
BCBG13AB	-0.35173	-0.34117	0.24349	0.09768	0.92
BCBG13AC	0.22227	-0.79974	0.05530	0.74444	1.07
BCBG13AD	-0.10888	-0.67368	0.03847	0.63521	1.12
BCBG13AE	0.27674	-0.51943	-0.13970	0.65913	1.00
BCBG13AF	0.05952	-1.47321	-0.01797	1.49118	1.01
BCBG13AG	0.03294	-1.20191	0.03559	1.16632	0.95
BCBG13AH	0.20110	-1.26755	0.06834	1.19921	1.09
BCBG13CA	0.07561	0.07128	-0.07062	-0.00066	1.08
BCBG13CB	0.04668	-1.47047	0.01664	1.45383	0.97
BCBG13CC	-0.14890	-1.46091	0.00973	1.45118	1.05
BCBG13CD	-0.50898	-0.84828	0.02025	0.82803	1.27
BCBG13CE	0.31891	-0.97265	-0.04312	1.01577	0.90

**Scale Transformation Constants for the TIMSS 2019 *Instruction Affected by Science Resource Shortages* Scale – Grade 8**

**Scale Transformation Constants**

A = 9.315269

B = 1.229797

Transformed Scale Score = 9.315269 + 1.229797 • Logit Scale Score



**Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS  
2019 Instruction Affected by Science Resource Shortages Scale – Grade 8**

Raw Score	Transformed Scale Score	Cutpoint
0	4.07624	
1	5.47004	
2	6.13851	
3	6.59064	
4	6.93605	
5	7.21741	
6	7.45575	7.5
7	7.66379	
8	7.84903	
9	8.01669	
10	8.17049	
11	8.31328	
12	8.44672	
13	8.57396	
14	8.69549	
15	8.81243	
16	8.92582	
17	9.03657	
18	9.14554	
19	9.25352	
20	9.36128	
21	9.46956	
22	9.57915	
23	9.69082	
24	9.80545	
25	9.92393	
26	10.04727	
27	10.17656	
28	10.31231	
29	10.45776	
30	10.61443	
31	10.78505	
32	10.97329	
33	11.18424	11.1
34	11.42529	
35	11.70901	
36	12.05633	
37	12.50978	
38	13.17876	
39	14.57239	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Instruction Affected by Science Resource Shortages* Scale – Grade 8

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	0.94	59	0.85	0.83	0.70	0.71	0.73	0.74	0.76	0.79	0.74	0.78	0.76	0.76	0.79
Bahrain	0.97	73	0.92	0.89	0.89	0.88	0.92	0.79	0.93	0.75	0.88	0.88	0.80	0.65	0.88
Chile	0.93	54	0.69	0.71	0.73	0.58	0.79	0.78	0.78	0.79	0.70	0.75	0.78	0.73	0.73
Chinese Taipei	0.90	48	0.57	0.65	0.71	0.71	0.70	0.76	0.78	0.78	0.57	0.72	0.72	0.52	0.76
Cyprus	0.93	54	0.83	0.76	0.74	0.80	0.74	0.78	0.71	0.61	0.75	0.72	0.70	0.63	0.76
Egypt	0.89	44	0.65	0.67	0.72	0.56	0.70	0.72	0.54	0.71	0.68	0.70	0.63	0.59	0.76
England	0.91	50	0.72	0.61	0.74	0.62	0.70	0.63	0.80	0.72	0.63	0.76	0.79	0.69	0.78
Finland	0.90	45	0.73	0.62	0.64	0.66	0.73	0.69	0.73	0.69	0.54	0.73	0.54	0.67	0.76
France	0.87	40	0.67	0.56	0.63	0.60	0.69	0.58	0.76	0.68	0.48	0.70	0.69	0.48	0.69
Georgia	0.91	48	0.64	0.57	0.57	0.59	0.67	0.70	0.78	0.80	0.71	0.82	0.77	0.47	0.76
Hong Kong SAR	0.97	71	0.86	0.88	0.79	0.90	0.77	0.79	0.82	0.84	0.88	0.85	0.81	0.88	0.87
Hungary	0.89	43	0.69	0.62	0.68	0.66	0.75	0.52	0.70	0.72	0.54	0.70	0.63	0.58	0.71
Iran, Islamic Rep. of	0.89	44	0.70	0.76	0.67	0.78	0.79	0.73	0.69	0.48	0.69	0.67	0.57	0.31	0.65
Ireland	0.88	42	0.49	0.50	0.73	0.62	0.66	0.70	0.74	0.65	0.55	0.69	0.58	0.67	0.79
Israel	0.89	43	0.71	0.74	0.61	0.70	0.70	0.66	0.67	0.56	0.59	0.66	0.58	0.66	0.71
Italy	0.84	35	0.42	0.49	0.62	0.46	0.61	0.60	0.65	0.72	0.57	0.70	0.64	0.51	0.62
Japan	0.91	49	0.71	0.73	0.68	0.61	0.79	0.70	0.70	0.73	0.72	0.71	0.73	0.50	0.70
Jordan	0.90	46	0.74	0.77	0.79	0.52	0.78	0.65	0.53	0.74	0.73	0.65	0.55	0.48	0.79
Kazakhstan	0.94	58	0.76	0.67	0.69	0.76	0.74	0.80	0.82	0.79	0.83	0.80	0.80	0.60	0.80
Korea, Rep. of	0.96	66	0.82	0.84	0.79	0.87	0.86	0.74	0.81	0.80	0.83	0.79	0.80	0.68	0.86
Kuwait	0.95	62	0.86	0.84	0.72	0.81	0.84	0.73	0.81	0.78	0.87	0.72	0.74	0.60	0.87
Lebanon	0.94	61	0.85	0.85	0.84	0.67	0.86	0.82	0.82	0.36	0.84	0.79	0.75	0.77	0.76
Lithuania	0.88	42	0.70	0.59	0.52	0.55	0.54	0.64	0.76	0.75	0.62	0.69	0.78	0.58	0.63
Malaysia	0.91	48	0.76	0.77	0.73	0.61	0.72	0.71	0.56	0.50	0.78	0.71	0.72	0.64	0.74
Morocco	0.82	33	0.38	0.35	0.13	0.51	0.08	0.73	0.72	0.70	0.06	0.77	0.81	0.70	0.67
New Zealand	0.96	66	0.85	0.83	0.75	0.81	0.70	0.77	0.86	0.75	0.80	0.87	0.85	0.84	0.87
Norway (9)	0.84	36	0.63	0.43	0.63	0.62	0.74	0.73	0.71	0.52	0.28	0.66	0.58	0.40	0.63
Oman	0.95	63	0.79	0.80	0.81	0.81	0.82	0.82	0.80	0.82	0.85	0.81	0.79	0.55	0.84
Portugal	0.91	47	0.58	0.63	0.74	0.67	0.80	0.71	0.78	0.67	0.62	0.65	0.69	0.66	0.71
Qatar	0.99	86	0.95	0.93	0.91	0.94	0.95	0.95	0.94	0.95	0.93	0.86	0.91	0.89	0.91
Romania	0.90	45	0.77	0.75	0.73	0.72	0.69	0.69	0.61	0.63	0.62	0.62	0.65	0.62	0.59
Russian Federation	0.91	50	0.77	0.66	0.60	0.71	0.61	0.73	0.77	0.72	0.68	0.77	0.80	0.60	0.75
Saudi Arabia	0.92	53	0.74	0.80	0.57	0.80	0.78	0.77	0.77	0.75	0.75	0.70	0.54	0.64	0.75
Singapore	0.99	85	0.95	0.95	0.91	0.87	0.91	0.86	0.94	0.94	0.94	0.94	0.87	0.95	0.96
South Africa (9)	0.85	36	0.55	0.38	0.65	0.62	0.49	0.69	0.70	0.59	0.41	0.66	0.60	0.67	0.69
Sweden	0.87	40	0.77	0.74	0.60	0.57	0.59	0.63	0.72	0.72	0.58	0.64	0.40	0.51	0.67
Turkey	0.93	54	0.84	0.81	0.73	0.81	0.81	0.57	0.78	0.66	0.77	0.72	0.63	0.54	0.79
United Arab Emirates	0.97	76	0.88	0.87	0.89	0.92	0.90	0.91	0.91	0.90	0.87	0.85	0.81	0.76	0.88
United States	0.94	57	0.78	0.82	0.68	0.70	0.68	0.76	0.81	0.77	0.72	0.78	0.74	0.73	0.79

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Instruction Affected by Science Resource Shortages* Scale – Grade 8

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
<b>Benchmarking Participants</b>															
Ontario, Canada	0.88	43	0.73	0.70	0.61	0.59	0.61	0.69	0.74	0.77	0.48	0.68	0.73	0.53	0.57
Quebec, Canada	0.93	56	0.80	0.83	0.76	0.61	0.81	0.70	0.80	0.61	0.84	0.62	0.72	0.71	0.85
Moscow City, Russian Fed.	0.95	66	0.82	0.78	0.77	0.80	0.82	0.84	0.85	0.84	0.83	0.84	0.87	0.67	0.84
Gauteng, RSA (9)	0.87	39	0.69	0.67	0.74	0.53	0.74	0.74	0.59	0.31	0.66	0.50	0.45	0.65	0.72
Western Cape, RSA (9)	0.89	43	0.76	0.68	0.71	0.68	0.62	0.71	0.77	0.65	0.68	0.56	0.42	0.59	0.64
Abu Dhabi, UAE	0.98	80	0.89	0.85	0.92	0.93	0.92	0.93	0.93	0.87	0.92	0.86	0.81	0.83	0.94
Dubai, UAE	0.98	79	0.89	0.92	0.85	0.94	0.88	0.90	0.92	0.93	0.92	0.87	0.87	0.80	0.86

**Relationship Between the TIMSS 2019 *Instruction Affected by Science Resource Shortages* Scale and TIMSS 2019 Achievement – Grade 8**

Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
Australia	0.25	0.06	0.03
Bahrain	-0.01	0.00	0.03
Chile	0.21	0.04	0.06
Chinese Taipei	0.06	0.00	0.00
Cyprus	0.01	0.00	0.01
Egypt	0.09	0.01	0.01
England	0.13	0.02	0.01
Finland	0.05	0.00	0.00
France	0.09	0.01	0.02
Georgia	0.06	0.00	0.00
Hong Kong SAR	0.09	0.01	0.03
Hungary	-0.02	0.00	0.00
Iran, Islamic Rep. of	0.11	0.01	0.04
Ireland	0.12	0.01	0.01
Israel	0.12	0.02	0.01
Italy	0.03	0.00	0.00
Japan	0.08	0.01	0.01
Jordan	-0.12	0.01	0.01
Kazakhstan	0.07	0.00	0.01
Korea, Rep. of	0.02	0.00	0.00
Kuwait	-0.01	0.00	0.02
Lebanon	0.17	0.03	0.10
Lithuania	-0.02	0.00	0.00
Malaysia	-0.08	0.01	0.01
Morocco	-0.03	0.00	0.03
New Zealand	0.21	0.04	0.03
Norway (9)	0.01	0.00	0.00
Oman	0.05	0.00	0.01
Portugal	0.10	0.01	0.01
Qatar	0.20	0.04	0.05
Romania	0.16	0.03	0.02
Russian Federation	0.08	0.01	0.02
Saudi Arabia	-0.05	0.00	0.01
Singapore	0.04	0.00	0.00
South Africa (9)	0.21	0.05	0.09
Sweden	0.04	0.00	0.00
Turkey	0.18	0.03	0.02
United Arab Emirates	0.20	0.04	0.05
United States	0.12	0.01	0.02
<b>International Median</b>	<b>0.08</b>	<b>0.01</b>	<b>0.01</b>

