U.S. Technical Report and User Guide for the 2019 Trends in International Mathematics and Science Study (TIMSS) (continued)

Appendix E

TIMSS 2019 Questionnaire Adaptations

Appendix E: TIMSS 2019 Questionnaire Adaptations

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Exhibit E-1. TIMSS 2019 Grade 4 School Questionnaire

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	Item	National Item Number	Item	Recoding instructions
School Enrollment and Characteristics				
ScQ-01	**What is the total enrollment of students in your school as of <first day of month TIMSS testing begins, 2019>?** *Write in the number.* _____ students	ScQ-01	April 1, 2019	
ScQ-02	**What is the total enrollment of <fourth grade> students in your school as of <first day of month TIMSS testing begins, 2019>?** *Write in the number.* _____ students	ScQ-02	fourth-grade April 1, 2019	
ScQ-03	**Approximately what percentage of students in your school have the following backgrounds?** *Check **one** circle for each line.* 1. 0 to 10% 2. 11 to 25% 3. 26 to 50% 4. More than 50%	ScQ-03		
ScQ-03a	Come from economically disadvantaged homes	ScQ-03a		
ScQ-03b	Come from economically affluent homes	ScQ-03b		
		ScQ-04	**Around the 1st of October 2018, what percentage of students at this school were eligible to receive free or reduced-price lunches through the National School Lunch Program?** _____ percentage of students *Write in the number.*	
ScQ-04	**Approximately what percentage of students in your school have <language of test> as their native language?** *Check **one** circle only.* 1. More than 90% 2. 76 to 90% 3. 51 to 75% 4. 26 to 50% 5. 25% or less	ScQ-05	English	
		ScQ-06	**Of the students currently enrolled in your school, what percentage has been identified as limited-English proficient (LEP)/English language learners (ELL)?** *Fill in **one** circle only.* 1. 0% 2. 1-5% 3. 6-10% 4. 11-25% 5. 26-50% 6. 51-75% 7. 76-90% 8. Over 90%	

Exhibit E-1. TIMSS 2019 Grade 4 School Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
		ScQ-07	**What type of school is this?** *Fill in **one** circle only.* 1. Regular public school 2. A regular public school with a magnet program 3. A magnet school or school with a special program emphasis (e.g., Montessori, science/math school, performing arts school, talented/gifted school, foreign language immersion school) 4. Special education: a school that primarily serves students with disabilities 5. Alternative: a school designed to address the needs of students, typically at risk of educational failure, which cannot be met in regular schools 6. Vocational 7. Charter school 8. Private (independent) 9. Private (religiously affiliated) 10. Other	
ScQ-05A	**How many people live in the city, town, or area where your school is located?** *Check **one** circle only.* 1. More than 500,001 people 2. 100,001 to 500,000 people 3. 50,001 to 100,000 people 4. 30,001 to 50,000 people 5. 15,001 to 30,000 people 6. 3,001 to 15,000 people 7. 3,000 people or fewer	ScQ-08A		
ScQ-05B	**Which best describes the immediate area in which your school is located?** *Check **one** circle only.* 1. Urban–Densely populated 2. Suburban–On fringe or outskirts of urban area 3. Medium size city or large town 4. Small town or village 5. Remote rural	ScQ-08B		
		ScQ-09	**Which best characterizes the average income level of the school's immediate area?** *Fill in **one** circle only.* 1. High 2. Medium 3. Low	
Instructional Time				
ScQ-06A	**For the <fourth grade> students in your school:** **How many <u>days per year</u> is your school open for instruction?** *Write in the number.* _____days	ScQ-10A	fourth-grade	

Exhibit E-1. TIMSS 2019 Grade 4 School Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
ScQ-06B	**What is the total instructional time, excluding breaks, in a typical day?** *Write in the number of minutes per day. Please convert the number of hours into minutes.* _____ minutes	ScQ-10B	**What is the total instructional time, excluding breaks, in a typical day?** _____hours _____minutes *Write in the number of hours and minutes per day*	(Hours x 60) + Minutes
ScQ-06C	**In one calendar week, how many days is the school open for instruction?** *Check **one** circle only.* 1. 6 days 2. 5 1/2 days 3. 5 days 4. 4 1/2 days 5. 4 days 6. Other	ScQ-10C		
Resources and Technology				
ScQ-07	**How many computers (including tablets) does your school have for use by <fourth grade> students?** *Write in the number.* _____ computers	ScQ-11	fourth-grade	
ScQ-08A	**Does your school have a science laboratory that can be used by <fourth grade> students?** *Check **one** circle only.* 1. Yes 2. No	ScQ-12A	fourth-grade	
ScQ-08B	**Do teachers usually have assistance available when students are conducting science experiments?** *Check **one** circle only.* 1. Yes 2. No	ScQ-12B		
ScQ-09	**Does your school use an online learning management system to support learning (e.g., teacher-student communication, management of grades, student access to course materials)?** *Check **one** circle only.* 1. Yes 2. No	ScQ-13		
ScQ-10A	**Does your school have a school library?** *Check **one** circle only.* 1. Yes 2. No (If No, go to #11)	ScQ-14A	**Does your school have a school library?** *Fill in one circle only.* 1. Yes 2. No (If No, go to question 15)	
ScQ-10B	**If Yes,** **Approximately how many books (print) with different titles does your school library have (exclude magazines and periodicals)?** *Check **one** circle only.* 1. 2,000 books or fewer 2. More than 2,000 books	ScQ-14B		