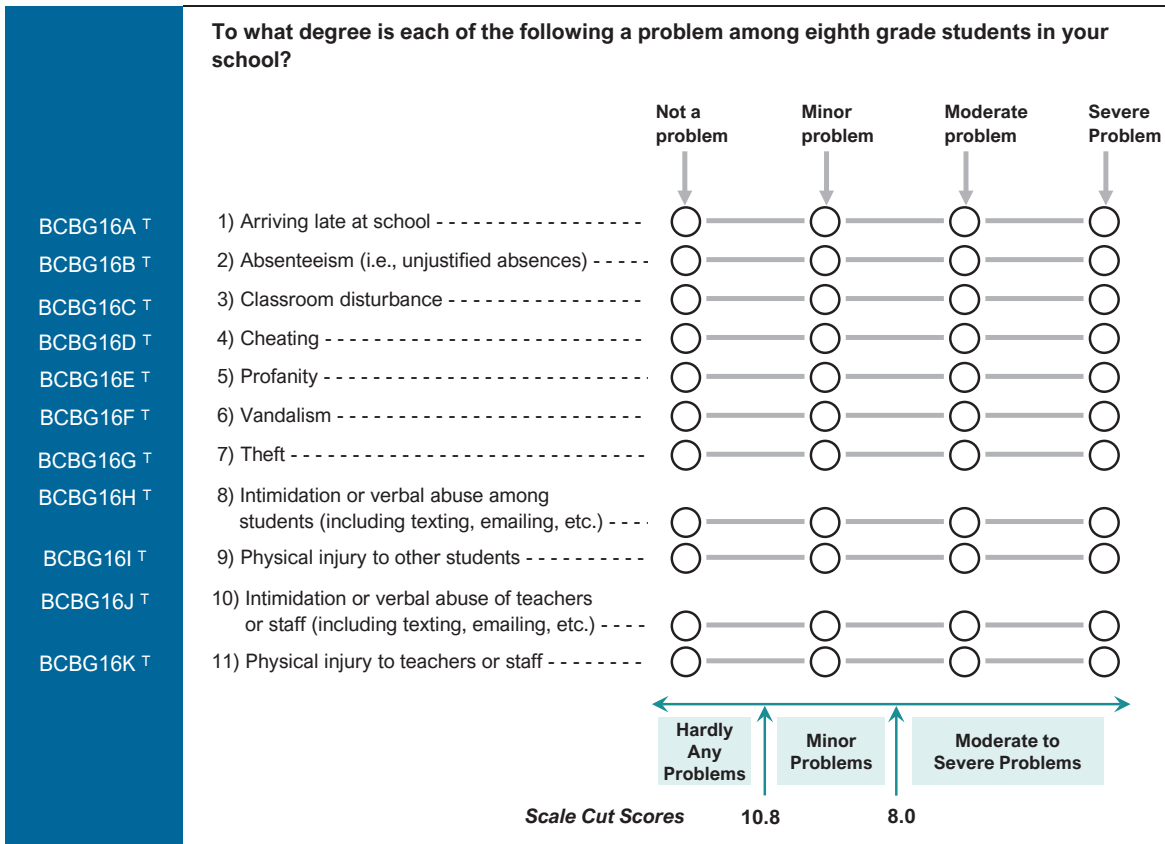
**Relationship Between the TIMSS 2019 *Instruction Affected by Science Resource Shortages* Scale and TIMSS 2019 Achievement – Grade 8**

Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
<b>Benchmarking Participants</b>			
Ontario, Canada	0.08	0.01	0.02
Quebec, Canada	-0.02	0.00	0.01
Moscow City, Russian Fed.	0.00	0.00	0.00
Gauteng, RSA (9)	0.32	0.10	0.15
Western Cape, RSA (9)	0.47	0.22	0.24
Abu Dhabi, UAE	0.16	0.03	0.04
Dubai, UAE	0.19	0.04	0.05

# School Discipline – Grade 8

## About the Scale

The *School Discipline* scale was created based on principals’ responses to eleven items listed below.



<sup>T</sup> Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.

### Item Parameters for the TIMSS 2019 School Discipline Scale – Grade 8

Item	delta	tau_1	tau_2	tau_3	Infit
BCBG16A	0.32951	-2.48171	-0.42419	2.90590	1.27
BCBG16B	0.89186	-1.91504	-0.57924	2.49428	1.28
BCBG16C	0.79991	-2.31615	-0.33558	2.65173	0.97
BCBG16D	-0.17728	-1.38113	-0.75069	2.13182	1.09
BCBG16E	0.54617	-1.88683	-0.34275	2.22958	0.92
BCBG16F	-0.05891	-0.80027	-0.74541	1.54568	0.83
BCBG16G	-0.59715	-0.18031	-1.07997	1.26028	0.82
BCBG16H	0.45456	-1.89207	-0.59214	2.48421	1.02
BCBG16I	-0.30789	-0.85864	-0.95601	1.81465	0.80
BCBG16J	-0.64994	-0.36374	-0.79318	1.15692	0.82
BCBG16K	-1.23084	1.01064	-0.65683	-0.35381	0.88

### Scale Transformation Constants for the TIMSS 2019 School Discipline Scale – Grade 8

#### Scale Transformation Constants

$$A = 8.418512$$

$$B = 0.982377$$

$$\text{Transformed Scale Score} = 8.418512 + 0.982377 \cdot \text{Logit Scale Score}$$

**Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS  
2019 School Discipline Scale – Grade 8**

Raw Score	Transformed Scale Score	Cutpoint
0	4.10007	
1	5.19151	
2	5.69640	
3	6.02711	
4	6.27380	
5	6.47245	
6	6.64117	
7	6.79025	
8	6.92622	
9	7.05373	
10	7.17625	
11	7.29658	
12	7.41582	
13	7.53896	
14	7.66553	
15	7.79736	
16	7.93621	8.0
17	8.08398	
18	8.24184	
19	8.41207	
20	8.59633	
21	8.79625	
22	9.01493	
23	9.25300	
24	9.51280	
25	9.79607	
26	10.10482	
27	10.43939	
28	10.80136	10.8
29	11.19421	
30	11.62884	
31	12.13532	
32	12.80218	
33	14.02858	



### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 School Discipline Scale – Grade 8

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item										
			BCBG16A	BCBG16B	BCBG16C	BCBG16D	BCBG16E	BCBG16F	BCBG16G	BCBG16H	BCBG16I	BCBG16J	BCBG16K
Australia	0.92	57	0.71	0.74	0.82	0.65	0.85	0.78	0.61	0.76	0.86	0.83	0.66
Bahrain	0.96	73	0.76	0.76	0.79	0.86	0.87	0.88	0.90	0.87	0.90	0.90	0.88
Chile	0.90	52	0.56	0.64	0.77	0.76	0.80	0.73	0.76	0.72	0.80	0.72	0.60
Chinese Taipei	0.88	48	0.68	0.73	0.60	0.75	0.69	0.72	0.80	0.68	0.75	0.67	0.46
Cyprus	0.94	61	0.58	0.68	0.77	0.82	0.83	0.85	0.80	0.83	0.88	0.83	0.69
Egypt	0.96	70	0.64	0.71	0.82	0.81	0.84	0.91	0.88	0.89	0.92	0.88	0.86
England	0.82	36	0.67	0.65	0.68	0.46	0.71	0.68	0.44	0.50	0.65	0.62	0.47
Finland	0.85	41	0.59	0.65	0.67	0.61	0.70	0.66	0.50	0.71	0.70	0.67	0.54
France	0.88	46	0.64	0.75	0.78	0.52	0.81	0.58	0.60	0.72	0.72	0.75	0.49
Georgia	0.95	69	0.68	0.80	0.78	0.62	0.85	0.88	0.90	0.90	0.91	0.90	0.88
Hong Kong SAR	0.81	37	0.65	0.53	0.60	0.72	0.74	0.66	0.68	0.58	0.63	0.41	0.37
Hungary	0.89	47	0.69	0.70	0.81	0.69	0.82	0.78	0.49	0.70	0.71	0.71	0.14
Iran, Islamic Rep. of	0.90	52	0.64	0.61	0.75	0.73	0.82	0.78	0.75	0.78	0.71	0.73	0.60
Ireland	0.88	45	0.71	0.73	0.76	0.63	0.79	0.72	0.59	0.74	0.60	0.74	0.11
Israel	0.92	56	0.63	0.65	0.70	0.71	0.79	0.78	0.79	0.74	0.77	0.84	0.80
Italy	0.91	52	0.57	0.74	0.64	0.64	0.68	0.80	0.74	0.75	0.84	0.79	0.71
Japan	0.92	63	0.62	0.15	0.86	0.80	0.86	0.92	0.79	0.67	0.88	0.88	0.93
Jordan	0.95	68	0.55	0.70	0.81	0.84	0.88	0.89	0.86	0.87	0.89	0.88	0.79
Kazakhstan	0.98	82	0.74	0.91	0.89	0.72	0.89	0.95	0.96	0.96	0.96	0.96	0.96
Korea, Rep. of	0.95	67	0.77	0.86	0.75	0.76	0.83	0.85	0.81	0.83	0.87	0.85	0.78
Kuwait	0.95	67	0.60	0.72	0.79	0.87	0.84	0.89	0.86	0.85	0.83	0.85	0.83
Lebanon	0.97	77	0.83	0.86	0.81	0.91	0.87	0.92	0.93	0.80	0.88	0.90	0.92
Lithuania	0.83	38	0.62	0.61	0.65	0.62	0.73	0.66	0.49	0.60	0.74	0.63	0.22
Malaysia	0.92	58	0.59	0.64	0.76	0.85	0.82	0.82	0.84	0.81	0.84	0.75	0.59
Morocco	0.96	72	0.59	0.72	0.87	0.87	0.89	0.89	0.92	0.85	0.91	0.89	0.86
New Zealand	0.90	52	0.71	0.74	0.79	0.59	0.78	0.79	0.75	0.71	0.78	0.75	0.42
Norway (9)	0.88	46	0.72	0.76	0.67	0.68	0.69	0.64	0.69	0.75	0.65	0.70	0.49
Oman	0.97	80	0.80	0.82	0.83	0.91	0.90	0.93	0.94	0.91	0.92	0.92	0.91
Portugal	0.92	56	0.61	0.68	0.76	0.70	0.70	0.84	0.79	0.76	0.82	0.84	0.67
Qatar	0.97	75	0.77	0.86	0.86	0.92	0.87	0.88	0.83	0.89	0.87	0.89	0.87
Romania	0.94	65	0.76	0.67	0.80	0.81	0.76	0.87	0.90	0.75	0.80	0.88	0.83
Russian Federation	0.81	36	0.52	0.48	0.61	0.56	0.67	0.60	0.68	0.68	0.68	0.63	0.39
Saudi Arabia	0.96	72	0.53	0.68	0.80	0.89	0.90	0.92	0.93	0.87	0.92	0.91	0.87
Singapore	0.86	43	0.64	0.68	0.70	0.64	0.75	0.71	0.74	0.56	0.73	0.68	0.30
South Africa (9)	0.91	53	0.67	0.70	0.77	0.71	0.77	0.77	0.75	0.80	0.80	0.69	0.56
Sweden	0.85	40	0.63	0.69	0.63	0.52	0.73	0.64	0.55	0.67	0.69	0.63	0.49
Turkey	0.96	72	0.69	0.75	0.86	0.86	0.81	0.87	0.89	0.88	0.92	0.91	0.88
United Arab Emirates	0.92	57	0.62	0.66	0.73	0.80	0.77	0.82	0.75	0.80	0.77	0.78	0.76
United States	0.89	49	0.70	0.67	0.76	0.45	0.78	0.69	0.71	0.71	0.80	0.79	0.57

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *School Discipline* Scale – Grade 8

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item										
			BCBG16A	BCBG16B	BCBG16C	BCBG16D	BCBG16E	BCBG16F	BCBG16G	BCBG16H	BCBG16I	BCBG16J	BCBG16K
<b>Benchmarking Participants</b>													
Ontario, Canada	0.88	48	0.67	0.57	0.73	0.59	0.81	0.75	0.75	0.75	0.71	0.78	0.44
Quebec, Canada	0.87	45	0.63	0.72	0.75	0.51	0.83	0.67	0.57	0.74	0.67	0.77	0.34
Moscow City, Russian Fed.	0.79	35	0.59	0.54	0.67	0.61	0.73	0.56	0.52	0.65	0.56	0.44	-
Gauteng, RSA (9)	0.92	54	0.74	0.74	0.75	0.69	0.74	0.80	0.79	0.81	0.77	0.60	0.62
Western Cape, RSA (9)	0.93	58	0.77	0.80	0.78	0.76	0.83	0.80	0.81	0.78	0.80	0.71	0.50
Abu Dhabi, UAE	0.92	58	0.70	0.69	0.80	0.83	0.76	0.84	0.63	0.83	0.76	0.79	0.71
Dubai, UAE	0.85	45	0.45	0.59	0.59	0.77	0.71	0.83	0.78	0.63	0.64	0.55	0.74

### Relationship Between the TIMSS 2019 School Discipline Scale and TIMSS 2019 Achievement – Grade 8

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
Australia	0.35	0.12	0.12	0.32	0.10	0.10
Bahrain	0.08	0.01	0.01	0.07	0.01	0.02
Chile	0.26	0.07	0.06	0.25	0.06	0.06
Chinese Taipei	0.12	0.01	0.01	0.10	0.01	0.01
Cyprus	0.24	0.06	0.08	0.21	0.04	0.07
Egypt	0.06	0.00	0.01	0.06	0.00	0.01
England	0.22	0.05	0.02	0.22	0.05	0.02
Finland	0.11	0.01	0.01	0.12	0.01	0.02
France	0.28	0.08	0.08	0.28	0.08	0.08
Georgia	0.13	0.02	0.02	0.12	0.01	0.02
Hong Kong SAR	0.24	0.06	0.02	0.17	0.03	0.00
Hungary	0.28	0.08	0.06	0.27	0.07	0.06
Iran, Islamic Rep. of	0.23	0.05	0.04	0.22	0.05	0.03
Ireland	0.24	0.06	0.04	0.24	0.06	0.03
Israel	0.22	0.05	0.05	0.20	0.04	0.04
Italy	0.08	0.01	0.01	0.08	0.01	0.01
Japan	0.08	0.01	0.00	0.07	0.01	0.00
Jordan	0.09	0.01	0.01	0.10	0.01	0.02
Kazakhstan	0.10	0.01	0.01	0.07	0.00	0.00
Korea, Rep. of	0.01	0.00	0.00	0.02	0.00	0.00
Kuwait	0.15	0.02	0.03	0.15	0.02	0.03
Lebanon	0.04	0.00	0.01	0.06	0.00	0.01
Lithuania	0.09	0.01	0.00	0.08	0.01	0.00
Malaysia	0.20	0.04	0.03	0.17	0.03	0.03
Morocco	0.01	0.00	0.01	-0.02	0.00	0.01
New Zealand	0.28	0.08	0.05	0.25	0.06	0.04
Norway (9)	0.11	0.01	0.00	0.12	0.02	0.01
Oman	0.12	0.01	0.02	0.10	0.01	0.01
Portugal	0.11	0.01	0.01	0.09	0.01	0.01
Qatar	0.09	0.01	0.01	0.04	0.00	0.00
Romania	0.18	0.03	0.03	0.18	0.03	0.03
Russian Federation	0.03	0.00	0.00	0.02	0.00	0.00
Saudi Arabia	0.10	0.01	0.01	0.12	0.01	0.01
Singapore	0.15	0.02	0.02	0.14	0.02	0.02
South Africa (9)	0.17	0.03	0.04	0.15	0.02	0.03
Sweden	0.16	0.03	0.02	0.16	0.03	0.02
Turkey	0.14	0.02	0.03	0.13	0.02	0.02
United Arab Emirates	0.26	0.07	0.06	0.28	0.08	0.07
United States	0.28	0.08	0.07	0.28	0.08	0.07
<b>International Median</b>	<b>0.14</b>	<b>0.02</b>	<b>0.02</b>	<b>0.13</b>	<b>0.02</b>	<b>0.02</b>

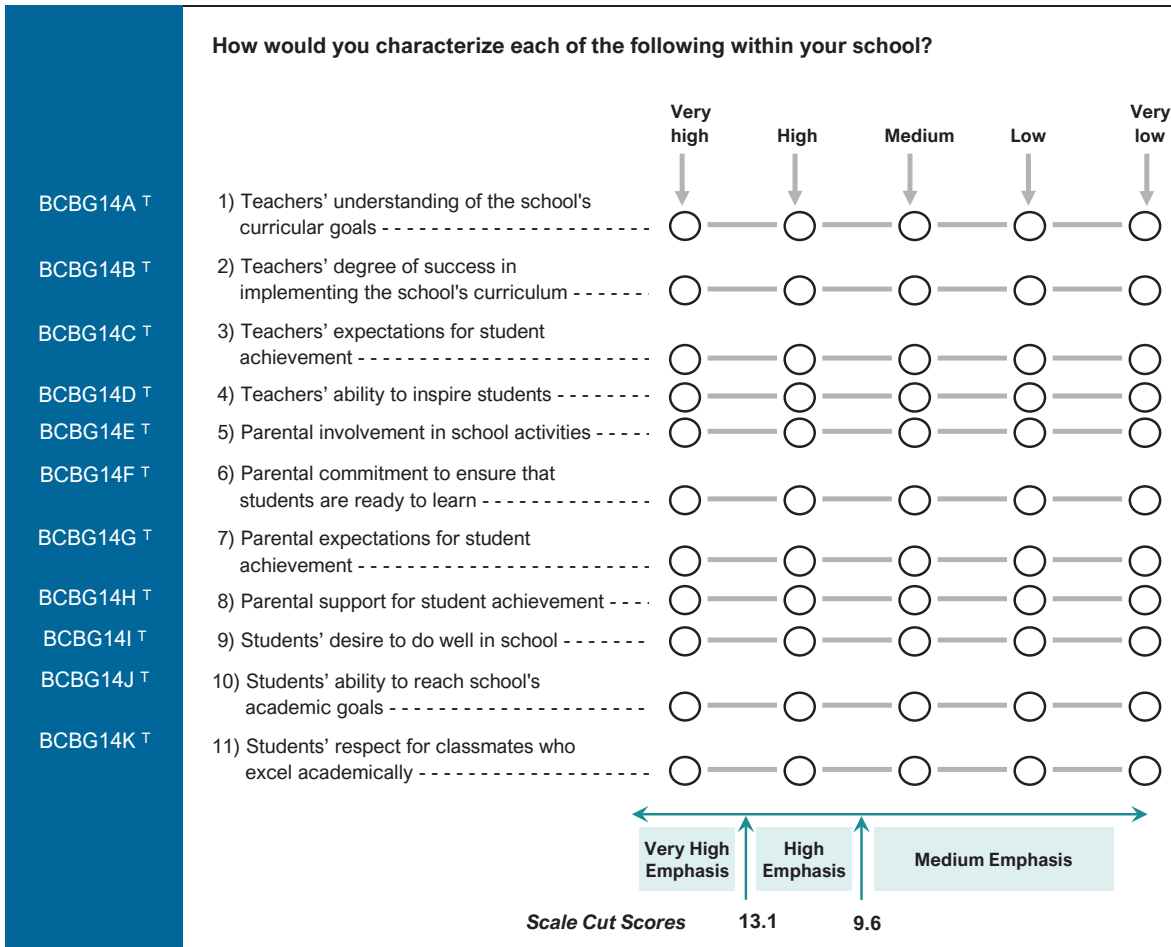
### Relationship Between the TIMSS 2019 *School Discipline* Scale and TIMSS 2019 Achievement – Grade 8

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
<b>Benchmarking Participants</b>						
Ontario, Canada	0.20	0.04	0.02	0.15	0.02	0.02
Quebec, Canada	0.15	0.02	0.01	0.12	0.01	0.01
Moscow City, Russian Fed.	0.02	0.00	0.00	0.00	0.00	0.00
Gauteng, RSA (9)	0.39	0.15	0.17	0.39	0.16	0.17
Western Cape, RSA (9)	0.58	0.34	0.31	0.58	0.33	0.31
Abu Dhabi, UAE	0.23	0.05	0.04	0.26	0.07	0.06
Dubai, UAE	0.23	0.05	0.04	0.23	0.05	0.03

# School Emphasis on Academic Success— Principals’ Reports – Grade 8

## About the Scale

The *School Emphasis on Academic Success* scale was created based on principals’ responses to eleven items listed below.<sup>1</sup>



<sup>1</sup> 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.

<sup>T</sup> Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.

**Item Parameters for the TIMSS 2019 School Emphasis on Academic Success—Principals' Reports Scale – Grade 8**

Item	delta	tau_1	tau_2	tau_3	Infit
BCBG14A	-1.68808	-3.41252	0.01816	3.39436	1.19
BCBG14B	-1.24407	-3.72289	0.13877	3.58412	1.00
BCBG14C	-0.83743	-3.38294	-0.01936	3.40230	0.98
BCBG14D	-0.60365	-3.45458	0.05816	3.39642	1.03
BCBG14E	1.62892	-2.42516	0.09836	2.32680	1.17
BCBG14F	1.44778	-2.60585	0.04277	2.56308	0.82
BCBG14G	-0.09004	-2.61114	-0.18026	2.79140	1.02
BCBG14H	1.20810	-2.67184	0.05169	2.62015	0.85
BCBG14I	0.05948	-3.47526	0.16895	3.30631	0.86
BCBG14J	0.43096	-3.76989	0.24784	3.52205	0.85
BCBG14K	-0.31197	-2.97209	-0.24200	3.21409	1.20

**Scale Transformation Constants for the TIMSS 2019 School Emphasis on Academic Success—Principals' Reports Scale – Grade 8**

**Scale Transformation Constants**

A = 9.585866

B = 1.044298

Transformed Scale Score = 9.585866 + 1.044298 • Logit Scale Score

**Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019  
School Emphasis on Academic Success—Principals' Reports Scale – Grade 8**

Raw Score	Transformed Scale Score	Cutpoint
1	3.55446	
2	4.30371	
3	4.88060	
4	5.37607	
5	5.82698	
6	6.24903	
7	6.65002	
8	7.03177	
9	7.39368	
10	7.73586	
11	8.06046	
12	8.37165	
13	8.67341	
14	8.96990	
15	9.26475	
16	9.56054	9.6
17	9.85898	
18	10.15969	
19	10.46161	
20	10.76309	
21	11.06274	
22	11.35999	
23	11.65536	
24	11.95038	
25	12.24755	
26	12.55044	
27	12.86324	
28	13.19357	13.1
29	13.55081	
30	13.95351	
31	14.43815	
32	15.09677	
33	16.36222	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 School Emphasis on Academic Success—Principals' Reports Scale – Grade 8