Exhibit E-1. TIMSS 2019 Grade 4 School Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	Item	National Item Number	Item	Recoding instructions
ScQ-11	**Does your school have classroom libraries?** *Check **one** circle only.* 1. Yes 2. No	ScQ-15		
ScQ-12	**Does your school provide students access to digital learning resources (e.g., books, videos)?** *Check **one** circle only.* 1. Yes 2. No	ScQ-16		
ScQ-13	**How much is your school's capacity to provide instruction affected by a shortage or inadequacy of the following?** *Check **one** circle for each line.* 1. Not at all 2. A little 3. Some 4. A lot	ScQ-17		
ScQ-13A	**General School Resources**	ScQ-17A		
ScQ-13Aa	Instructional materials (e.g., textbooks)	ScQ-17Aa		
ScQ-13Ab	Supplies (e.g., papers, pencils, materials)	ScQ-17Ab		
ScQ-13Ac	School buildings and grounds	ScQ-17Ac		
ScQ-13Ad	Heating/cooling and lighting systems	ScQ-17Ad		
ScQ-13Ae	Instructional space (e.g., classrooms)	ScQ-17Ae		
ScQ-13Af	Technologically competent staff	ScQ-17Af		
ScQ-13Ag	Audio-visual resources for delivery of instruction (e.g., interactive white boards, digital projectors)	ScQ-17Ag		
ScQ-13Ah	Computer technology for teaching and learning (e.g., computers or tablets for student use)	ScQ-17Ah		
ScQ-13Ai	Resources for students with disabilities	ScQ-17Ai		
ScQ-13B	**Resources for Mathematics Instruction**	ScQ-17B		
ScQ-13Ba	Teachers with a specialization in mathematics	ScQ-17Ba		
ScQ-13Bb	Computer software/applications for mathematics instruction	ScQ-17Bb		
ScQ-13Bc	Library resources relevant to mathematics instruction	ScQ-17Bc		
ScQ-13Bd	Calculators for mathematics instruction	ScQ-17Bd		
ScQ-13Be	Concrete objects or materials to help students understand quantities or procedures	ScQ-17Be		
ScQ-13C	**Resources for Science Instruction**	ScQ-17C		
ScQ-13Ca	Teachers with a specialization in science	ScQ-17Ca		
ScQ-13Cb	Computer software/applications for science instruction	ScQ-17Cb		
ScQ-13Cc	Library resources relevant to science instruction	ScQ-17Cc		
ScQ-13Cd	Science equipment and materials for experiments	ScQ-17Cd		