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
Australia	0.94	65	0.68	0.76	0.81	0.73	0.79	0.85	0.83	0.87	0.87	0.81	0.83
Bahrain	0.94	63	0.72	0.76	0.77	0.85	0.69	0.87	0.84	0.88	0.81	0.85	0.69
Chile	0.95	66	0.75	0.79	0.81	0.81	0.77	0.83	0.83	0.86	0.86	0.84	0.77
Chinese Taipei	0.93	61	0.64	0.77	0.77	0.78	0.77	0.81	0.85	0.82	0.84	0.76	0.73
Cyprus	0.89	50	0.39	0.73	0.70	0.53	0.59	0.78	0.83	0.82	0.77	0.82	0.66
Egypt	0.89	49	0.46	0.64	0.63	0.67	0.71	0.82	0.78	0.81	0.74	0.74	0.59
England	0.93	58	0.64	0.70	0.75	0.71	0.70	0.85	0.80	0.82	0.85	0.83	0.71
Finland	0.87	44	0.67	0.62	0.63	0.64	0.65	0.75	0.71	0.72	0.66	0.68	0.57
France	0.86	42	0.39	0.54	0.56	0.54	0.69	0.82	0.65	0.80	0.71	0.74	0.56
Georgia	0.91	51	0.76	0.76	0.74	0.77	0.73	0.78	0.62	0.72	0.74	0.65	0.56
Hong Kong SAR	0.92	55	0.62	0.71	0.78	0.78	0.67	0.83	0.78	0.82	0.77	0.79	0.54
Hungary	0.91	54	0.47	0.72	0.63	0.77	0.73	0.87	0.69	0.86	0.81	0.76	0.67
Iran, Islamic Rep. of	0.89	49	0.71	0.69	0.69	0.69	0.69	0.77	0.59	0.76	0.75	0.76	0.55
Ireland	0.92	59	0.65	0.70	0.82	0.67	0.76	0.83	0.80	0.80	0.85	0.84	0.68
Israel	0.88	46	0.54	0.62	0.69	0.60	0.60	0.72	0.77	0.79	0.71	0.72	0.66
Italy	0.84	40	0.53	0.64	0.61	0.56	0.65	0.74	0.56	0.72	0.71	0.65	0.51
Japan	0.91	52	0.55	0.57	0.73	0.71	0.67	0.85	0.72	0.83	0.78	0.81	0.65
Jordan	0.91	53	0.66	0.74	0.63	0.72	0.70	0.80	0.77	0.78	0.78	0.76	0.64
Kazakhstan	0.89	50	0.63	0.68	0.68	0.79	0.67	0.79	0.68	0.78	0.73	0.62	0.69
Korea, Rep. of	0.91	54	0.62	0.64	0.69	0.53	0.78	0.83	0.78	0.81	0.77	0.81	0.72
Kuwait	0.91	53	0.61	0.69	0.71	0.72	0.68	0.80	0.79	0.75	0.80	0.75	0.68
Lebanon	0.87	44	0.58	0.54	0.66	0.59	0.67	0.73	0.68	0.76	0.65	0.78	0.56
Lithuania	0.85	41	0.54	0.62	0.61	0.68	0.70	0.77	0.58	0.77	0.62	0.57	0.48
Malaysia	0.91	51	0.54	0.61	0.60	0.65	0.77	0.80	0.73	0.80	0.83	0.81	0.69
Morocco	0.88	47	0.66	0.63	0.68	0.70	0.63	0.80	0.73	0.73	0.67	0.72	0.55
New Zealand	0.92	56	0.68	0.80	0.77	0.73	0.65	0.77	0.79	0.81	0.81	0.76	0.63
Norway (9)	0.89	48	0.49	0.60	0.74	0.59	0.77	0.72	0.76	0.71	0.78	0.77	0.61
Oman	0.89	49	0.66	0.68	0.61	0.64	0.67	0.83	0.74	0.77	0.68	0.77	0.61
Portugal	0.91	52	0.59	0.74	0.75	0.57	0.68	0.81	0.74	0.81	0.77	0.79	0.63
Qatar	0.92	56	0.67	0.76	0.78	0.85	0.79	0.77	0.72	0.70	0.74	0.81	0.62
Romania	0.88	46	0.51	0.64	0.63	0.71	0.73	0.76	0.58	0.73	0.75	0.81	0.56
Russian Federation	0.84	39	0.56	0.67	0.61	0.60	0.75	0.68	0.49	0.73	0.67	0.59	0.42
Saudi Arabia	0.92	53	0.64	0.67	0.76	0.73	0.72	0.75	0.75	0.78	0.77	0.79	0.66
Singapore	0.94	61	0.70	0.73	0.81	0.75	0.70	0.84	0.82	0.84	0.82	0.84	0.73
South Africa (9)	0.88	47	0.52	0.68	0.63	0.63	0.77	0.81	0.62	0.81	0.69	0.69	0.67
Sweden	0.89	49	0.61	0.60	0.74	0.68	0.74	0.82	0.74	0.79	0.74	0.75	0.46
Turkey	0.90	51	0.66	0.60	0.74	0.63	0.80	0.81	0.62	0.83	0.75	0.80	0.56
United Arab Emirates	0.94	65	0.75	0.78	0.85	0.83	0.76	0.85	0.75	0.83	0.85	0.84	0.74
United States	0.93	60	0.68	0.77	0.77	0.80	0.80	0.84	0.82	0.82	0.80	0.72	0.69



**Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 School Emphasis on Academic Success—Principals' Reports Scale – Grade 8**

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
<b>Benchmarking Participants</b>													
Ontario, Canada	0.90	53	0.54	0.68	0.76	0.61	0.63	0.77	0.77	0.83	0.82	0.76	0.74
Quebec, Canada	0.91	53	0.68	0.69	0.65	0.75	0.62	0.79	0.75	0.80	0.83	0.77	0.68
Moscow City, Russian Fed.	0.86	42	0.63	0.68	0.60	0.67	0.70	0.78	0.48	0.69	0.68	0.60	0.57
Gauteng, RSA (9)	0.90	50	0.64	0.74	0.63	0.63	0.72	0.77	0.63	0.78	0.73	0.76	0.71
Western Cape, RSA (9)	0.91	54	0.58	0.68	0.63	0.68	0.79	0.84	0.63	0.83	0.83	0.82	0.74
Abu Dhabi, UAE	0.95	65	0.72	0.74	0.83	0.82	0.80	0.85	0.74	0.86	0.87	0.85	0.78
Dubai, UAE	0.94	62	0.73	0.76	0.85	0.80	0.70	0.82	0.75	0.83	0.84	0.82	0.71

**Relationship Between the TIMSS 2019 School Emphasis on Academic Success—Principals' Reports Scale and TIMSS 2019 Achievement – Grade 8**

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
Australia	0.45	0.20	0.17	0.39	0.15	0.11
Bahrain	0.14	0.02	0.02	0.32	0.10	0.10
Chile	0.35	0.12	0.13	0.34	0.11	0.12
Chinese Taipei	0.26	0.07	0.05	0.22	0.05	0.04
Cyprus	0.21	0.05	0.04	0.18	0.03	0.03
Egypt	0.19	0.03	0.03	0.20	0.04	0.03
England	0.29	0.08	0.18	0.26	0.07	0.15
Finland	0.14	0.02	0.01	0.13	0.02	0.01
France	0.26	0.07	0.05	0.25	0.06	0.04
Georgia	0.12	0.01	0.02	0.05	0.00	0.00
Hong Kong SAR	0.41	0.17	0.15	0.35	0.12	0.12
Hungary	0.44	0.20	0.12	0.42	0.17	0.10
Iran, Islamic Rep. of	0.34	0.12	0.10	0.34	0.12	0.10
Ireland	0.29	0.08	0.08	0.26	0.07	0.07
Israel	0.20	0.04	0.04	0.22	0.05	0.04
Italy	0.13	0.02	0.00	0.13	0.02	0.00
Japan	0.23	0.05	0.06	0.20	0.04	0.04
Jordan	0.24	0.06	0.05	0.25	0.06	0.05
Kazakhstan	0.05	0.00	0.00	0.02	0.00	0.00
Korea, Rep. of	0.15	0.02	0.02	0.11	0.01	0.02
Kuwait	0.28	0.08	0.06	0.29	0.09	0.08
Lebanon	0.33	0.11	0.09	0.36	0.13	0.11
Lithuania	0.15	0.02	0.02	0.14	0.02	0.01
Malaysia	0.30	0.09	0.07	0.30	0.09	0.07
Morocco	0.17	0.03	0.03	0.13	0.02	0.02
New Zealand	0.31	0.10	0.07	0.29	0.08	0.06
Norway (9)	0.14	0.02	0.01	0.11	0.01	0.01
Oman	0.18	0.03	0.03	0.16	0.03	0.03
Portugal	0.32	0.10	0.05	0.28	0.08	0.04
Qatar	0.24	0.06	0.08	0.19	0.04	0.05
Romania	0.26	0.07	0.05	0.24	0.06	0.04
Russian Federation	0.19	0.04	0.03	0.17	0.03	0.02
Saudi Arabia	0.16	0.02	0.02	0.19	0.03	0.03
Singapore	0.37	0.14	0.14	0.36	0.13	0.13
South Africa (9)	0.27	0.07	0.04	0.27	0.07	0.04
Sweden	0.25	0.06	0.05	0.24	0.06	0.05
Turkey	0.28	0.08	0.07	0.26	0.07	0.06
United Arab Emirates	0.36	0.13	0.11	0.37	0.14	0.12
United States	0.31	0.10	0.09	0.29	0.08	0.08
<b>International Median</b>	<b>0.26</b>	<b>0.07</b>	<b>0.05</b>	<b>0.25</b>	<b>0.06</b>	<b>0.04</b>

**Relationship Between the TIMSS 2019 School Emphasis on Academic Success—Principals' Reports Scale and TIMSS 2019 Achievement – Grade 8**

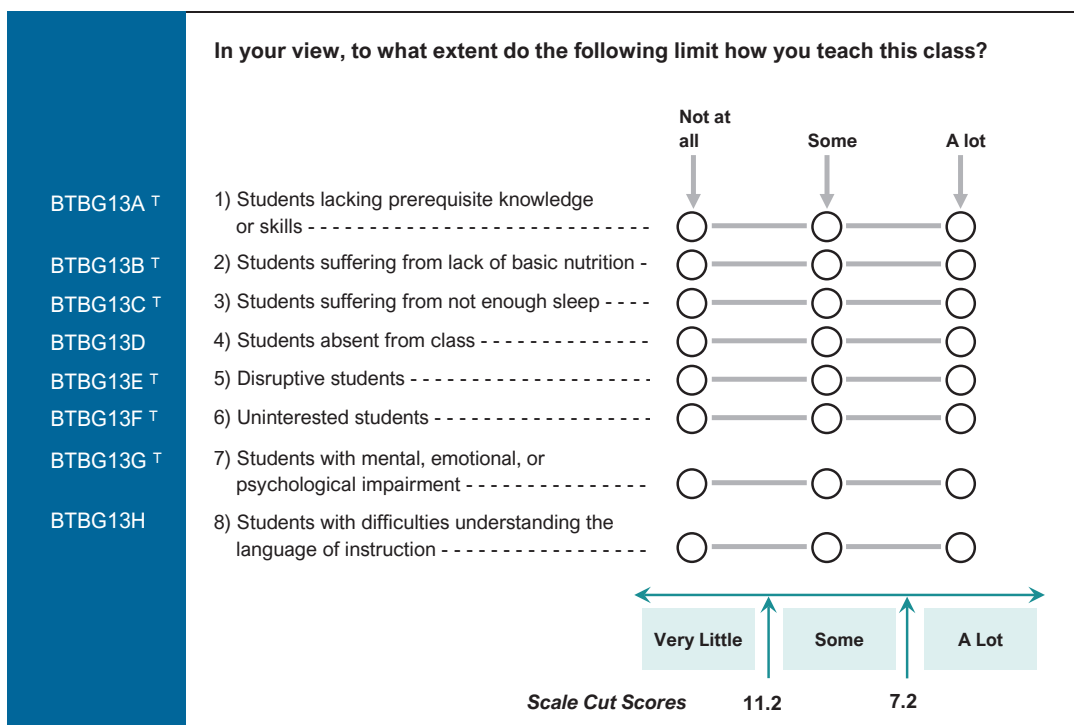
Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
<b>Benchmarking Participants</b>						
Ontario, Canada	0.24	0.06	0.05	0.17	0.03	0.03
Quebec, Canada	0.31	0.09	0.10	0.27	0.07	0.08
Moscow City, Russian Fed.	0.06	0.00	0.01	0.06	0.00	0.01
Gauteng, RSA (9)	0.29	0.08	0.04	0.29	0.09	0.04
Western Cape, RSA (9)	0.55	0.30	0.25	0.54	0.29	0.25
Abu Dhabi, UAE	0.37	0.13	0.13	0.40	0.16	0.16
Dubai, UAE	0.30	0.09	0.07	0.27	0.07	0.05

## Scales Based on Teachers' Reports

# Classroom Teaching Limited by Students Not Ready for Instruction – Grade 8

## About the Scale

The *Classroom Teaching Limited by Students Not Ready for Instruction* scale was created based on teachers' responses to eight items listed below.



<sup>T</sup> Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.

**Item Parameters for the TIMSS 2019 Classroom Teaching Limited by Students Not Ready for Instruction Scale – Grade 8**

Item	delta	tau_1	tau_2	Infit
BTBG13A	1.09871	-1.88960	1.88960	1.02
BTBG13B	-1.09149	-1.20078	1.20078	1.11
BTBG13C	0.14688	-1.69582	1.69582	0.99
BTBG13D	0.14205	-1.54079	1.54079	0.98
BTBG13E	0.27077	-1.26887	1.26887	0.95
BTBG13F	0.84736	-1.78301	1.78301	0.91
BTBG13G	-0.61321	-1.43379	1.43379	0.99
BTBG13H	-0.80107	-1.14438	1.14438	1.08

**Scale Transformation Constants for the TIMSS 2019 Classroom Teaching Limited by Students Not Ready for Instruction Scale – Grade 8**

**Scale Transformation Constants**

$$A = 9.253899$$

$$B = 1.261053$$

$$\text{Transformed Scale Score} = 9.253899 + 1.261053 \cdot \text{Logit Scale Score}$$

**Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019 Classroom Teaching Limited by Students Not Ready for Instruction Scale – Grade 8**

Raw Score	Transformed Scale Score	Cutpoint
0	3.62369	
1	5.18385	
2	6.01647	
3	6.64377	
4	7.18242	7.2
5	7.67828	
6	8.15603	
7	8.63238	
8	9.11668	
9	9.61910	
10	10.14509	
11	10.69865	
12	11.28828	11.2
13	11.93193	
14	12.67245	
15	13.61824	
16	15.29510	

**Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 Classroom Teaching Limited by Students Not Ready for Instruction Scale – Grade 8**

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item							
			BTBG13A	BTBG13B	BTBG13C	BTBG13D	BTBG13E	BTBG13F	BTBG13G	BTBG13H
Australia	0.83	46	0.69	0.60	0.65	0.67	0.75	0.76	0.66	0.61
Bahrain	0.76	38	0.63	0.60	0.64	0.39	0.71	0.73	0.58	0.55
Chile	0.84	47	0.67	0.72	0.73	0.73	0.71	0.76	0.64	0.53
Chinese Taipei	0.80	43	0.59	0.56	0.63	0.70	0.69	0.62	0.71	0.71
Cyprus	0.80	43	0.57	0.58	0.69	0.68	0.65	0.69	0.70	0.69
Egypt	0.68	31	0.49	0.42	0.35	0.55	0.72	0.71	0.60	0.55
England	0.82	45	0.58	0.70	0.76	0.64	0.72	0.72	0.62	0.63
Finland	0.78	40	0.72	0.44	0.68	0.62	0.63	0.73	0.70	0.46
France	0.75	36	0.58	0.56	0.61	0.70	0.57	0.59	0.65	0.53
Georgia	0.71	33	0.56	0.43	0.43	0.56	0.66	0.69	0.66	0.57
Hong Kong SAR	0.71	34	0.65	0.33	0.51	0.62	0.65	0.69	0.69	0.40
Hungary	0.78	40	0.62	0.55	0.66	0.58	0.69	0.71	0.74	0.47
Iran, Islamic Rep. of	0.76	38	0.50	0.59	0.60	0.59	0.69	0.61	0.75	0.55
Ireland	0.81	43	0.54	0.63	0.69	0.65	0.69	0.74	0.66	0.61
Israel	0.86	51	0.63	0.64	0.72	0.78	0.72	0.74	0.71	0.72
Italy	0.80	42	0.70	0.65	0.66	0.66	0.70	0.64	0.54	0.65
Japan	0.78	40	0.68	0.21	0.63	0.66	0.61	0.71	0.65	0.72
Jordan	0.71	34	0.57	0.40	0.56	0.59	0.67	0.73	0.47	0.60
Kazakhstan	0.83	46	0.62	0.53	0.71	0.70	0.74	0.71	0.76	0.62
Korea, Rep. of	0.77	39	0.37	0.53	0.66	0.62	0.67	0.64	0.73	0.68
Kuwait	0.68	32	0.43	0.33	0.60	0.60	0.69	0.74	0.55	0.47
Lebanon	0.75	37	0.57	0.49	0.60	0.64	0.64	0.70	0.59	0.60
Lithuania	0.85	49	0.63	0.68	0.73	0.76	0.74	0.73	0.72	0.60
Malaysia	0.84	48	0.67	0.58	0.63	0.73	0.78	0.82	0.69	0.57
Morocco	0.69	31	0.45	0.52	0.51	0.56	0.66	0.65	0.55	0.55
New Zealand	0.79	41	0.57	0.63	0.64	0.66	0.69	0.73	0.71	0.47
Norway (9)	0.74	36	0.55	0.63	0.71	0.67	0.64	0.65	0.47	0.41
Oman	0.75	37	0.53	0.54	0.56	0.62	0.61	0.64	0.65	0.67
Portugal	0.77	39	0.56	0.60	0.65	0.68	0.62	0.76	0.55	0.56
Qatar	0.78	39	0.62	0.56	0.70	0.61	0.70	0.74	0.50	0.56
Romania	0.78	40	0.59	0.57	0.55	0.67	0.71	0.67	0.65	0.60
Russian Federation	0.84	48	0.61	0.63	0.69	0.78	0.75	0.71	0.75	0.58
Saudi Arabia	0.78	40	0.55	0.60	0.64	0.67	0.70	0.66	0.61	0.61
Singapore	0.80	42	0.60	0.53	0.55	0.72	0.69	0.70	0.70	0.64
South Africa (9)	0.75	37	0.47	0.54	0.58	0.62	0.71	0.74	0.63	0.54
Sweden	0.75	36	0.65	0.37	0.64	0.57	0.69	0.68	0.62	0.54
Turkey	0.83	46	0.62	0.69	0.66	0.68	0.68	0.71	0.74	0.63
United Arab Emirates	0.84	48	0.64	0.54	0.70	0.67	0.77	0.78	0.69	0.71
United States	0.80	42	0.61	0.66	0.65	0.64	0.73	0.72	0.70	0.48

**Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 Classroom Teaching Limited by Students Not Ready for Instruction Scale – Grade 8**

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item							
			BTBG13A	BTBG13B	BTBG13C	BTBG13D	BTBG13E	BTBG13F	BTBG13G	BTBG13H
<b>Benchmarking Participants</b>										
Ontario, Canada	0.81	45	0.61	0.67	0.74	0.73	0.70	0.76	0.69	0.36
Quebec, Canada	0.80	42	0.61	0.68	0.70	0.71	0.59	0.74	0.68	0.42
Moscow City, Russian Fed.	0.87	52	0.65	0.63	0.72	0.78	0.76	0.73	0.77	0.71
Gauteng, RSA (9)	0.79	41	0.46	0.66	0.58	0.63	0.69	0.74	0.63	0.66
Western Cape, RSA (9)	0.82	45	0.58	0.67	0.58	0.64	0.77	0.79	0.69	0.58
Abu Dhabi, UAE	0.84	47	0.70	0.40	0.67	0.68	0.77	0.77	0.69	0.75
Dubai, UAE	0.84	48	0.52	0.61	0.71	0.68	0.77	0.79	0.71	0.71

**Relationship Between the TIMSS 2019 Classroom Teaching Limited by Students Not Ready for Instruction Scale and TIMSS 2019 Achievement – Grade 8**

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
Australia	0.49	0.24	0.20	0.36	0.13	0.10
Bahrain	0.05	0.00	0.00	0.21	0.04	0.04
Chile	0.26	0.07	0.05	0.21	0.04	0.04
Chinese Taipei	0.13	0.02	0.02	0.08	0.01	0.01
Cyprus	0.16	0.02	0.02	0.10	0.01	0.02
Egypt	0.11	0.01	0.01	0.05	0.00	0.00
England	0.34	0.12	0.12	0.23	0.05	0.08
Finland	0.25	0.06	0.04	0.22	0.05	0.04
France	0.24	0.06	0.04	0.19	0.04	0.04
Georgia	0.01	0.00	0.00	0.11	0.01	0.01
Hong Kong SAR	0.45	0.20	0.14	0.26	0.07	0.06
Hungary	0.34	0.11	0.10	0.29	0.09	0.07
Iran, Islamic Rep. of	0.21	0.04	0.02	0.05	0.00	0.00
Ireland	0.36	0.13	0.09	0.24	0.06	0.04
Israel	0.34	0.11	0.11	0.33	0.11	0.11
Italy	0.05	0.00	0.00	0.03	0.00	0.01
Japan	0.09	0.01	0.00	0.10	0.01	0.01
Jordan	0.18	0.03	0.03	0.24	0.06	0.05
Kazakhstan	-0.01	0.00	0.01	0.01	0.00	0.01
Korea, Rep. of	0.00	0.00	0.00	0.06	0.00	0.01
Kuwait	0.22	0.05	0.04	0.03	0.00	0.00
Lebanon	0.08	0.01	0.01	0.15	0.02	0.01
Lithuania	0.21	0.04	0.03	0.13	0.02	0.02
Malaysia	0.39	0.15	0.12	0.39	0.15	0.11
Morocco	0.17	0.03	0.04	0.18	0.03	0.03
New Zealand	0.41	0.17	0.13	0.39	0.15	0.09
Norway (9)	0.17	0.03	0.02	0.15	0.02	0.02
Oman	0.15	0.02	0.02	0.08	0.01	0.01
Portugal	0.25	0.06	0.02	0.20	0.04	0.04
Qatar	0.27	0.07	0.04	0.17	0.03	0.02
Romania	0.29	0.08	0.08	0.23	0.05	0.03
Russian Federation	0.16	0.03	0.03	0.13	0.02	0.01
Saudi Arabia	0.10	0.01	0.01	0.15	0.02	0.02
Singapore	0.42	0.17	0.14	0.32	0.10	0.07
South Africa (9)	0.21	0.04	0.03	0.16	0.03	0.02
Sweden	0.21	0.05	0.03	0.18	0.03	0.02
Turkey	0.29	0.08	0.08	0.24	0.06	0.04
United Arab Emirates	0.37	0.14	0.13	0.40	0.16	0.13
United States	0.41	0.17	0.13	0.26	0.07	0.06
<b>International Median</b>	<b>0.21</b>	<b>0.05</b>	<b>0.03</b>	<b>0.18</b>	<b>0.03</b>	<b>0.03</b>



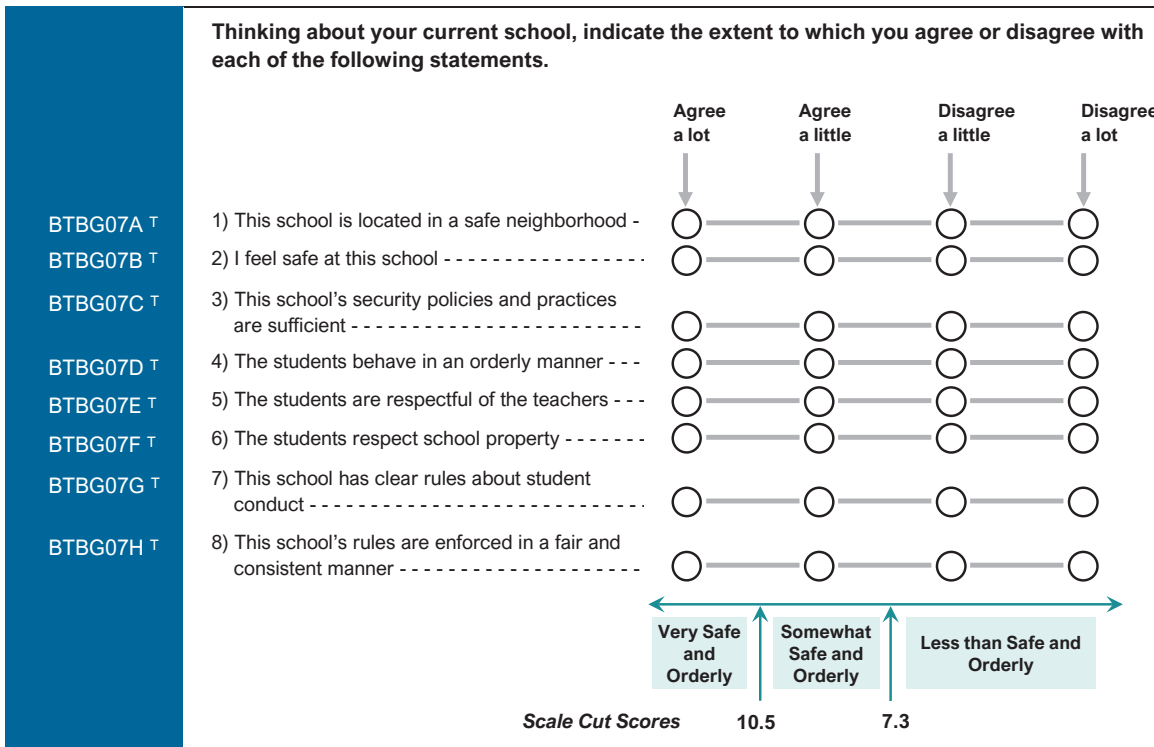
**Relationship Between the TIMSS 2019 Classroom Teaching Limited by Students Not Ready for Instruction Scale and TIMSS 2019 Achievement – Grade 8**

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
<b>Benchmarking Participants</b>						
Ontario, Canada	0.26	0.07	0.08	0.24	0.06	0.05
Quebec, Canada	0.33	0.11	0.09	0.35	0.13	0.12
Moscow City, Russian Fed.	0.17	0.03	0.04	0.16	0.03	0.02
Gauteng, RSA (9)	0.23	0.05	0.09	0.17	0.03	0.03
Western Cape, RSA (9)	0.49	0.24	0.16	0.42	0.18	0.10
Abu Dhabi, UAE	0.39	0.15	0.13	0.43	0.18	0.15
Dubai, UAE	0.34	0.11	0.11	0.35	0.12	0.10

# Safe and Orderly School – Grade 8

## About the Scale

The *Safe and Orderly School* scale was created based on teachers’ responses to eight items listed below.