Exhibit E-1. TIMSS 2019 Grade 4 School Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	Item	National Item Number	Item	Recoding instructions
School Emphasis on Academic Success				
ScQ-14	**How would you characterize each of the following within your school?** *Check **one** circle for each line.* 1. Very high 2. High 3. Medium 4. Low 5. Very low	ScQ-18		
ScQ-14a	Teachers' understanding of the school's curricular goals	ScQ-18a		
ScQ-14b	Teachers' degree of success in implementing the school's curriculum	ScQ-18b		
ScQ-14c	Teachers' expectations for student achievement	ScQ-18c		
ScQ-14d	Teachers' ability to inspire students	ScQ-18d		
ScQ-14e	Parental involvement in school activities	ScQ-18e		
ScQ-14f	Parental commitment to ensure that students are ready to learn	ScQ-18f		
ScQ-14g	Parental expectations for student achievement	ScQ-18g		
ScQ-14h	Parental support for student achievement	ScQ-18h		
ScQ-14i	Students' desire to do well in school	ScQ-18i		
ScQ-14j	Students' ability to reach school's academic goals	ScQ-18j		
ScQ-14k	Students' respect for classmates who excel academically	ScQ-18k		
School Discipline and Safety				
ScQ-15	**To what degree is each of the following a problem among <fourth grade> students in your school?** *Check **one** circle for each line.* 1. Not a problem 2. Minor problem 3. Moderate problem 4. Serious problem	ScQ-19	fourth-grade	
ScQ-15a	Arriving late at school	ScQ-19a		
ScQ-15b	Absenteeism (i.e., unjustified absences)	ScQ-19b		
ScQ-15c	Classroom disturbance	ScQ-19c		
ScQ-15d	Cheating	ScQ-19d		
ScQ-15e	Profanity	ScQ-19e		
ScQ-15f	Vandalism	ScQ-19f		
ScQ-15g	Theft	ScQ-19g		
ScQ-15h	Intimidation or verbal abuse among students (including texting, emailing, etc.)	ScQ-19h		
ScQ-15i	Physical fights among students	ScQ-19i		
ScQ-15j	Intimidation or verbal abuse of teachers or staff (including texting, emailing, etc.)	ScQ-19j		
ScQ-16	**To what degree is each of the following a problem among teachers in your school?** *Check **one** circle for each line.* 1. Not a problem 2. Minor problem 3. Moderate problem 4. Serious problem	ScQ-20		

Exhibit E-1. TIMSS 2019 Grade 4 School Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
ScQ-16a	Arriving late or leaving early	ScQ-20a		
ScQ-16b	Absenteeism	ScQ-20b		
Teachers In Your School				
		ScQ-21	**In your school, are any of the following used to evaluate the practice of fourth-grade teachers?** *Fill in only one circle for each row.* 1. Yes 2. No	
		ScQ-21a	Observations by the principal or senior staff	
		ScQ-21b	Observations by inspectors or other persons external to the school	
		ScQ-21c	Student achievement	
		ScQ-21d	Teacher peer review	
School Readiness				
ScQ-17	**About how many of the students in your school can do the following when they begin the <first grade> of primary/elementary school?** *Check **one** circle for each line.* 1. Less than 25% 2. 25–50% 3. 51–75% 4. More than 75%	ScQ-22	first grade	
ScQ-17a	Recognize most of the letters of the alphabet	ScQ-22a		
ScQ-17b	Read some words	ScQ-22b		
ScQ-17c	Read sentences	ScQ-22c		
ScQ-17d	Write letters of the alphabet	ScQ-22d		
ScQ-17e	Write their names	ScQ-22e		
ScQ-17f	Write words other than their names	ScQ-22f		
ScQ-17g	Count up to 100 or higher	ScQ-22g		
ScQ-17h	Recognize written numbers from 1-10	ScQ-22h		
ScQ-17i	Recognize written numbers higher than 10	ScQ-22i		
ScQ-17j	Write numbers from 1-10	ScQ-22j		
ScQ-17k	Do simple addition	ScQ-22k		
ScQ-17l	Do simple subtraction	ScQ-22l		
Principal Experience and Education				
ScQ-18	**By the end of this school year, how many years will you have been a principal altogether?** *Please **round** to the nearest whole number.* _____ years	ScQ-23	**By the end of this school year, how many years altogether will you have been a principal?** _____years *Please round to the nearest whole number.*	
ScQ-19	**By the end of this school year, how many years will you have been a principal at this school?** *Please **round** to the nearest whole number.* _____ years	ScQ-24		

Exhibit E-1. TIMSS 2019 Grade 4 School Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
ScQ-20	**What is the highest level of formal education you have completed?** *Check **one** circle only.* 1. Did not complete <Bachelor's or equivalent level—ISCED Level 6> 2. <Bachelor's or equivalent level—ISCED Level 6> 3. <Master's or equivalent level—ISCED Level 7> 4. <Doctor or equivalent level—ISCED Level 8>	ScQ-25	**What is the highest level of formal education you have completed?** *Fill in one circle only.* 1. Did not complete Bachelor's degree (4-year college program) 2. Bachelor's degree (4-year college program) 3. Master's degree or professional degree (MD, DDS, lawyer, minister) 4. Doctorate (Ph.D., Ed.D.)	Nat -> Int 1 -> 1 2 -> 2 3 -> 3 4 -> 4
ScQ-21	**Do you hold the following qualifications or credentials in <u>educational leadership</u>?** *Check **one** circle for each line.* 1. Yes 2. No	ScQ-26		
ScQ-21a	<Certificate or license>	ScQ-26a	Principal Certification	
ScQ-21b	<Master's or equivalent level—ISCED Level 7>	ScQ-26b	Master's degree or professional degree (MD, DDS, lawyer, minister)	
ScQ-21c	<Doctor or equivalent level—ISCED Level 8>	ScQ-26c	Doctorate (Ph.D., Ed.D.)	