<sup>1</sup> 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.

<sup>T</sup> Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.

### Item Parameters for the TIMSS 2019 *Safe and Orderly School* Scale – Grade 8

Item	delta	tau_1	tau_2	Infit
BTBG07A	-0.93180	-1.21284	1.21284	1.26
BTBG07B	-1.50733	-1.31584	1.31584	0.98
BTBG07C	-0.70617	-1.53302	1.53302	1.04
BTBG07D	1.04692	-1.96681	1.96681	0.91
BTBG07E	0.77423	-1.93544	1.93544	0.91
BTBG07F	1.59701	-1.88167	1.88167	0.94
BTBG07G	-0.48472	-1.53624	1.53624	1.05
BTBG07H	0.21186	-1.57604	1.57604	1.03

### Scale Transformation Constants for the TIMSS 2019 *Safe and Orderly School* Scale – Grade 8

#### Scale Transformation Constants

$$A = 8.929660$$

$$B = 0.950459$$

$$\text{Transformed Scale Score} = 8.929660 + 0.950459 \cdot \text{Logit Scale Score}$$

### Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019 *Safe and Orderly School* Scale – Grade 8

Raw Score	Transformed Scale Score	Cutpoint
0	4.42632	
1	5.63149	
2	6.28831	
3	6.79059	
4	7.22558	7.3
5	7.62717	
6	8.01327	
7	8.39631	
8	8.78337	
9	9.18523	
10	9.61153	
11	10.07263	
12	10.58171	10.5
13	11.14932	
14	11.78998	
15	12.56459	
16	13.87035	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Safe and Orderly School* Scale – Grade 8

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item							
			BTBG07A	BTBG07B	BTBG07C	BTBG07D	BTBG07E	BTBG07F	BTBG07G	BTBG07H
Australia	0.89	58	0.59	0.71	0.74	0.85	0.85	0.85	0.70	0.74
Bahrain	0.87	53	0.41	0.53	0.68	0.85	0.83	0.82	0.77	0.79
Chile	0.90	59	0.66	0.72	0.75	0.80	0.83	0.83	0.73	0.78
Chinese Taipei	0.88	54	0.69	0.73	0.72	0.76	0.78	0.75	0.70	0.72
Cyprus	0.91	61	0.63	0.81	0.79	0.83	0.84	0.81	0.73	0.78
Egypt	0.86	50	0.64	0.63	0.71	0.74	0.73	0.77	0.68	0.75
England	0.88	56	0.42	0.69	0.75	0.85	0.84	0.84	0.69	0.80
Finland	0.85	50	0.54	0.69	0.65	0.79	0.80	0.74	0.66	0.77
France	0.89	57	0.75	0.76	0.73	0.82	0.82	0.76	0.70	0.70
Georgia	0.78	40	0.35	0.58	0.54	0.73	0.74	0.71	0.65	0.68
Hong Kong SAR	0.85	49	0.51	0.62	0.71	0.76	0.77	0.74	0.73	0.73
Hungary	0.86	50	0.57	0.64	0.74	0.78	0.79	0.75	0.63	0.74
Iran, Islamic Rep. of	0.88	54	0.69	0.68	0.71	0.79	0.72	0.76	0.78	0.74
Ireland	0.88	56	0.56	0.70	0.68	0.85	0.85	0.79	0.75	0.78
Israel	0.87	52	0.48	0.62	0.62	0.82	0.82	0.80	0.77	0.78
Italy	0.83	46	0.69	0.73	0.65	0.69	0.63	0.69	0.64	0.72
Japan	0.83	46	0.66	0.76	0.61	0.72	0.67	0.68	0.62	0.72
Jordan	0.90	58	0.67	0.76	0.77	0.79	0.77	0.82	0.74	0.75
Kazakhstan	0.84	48	0.54	0.64	0.67	0.71	0.75	0.69	0.75	0.77
Korea, Rep. of	0.90	58	0.72	0.80	0.82	0.78	0.72	0.73	0.75	0.75
Kuwait	0.84	48	0.42	0.60	0.65	0.78	0.73	0.81	0.72	0.73
Lebanon	0.85	50	0.50	0.52	0.61	0.81	0.79	0.81	0.77	0.74
Lithuania	0.87	52	0.56	0.76	0.78	0.76	0.75	0.72	0.67	0.73
Malaysia	0.88	55	0.73	0.80	0.76	0.78	0.77	0.70	0.69	0.69
Morocco	0.89	58	0.68	0.77	0.80	0.79	0.77	0.77	0.73	0.75
New Zealand	0.88	54	0.56	0.67	0.66	0.84	0.82	0.82	0.71	0.73
Norway (9)	0.83	46	0.45	0.64	0.63	0.78	0.76	0.75	0.66	0.70
Oman	0.80	42	0.54	0.58	0.60	0.77	0.74	0.66	0.64	0.65
Portugal	0.87	53	0.61	0.71	0.74	0.77	0.79	0.76	0.72	0.71
Qatar	0.88	54	0.46	0.69	0.67	0.80	0.79	0.76	0.83	0.82
Romania	0.86	51	0.48	0.62	0.69	0.79	0.82	0.81	0.66	0.76
Russian Federation	0.87	52	0.60	0.68	0.69	0.80	0.81	0.81	0.59	0.76
Saudi Arabia	0.86	51	0.45	0.66	0.71	0.76	0.73	0.77	0.79	0.79
Singapore	0.88	56	0.59	0.65	0.70	0.82	0.83	0.82	0.72	0.79
South Africa (9)	0.87	53	0.67	0.76	0.77	0.78	0.79	0.78	0.59	0.65
Sweden	0.82	45	0.59	0.64	0.70	0.77	0.75	0.65	0.56	0.69
Turkey	0.90	58	0.73	0.75	0.78	0.80	0.74	0.78	0.76	0.74
United Arab Emirates	0.89	56	0.50	0.61	0.65	0.84	0.84	0.84	0.81	0.84
United States	0.87	54	0.50	0.64	0.65	0.86	0.84	0.83	0.70	0.78

**Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Safe and Orderly School* Scale – Grade 8**

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item							
			BTBG07A	BTBG07B	BTBG07C	BTBG07D	BTBG07E	BTBG07F	BTBG07G	BTBG07H
<b>Benchmarking Participants</b>										
Ontario, Canada	0.89	58	0.61	0.69	0.69	0.87	0.84	0.86	0.75	0.74
Quebec, Canada	0.87	54	0.56	0.72	0.80	0.80	0.73	0.77	0.75	0.71
Moscow City, Russian Fed.	0.87	52	0.58	0.64	0.68	0.81	0.79	0.79	0.68	0.79
Gauteng, RSA (9)	0.88	55	0.64	0.77	0.81	0.81	0.78	0.83	0.55	0.71
Western Cape, RSA (9)	0.89	57	0.75	0.83	0.74	0.81	0.76	0.80	0.63	0.68
Abu Dhabi, UAE	0.90	59	0.52	0.59	0.67	0.86	0.87	0.88	0.80	0.85
Dubai, UAE	0.87	54	0.49	0.60	0.60	0.84	0.85	0.79	0.79	0.83

### Relationship Between the TIMSS 2019 *Safe and Orderly School* Scale and TIMSS 2019 Achievement – Grade 8

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
Australia	0.26	0.07	0.05	0.23	0.05	0.03
Bahrain	0.05	0.00	0.01	0.16	0.03	0.02
Chile	0.27	0.07	0.10	0.24	0.06	0.05
Chinese Taipei	0.07	0.00	0.00	0.08	0.01	0.01
Cyprus	0.19	0.04	0.03	0.12	0.02	0.01
Egypt	0.15	0.02	0.02	0.08	0.01	0.01
England	0.14	0.02	0.02	0.09	0.01	0.01
Finland	0.11	0.01	0.01	0.11	0.01	0.01
France	0.18	0.03	0.04	0.21	0.04	0.04
Georgia	0.05	0.00	0.00	0.05	0.00	0.00
Hong Kong SAR	0.17	0.03	0.02	0.08	0.01	0.01
Hungary	0.22	0.05	0.04	0.20	0.04	0.03
Iran, Islamic Rep. of	0.13	0.02	0.01	0.13	0.02	0.02
Ireland	0.26	0.07	0.06	0.22	0.05	0.04
Israel	0.21	0.04	0.06	0.09	0.01	0.02
Italy	0.10	0.01	0.02	0.07	0.01	0.01
Japan	0.08	0.01	0.01	0.04	0.00	0.00
Jordan	0.18	0.03	0.03	0.22	0.05	0.02
Kazakhstan	-0.01	0.00	0.00	0.05	0.00	0.01
Korea, Rep. of	0.04	0.00	0.00	0.05	0.00	0.00
Kuwait	0.16	0.03	0.00	0.15	0.02	0.00
Lebanon	0.24	0.06	0.06	0.21	0.04	0.05
Lithuania	0.11	0.01	0.00	0.06	0.00	0.00
Malaysia	0.15	0.02	0.01	0.22	0.05	0.03
Morocco	0.12	0.01	0.01	0.06	0.00	0.00
New Zealand	0.27	0.07	0.06	0.20	0.04	0.03
Norway (9)	0.12	0.01	0.01	0.12	0.01	0.01
Oman	0.08	0.01	0.00	0.14	0.02	0.02
Portugal	0.16	0.02	0.02	0.12	0.01	0.01
Qatar	0.14	0.02	0.01	0.06	0.00	0.00
Romania	0.10	0.01	0.01	0.15	0.02	0.01
Russian Federation	0.01	0.00	0.00	0.08	0.01	0.01
Saudi Arabia	0.09	0.01	0.01	0.17	0.03	0.02
Singapore	0.12	0.01	0.00	0.14	0.02	0.01
South Africa (9)	0.21	0.05	0.04	0.13	0.02	0.02
Sweden	0.19	0.04	0.03	0.18	0.03	0.03
Turkey	0.11	0.01	0.01	0.18	0.03	0.04
United Arab Emirates	0.31	0.09	0.07	0.33	0.11	0.08
United States	0.20	0.04	0.05	0.25	0.06	0.06
<b>International Median</b>	<b>0.14</b>	<b>0.02</b>	<b>0.01</b>	<b>0.13</b>	<b>0.02</b>	<b>0.01</b>

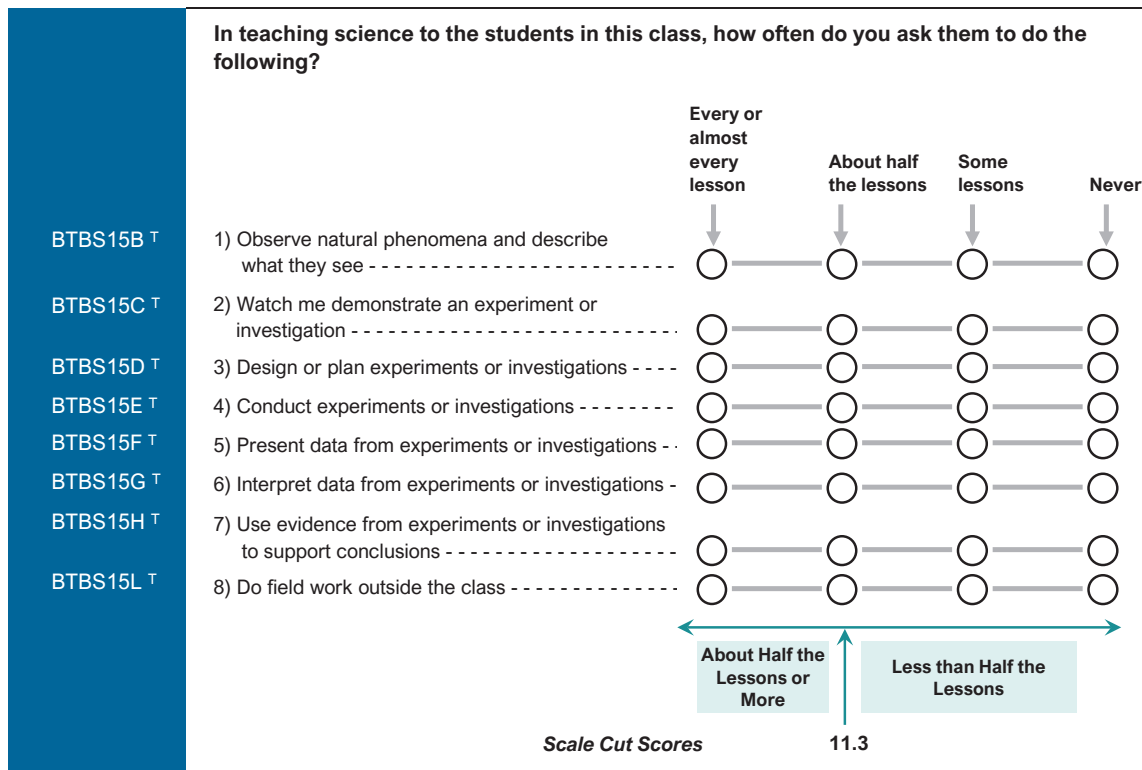
**Relationship Between the TIMSS 2019 *Safe and Orderly School* Scale and TIMSS 2019 Achievement – Grade 8**

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
<b>Benchmarking Participants</b>						
Ontario, Canada	0.20	0.04	0.04	0.19	0.03	0.04
Quebec, Canada	0.18	0.03	0.04	-0.06	0.00	0.02
Moscow City, Russian Fed.	0.13	0.02	0.02	0.09	0.01	0.01
Gauteng, RSA (9)	0.38	0.15	0.12	0.33	0.11	0.08
Western Cape, RSA (9)	0.51	0.26	0.21	0.57	0.33	0.32
Abu Dhabi, UAE	0.43	0.19	0.16	0.39	0.15	0.12
Dubai, UAE	0.19	0.04	0.03	0.20	0.04	0.01

## Teachers' Emphasis on Science Investigation – Grade 8

### About the Scale

The *Teachers' Emphasis on Science Investigation* scale was created based on teachers' responses to eight items listed below.



<sup>1</sup> 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.

<sup>T</sup> Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.



### Item Parameters for the TIMSS 2019 *Teachers' Emphasis on Science Investigation* Scale – Grade 8

Item	delta	tau_1	tau_2	Infit
BTBS15B	-0.94861	-0.86697	0.86697	1.36
BTBS15C	-0.56557	-0.45648	0.45648	1.25
BTBS15D	0.34598	-0.71308	0.71308	0.89
BTBS15E	0.02202	-0.89215	0.89215	0.88
BTBS15F	0.14912	-0.77092	0.77092	0.75
BTBS15G	-0.20789	-0.79691	0.79691	0.76
BTBS15H	-0.49705	-0.80328	0.80328	0.92
BTBS15L	1.70200	-0.19205	0.19205	1.18

### Scale Transformation Constants for the TIMSS 2019 *Teachers' Emphasis on Science Investigation* Scale – Grade 8

#### Scale Transformation Constants

$$A = 11.333349$$

$$B = 1.2708400$$

$$\text{Transformed Scale Score} = 11.333349 + 1.2708400 \cdot \text{Logit Scale Score}$$

### Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019 *Teachers' Emphasis on Science Investigation* Scale – Grade 8

Raw Score	Transformed Scale Score	Cutpoint
0	6.51309	
1	8.03870	
2	8.81776	
3	9.37904	
4	9.83696	
5	10.24200	
6	10.61377	
7	10.96886	
8	11.31862	11.3
9	11.67481	
10	12.04435	
11	12.43721	
12	12.86171	
13	13.33488	
14	13.88949	
15	14.62251	
16	16.03256	

**Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Teachers' Emphasis on Science Investigation Scale* – Grade 8**

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item							
			BTBS15B	BTBS15C	BTBS15D	BTBS15E	BTBS15F	BTBS15G	BTBS15H	BTBS15L
Australia	0.83	47	0.49	0.65	0.63	0.79	0.80	0.84	0.75	0.40
Bahrain	0.88	56	0.50	0.62	0.81	0.89	0.87	0.87	0.84	0.48
Chile	0.88	55	0.49	0.76	0.85	0.87	0.82	0.82	0.75	0.49
Chinese Taipei	0.83	47	0.51	0.58	0.71	0.79	0.82	0.84	0.76	0.26
Cyprus	0.86	56	0.54	0.59	0.81	0.88	0.87	0.90	0.86	0.27
Egypt	0.87	53	0.61	0.42	0.77	0.75	0.84	0.88	0.84	0.60
England	0.76	39	0.43	0.58	0.72	0.69	0.73	0.73	0.70	0.18
Finland	0.85	50	0.54	0.59	0.58	0.88	0.87	0.88	0.86	0.05
France	0.77	40	0.44	0.42	0.72	0.68	0.79	0.77	0.69	0.36
Georgia	0.85	54	0.43	0.60	0.80	0.88	0.90	0.88	0.75	0.47
Hong Kong SAR	0.86	52	0.54	0.69	0.68	0.73	0.84	0.85	0.81	0.52
Hungary	0.83	50	0.60	0.65	0.75	0.76	0.82	0.79	0.67	0.54
Iran, Islamic Rep. of	0.85	51	0.50	0.40	0.77	0.80	0.87	0.86	0.75	0.60
Ireland	0.81	46	0.33	0.29	0.77	0.81	0.88	0.87	0.84	0.14
Israel	0.88	57	0.68	0.58	0.87	0.83	0.88	0.83	0.75	0.54
Italy	0.83	51	0.44	0.55	0.85	0.83	0.86	0.85	0.76	0.33
Japan	0.81	44	0.74	0.66	0.30	0.82	0.84	0.80	0.63	0.07
Jordan	0.83	47	0.54	0.52	0.77	0.79	0.81	0.72	0.70	0.56
Kazakhstan	0.86	52	0.49	0.61	0.81	0.83	0.84	0.84	0.72	0.52
Korea, Rep. of	0.87	54	0.59	0.71	0.78	0.84	0.84	0.81	0.72	0.49
Kuwait	0.84	50	0.28	0.44	0.81	0.87	0.87	0.90	0.80	0.33
Lebanon	0.81	44	0.61	0.56	0.73	0.77	0.76	0.75	0.60	0.45
Lithuania	0.87	57	0.59	0.63	0.84	0.90	0.89	0.80	0.76	0.53
Malaysia	0.89	58	0.67	0.67	0.77	0.84	0.86	0.90	0.76	0.57
Morocco	0.78	40	0.47	0.40	0.71	0.73	0.79	0.77	0.69	0.37
New Zealand	0.80	44	0.47	0.61	0.68	0.68	0.79	0.82	0.80	0.22
Norway (9)	0.76	39	0.54	0.46	0.72	0.73	0.74	0.73	0.63	0.32
Oman	0.82	45	0.48	0.52	0.72	0.85	0.83	0.83	0.64	0.33
Portugal	0.84	51	0.58	0.66	0.81	0.78	0.82	0.79	0.73	0.50
Qatar	0.86	51	0.50	0.67	0.75	0.78	0.85	0.85	0.73	0.51
Romania	0.84	53	0.42	0.63	0.82	0.87	0.88	0.86	0.80	0.27
Russian Federation	0.90	61	0.61	0.66	0.85	0.89	0.90	0.87	0.76	0.63
Saudi Arabia	0.86	53	0.48	0.47	0.81	0.83	0.89	0.89	0.84	0.44
Singapore	0.78	43	0.47	0.57	0.58	0.72	0.83	0.79	0.70	0.45
South Africa (9)	0.90	59	0.61	0.71	0.80	0.85	0.87	0.85	0.83	0.53
Sweden	0.85	51	0.44	0.53	0.78	0.85	0.89	0.85	0.78	0.41
Turkey	0.91	61	0.62	0.64	0.82	0.89	0.88	0.87	0.80	0.67
United Arab Emirates	0.89	57	0.58	0.64	0.84	0.84	0.87	0.86	0.76	0.54
United States	0.84	48	0.57	0.46	0.71	0.82	0.86	0.85	0.76	0.33

**Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Teachers' Emphasis on Science Investigation Scale* – Grade 8**

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item							
			BTBS15B	BTBS15C	BTBS15D	BTBS15E	BTBS15F	BTBS15G	BTBS15H	BTBS15L
<b>Benchmarking Participants</b>										
Ontario, Canada	0.90	61	0.46	0.73	0.88	0.88	0.90	0.91	0.75	0.64
Quebec, Canada	0.62	-	-	-	-	-	-	-	-	-
Moscow City, Russian Fed.	0.87	56	0.56	0.58	0.83	0.88	0.88	0.88	0.77	0.48
Gauteng, RSA (9)	0.91	62	0.70	0.75	0.80	0.87	0.86	0.84	0.85	0.58
Western Cape, RSA (9)	0.90	60	0.63	0.67	0.81	0.87	0.88	0.88	0.87	0.49
Abu Dhabi, UAE	0.90	61	0.60	0.70	0.84	0.86	0.89	0.90	0.80	0.54
Dubai, UAE	0.87	54	0.56	0.59	0.85	0.76	0.86	0.85	0.79	0.52

A dash (-) indicates comparable data not available.

### Relationship Between the TIMSS 2019 *Teachers' Emphasis on Science Investigation* Scale and TIMSS 2019 Achievement – Grade 8

Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
Australia	0.06	0.00	0.00
Bahrain	-0.01	0.00	0.00
Chile	-0.06	0.00	0.00
Chinese Taipei	0.01	0.00	0.00
Cyprus	-0.10	0.01	0.00
Egypt	0.12	0.01	0.01
England	-0.06	0.00	0.01
Finland	0.04	0.00	0.00
France	0.07	0.00	0.00
Georgia	-0.01	0.00	0.00
Hong Kong SAR	0.12	0.01	0.01
Hungary	0.04	0.00	0.00
Iran, Islamic Rep. of	0.04	0.00	0.00
Ireland	0.02	0.00	0.00
Israel	0.00	0.00	0.00
Italy	-0.06	0.00	0.00
Japan	0.02	0.00	0.00
Jordan	0.04	0.00	0.00
Kazakhstan	0.00	0.00	0.00
Korea, Rep. of	0.03	0.00	0.00
Kuwait	-0.05	0.00	0.01
Lebanon	-0.03	0.00	0.00
Lithuania	-0.01	0.00	0.00
Malaysia	0.09	0.01	0.01
Morocco	0.02	0.00	0.00
New Zealand	0.05	0.00	0.00
Norway (9)	0.04	0.00	0.00
Oman	0.03	0.00	0.00
Portugal	0.01	0.00	0.00
Qatar	0.01	0.00	0.00
Romania	0.03	0.00	0.00
Russian Federation	0.05	0.00	0.00
Saudi Arabia	0.12	0.01	0.00
Singapore	0.08	0.01	0.00
South Africa (9)	-0.03	0.00	0.00
Sweden	-0.01	0.00	0.00
Turkey	0.05	0.00	0.00
United Arab Emirates	0.11	0.01	0.01
United States	0.13	0.02	0.00
<b>International Median</b>	<b>0.03</b>	<b>0.00</b>	<b>0.00</b>

**Relationship Between the TIMSS 2019 *Teachers' Emphasis on Science Investigation* Scale and TIMSS 2019 Achievement – Grade 8**

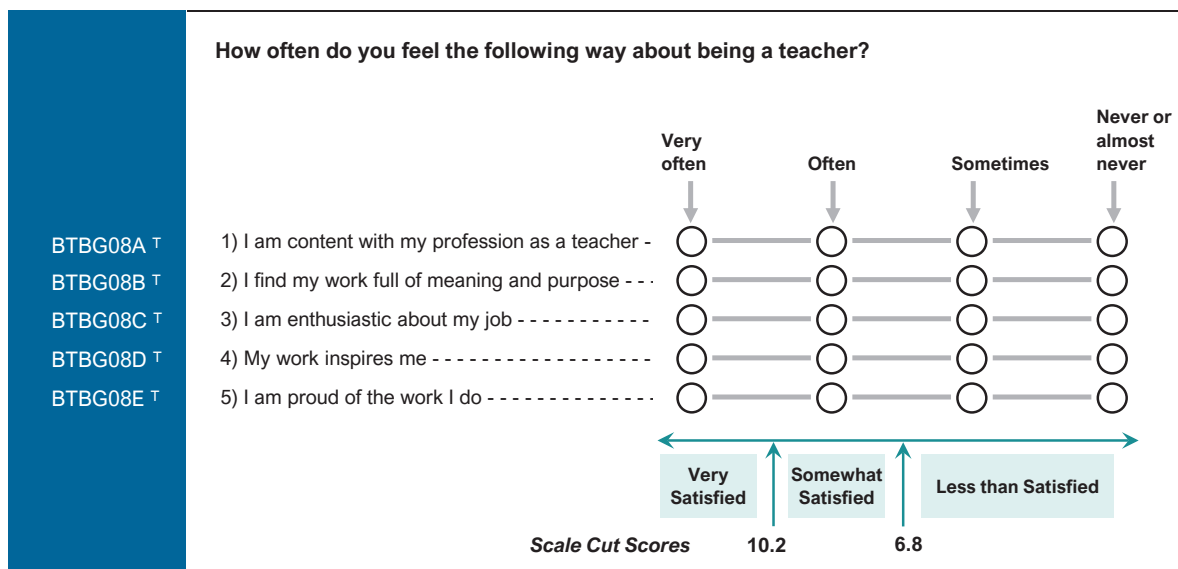
Country	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$	
<b>Benchmarking Participants</b>			
Ontario, Canada	0.01	0.00	0.00
Quebec, Canada	-	-	-
Moscow City, Russian Fed.	0.06	0.00	0.00
Gauteng, RSA (9)	-0.08	0.01	0.00
Western Cape, RSA (9)	-0.01	0.00	0.01
Abu Dhabi, UAE	0.24	0.06	0.04
Dubai, UAE	-0.08	0.01	0.00

A dash (–) indicates comparable data not available.

## Teachers' Job Satisfaction – Grade 8

### About the Scale

The *Teachers' Job Satisfaction* scale was created based on students' responses to five items listed below.<sup>1</sup>



<sup>1</sup> 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.

<sup>T</sup> Trend item—item was included in the same scale in TIMSS 2015 and was used for linking the TIMSS 2015 and TIMSS 2019 scales.

### Item Parameters for the TIMSS 2019 *Teachers' Job Satisfaction* Scale – Grade 8

Item	delta	tau_1	tau_2	Infit
BTBG08A	0.21265	-2.26347	2.26347	1.09
BTBG08B	-0.61570	-2.17906	2.17906	1.04
BTBG08C	0.10008	-2.26113	2.26113	0.93
BTBG08D	0.65284	-2.20301	2.20301	0.95
BTBG08E	-0.34987	-1.96126	1.96126	1.13

### Scale Transformation Constants for the TIMSS 2019 *Teachers' Job Satisfaction* Scale – Grade 8

#### Scale Transformation Constants

$$A = 8.497121$$

$$B = 0.691344$$

$$\text{Transformed Scale Score} = 8.497121 + 0.691344 \cdot \text{Logit Scale Score}$$

### Equivalence Table of the Raw Score and Transformed Scale Scores for the TIMSS 2019 *Teachers' Job Satisfaction* Scale – Grade 8

Raw Score	Transformed Scale Score	Cutpoint
0	5.28118	
1	6.19622	
2	6.74486	6.8
3	7.21969	
4	7.74231	
5	8.48286	
6	9.22836	
7	9.76930	
8	10.25874	10.2
9	10.82007	
10	11.74559	

### Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Teachers' Job Satisfaction Scale – Grade 8*

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item				
			BTBG08A	BTBG08B	BTBG08C	BTBG08D	BTBG08E
Australia	0.91	74	0.86	0.89	0.91	0.90	0.75
Bahrain	0.89	69	0.82	0.78	0.89	0.86	0.82
Chile	0.88	68	0.84	0.80	0.80	0.89	0.79
Chinese Taipei	0.93	78	0.89	0.91	0.90	0.84	0.87
Cyprus	0.93	78	0.87	0.92	0.89	0.89	0.83
Egypt	0.83	60	0.80	0.73	0.82	0.74	0.79
England	0.89	69	0.84	0.87	0.88	0.84	0.71
Finland	0.92	76	0.88	0.84	0.91	0.87	0.86
France	0.89	70	0.82	0.77	0.89	0.86	0.82
Georgia	0.78	54	0.71	0.71	0.69	0.75	0.80
Hong Kong SAR	0.91	75	0.87	0.87	0.87	0.85	0.87
Hungary	0.91	73	0.85	0.84	0.86	0.87	0.85
Iran, Islamic Rep. of	0.88	68	0.82	0.81	0.86	0.84	0.77
Ireland	0.91	74	0.84	0.88	0.90	0.86	0.81
Israel	0.90	72	0.83	0.84	0.87	0.87	0.83
Italy	0.88	68	0.81	0.78	0.87	0.84	0.83
Japan	0.90	72	0.85	0.86	0.83	0.88	0.82
Jordan	0.91	73	0.80	0.86	0.89	0.88	0.85
Kazakhstan	0.86	65	0.75	0.81	0.80	0.84	0.82
Korea, Rep. of	0.94	80	0.88	0.89	0.88	0.92	0.91
Kuwait	0.80	57	0.73	0.69	0.84	0.81	0.70
Lebanon	0.81	56	0.72	0.68	0.83	0.80	0.71
Lithuania	0.90	72	0.85	0.74	0.89	0.89	0.86
Malaysia	0.94	80	0.90	0.90	0.90	0.90	0.89
Morocco	0.89	69	0.83	0.80	0.88	0.85	0.80
New Zealand	0.91	73	0.83	0.87	0.88	0.88	0.81
Norway (9)	0.89	69	0.78	0.82	0.82	0.88	0.84
Oman	0.90	72	0.87	0.79	0.88	0.87	0.84
Portugal	0.90	72	0.86	0.85	0.88	0.89	0.74
Qatar	0.89	69	0.85	0.75	0.87	0.87	0.82
Romania	0.91	75	0.84	0.87	0.88	0.88	0.85
Russian Federation	0.89	69	0.83	0.74	0.86	0.88	0.85
Saudi Arabia	0.84	65	0.81	0.78	0.85	0.86	0.71
Singapore	0.95	83	0.89	0.90	0.93	0.92	0.91
South Africa (9)	0.89	69	0.78	0.85	0.85	0.86	0.82
Sweden	0.88	68	0.82	0.77	0.87	0.88	0.79
Turkey	0.92	77	0.85	0.85	0.92	0.91	0.86
United Arab Emirates	0.90	72	0.78	0.85	0.90	0.88	0.83
United States	0.93	78	0.85	0.92	0.92	0.92	0.83



**Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS 2019 *Teachers' Job Satisfaction Scale* – Grade 8**

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item				
			BTBG08A	BTBG08B	BTBG08C	BTBG08D	BTBG08E
<b>Benchmarking Participants</b>							
Ontario, Canada	0.92	75	0.83	0.86	0.90	0.88	0.87
Quebec, Canada	0.89	70	0.82	0.79	0.86	0.86	0.85
Moscow City, Russian Fed.	0.89	70	0.83	0.79	0.88	0.88	0.81
Gauteng, RSA (9)	0.90	72	0.79	0.87	0.87	0.87	0.83
Western Cape, RSA (9)	0.88	69	0.83	0.88	0.86	0.83	0.74
Abu Dhabi, UAE	0.91	74	0.80	0.90	0.90	0.87	0.84
Dubai, UAE	0.91	74	0.79	0.85	0.91	0.90	0.84

### Relationship Between the TIMSS 2019 Teachers' Job Satisfaction Scale and TIMSS 2019 Achievement – Grade 8

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
Australia	0.12	0.01	0.02	0.07	0.00	0.00
Bahrain	0.03	0.00	0.00	0.10	0.01	0.01
Chile	0.01	0.00	0.01	0.04	0.00	0.01
Chinese Taipei	0.04	0.00	0.00	0.01	0.00	0.00
Cyprus	0.04	0.00	0.01	0.04	0.00	0.00
Egypt	0.17	0.03	0.03	0.05	0.00	0.01
England	0.19	0.04	0.05	0.11	0.01	0.01
Finland	0.03	0.00	0.00	0.03	0.00	0.00
France	0.01	0.00	0.00	0.06	0.00	0.00
Georgia	-0.06	0.00	0.00	0.03	0.00	0.00
Hong Kong SAR	0.08	0.01	0.00	0.05	0.00	0.01
Hungary	0.14	0.02	0.02	0.07	0.01	0.01
Iran, Islamic Rep. of	0.04	0.00	0.00	0.02	0.00	0.01
Ireland	0.13	0.02	0.01	0.10	0.01	0.01
Israel	0.04	0.00	0.01	0.05	0.00	0.00
Italy	0.01	0.00	0.00	-0.02	0.00	0.00
Japan	0.08	0.01	0.00	0.02	0.00	0.00
Jordan	0.04	0.00	0.00	0.22	0.05	0.04
Kazakhstan	-0.12	0.01	0.02	-0.07	0.00	0.00
Korea, Rep. of	-0.02	0.00	0.00	0.06	0.00	0.00
Kuwait	-0.04	0.00	0.00	0.08	0.01	0.01
Lebanon	0.11	0.01	0.01	0.09	0.01	0.01
Lithuania	0.06	0.00	0.00	0.07	0.00	0.01
Malaysia	-0.03	0.00	0.00	0.10	0.01	0.02
Morocco	0.07	0.00	0.01	-0.01	0.00	0.00
New Zealand	0.00	0.00	0.00	0.03	0.00	0.00
Norway (9)	0.04	0.00	0.00	0.00	0.00	0.00
Oman	0.08	0.01	0.00	0.11	0.01	0.01
Portugal	0.08	0.01	0.00	0.04	0.00	0.00
Qatar	0.08	0.01	0.01	-0.04	0.00	0.00
Romania	0.06	0.00	0.01	0.10	0.01	0.01
Russian Federation	0.05	0.00	0.00	0.06	0.00	0.00
Saudi Arabia	-0.03	0.00	0.00	0.10	0.01	0.02
Singapore	0.12	0.01	0.01	0.06	0.00	0.00
South Africa (9)	0.00	0.00	0.00	-0.02	0.00	0.00
Sweden	0.03	0.00	0.00	0.04	0.00	0.00
Turkey	0.03	0.00	0.01	0.11	0.01	0.01
United Arab Emirates	0.18	0.03	0.03	0.13	0.02	0.01
United States	0.05	0.00	0.00	0.11	0.01	0.01
<b>International Median</b>	<b>0.04</b>	<b>0.00</b>	<b>0.00</b>	<b>0.06</b>	<b>0.00</b>	<b>0.00</b>

**Relationship Between the TIMSS 2019 Teachers' Job Satisfaction Scale and TIMSS 2019 Achievement – Grade 8**

Country	Pearson's Correlation with Mathematics Achievement		Variance in Mathematics Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )	Pearson's Correlation with Science Achievement		Variance in Science Achievement Accounted for by Difference Between Regions of the Scale ( $\eta^2$ )
	$r$	$r^2$		$r$	$r^2$	
<b>Benchmarking Participants</b>						
Ontario, Canada	0.01	0.00	0.00	0.04	0.00	0.00
Quebec, Canada	0.08	0.01	0.01	-0.05	0.00	0.02
Moscow City, Russian Fed.	0.14	0.02	0.02	0.02	0.00	0.00
Gauteng, RSA (9)	0.02	0.00	0.00	-0.08	0.01	0.01
Western Cape, RSA (9)	0.01	0.00	0.00	0.21	0.04	0.03
Abu Dhabi, UAE	0.25	0.06	0.04	0.21	0.05	0.03
Dubai, UAE	0.08	0.01	0.01	0.05	0.00	0.01