Exhibit E-2. TIMSS 2019 Grade 4 Teacher Questionnaire

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
About You				
		TQG-01	**What year did you start teaching?** _____ *Please write in a year.*	
TQG-01	**By the end of this school year, how many years will you have been teaching altogether?** *Please **round** to the nearest whole number.* _____ years	TQG-02	**At the end of this school year, how many years will you have taught altogether?** _____ years *Please **round** to the nearest whole number.*	
TQG-02	**Are you female or male?** *Check **one** circle only.* 1. Female 2. Male	TQG-03		
TQG-03	**How old are you?** *Check **one** circle only.* 1. Under 25 2. 25–29 3. 30–39 4. 40–49 5. 50–59 6. 60 or more	TQG-04		
TQG-04	**What is the highest level of formal education you have completed?** *Check **one** circle only.* 1. Did not complete <Upper secondary education—ISCED Level 3> 2. <Upper secondary education—ISCED Level 3> **(If you have not completed <post-secondary or tertiary education>, go to #G6)** 3. <Post-secondary, non-tertiary education—ISCED Level 4> 4. <Short-cycle tertiary education—ISCED Level 5> 5. <Bachelor's or equivalent level—ISCED Level 6> 6. <Master's or equivalent level—ISCED Level 7> 7. <Doctor or equivalent level—ISCED Level 8>	TQG-05	**What is the highest level of formal education you have completed?** *Fill in **one** circle only.* 1. Did not complete high school 2. High school graduate (If you have not completed more than high school, go to question 7) 3. Associate's degree (2-year college program) 4. Bachelor's degree (4-year college program) 5. Master's degree or professional degree (MD, DDS, lawyer, minister) 6. Doctorate (Ph.D., Ed.D.)	Nat -> Int 1 -> 1 2 -> 2 3 -> 4 4 -> 5 5 -> 6 6 -> 7 International Category 3 (ISCED Level 4) is not administered
TQG-05A	**During your <post-secondary> education, what was your major or main area(s) of study?** *Check **one** circle for each line.* 1. Yes 2. No	TQG-06A	college or university	
TQG-05Aa	Education—Primary/Elementary	TQG-06Aa		
TQG-05Ab	Education—Secondary	TQG-06Ab		
TQG-05Ac	Mathematics	TQG-06Ac		
TQG-05Ad	Science	TQG-06Ad		
TQG-05Ae	<language of test>	TQG-06Ae	English	
TQG-05Af	Other	TQG-06Af		

Exhibit E-2. TIMSS 2019 Grade 4 Teacher Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
TQG-05B	**If your major or main area of study was education, did you have a <specialization> in any of the following?** *Check **one** circle for each line.* 1. Yes 2. No	TQG-06B	specialization	
TQG-05Ba	Mathematics	TQG-06Ba		
TQG-05Bb	Science	TQG-06Bb		
TQG-05Bc	Language/reading	TQG-06Bc		
TQG-05Bd	Other subject	TQG-06Bd		
School Emphasis on Academic Success				
TQG-06	**How would you characterize each of the following within your school?** *Check **one** circle for each line.* 1. Very high 2. High 3. Medium 4. Low 5. Very low	TQG-07		
TQG-06a	Teachers' understanding of the school's curricular goals	TQG-07a		
TQG-06b	Teachers' degree of success in implementing the school's curriculum	TQG-07b		
TQG-06c	Teachers' expectations for student achievement	TQG-07c		
TQG-06d	Teachers' ability to inspire students	TQG-07d		
TQG-06e	Parental involvement in school activities	TQG-07e		
TQG-06f	Parental commitment to ensure that students are ready to learn	TQG-07f		
TQG-06g	Parental expectations for student achievement	TQG-07g		
TQG-06h	Parental support for student achievement	TQG-07h		
TQG-06i	Students' desire to do well in school	TQG-07i		
TQG-06j	Students' ability to reach school's academic goals	TQG-07j		
TQG-06k	Students' respect for classmates who excel academically	TQG-07k		
TQG-06l	Collaboration between school leadership (including master teachers) and teachers to plan instruction	TQG-07l		
School Environment				
TQG-07	**Thinking about your current school, indicate the extent to which you agree or disagree with each of the following statements.** *Check **one** circle for each line.* 1. Agree a lot 2. Agree a little 3. Disagree a little 4. Disagree a lot	TQG-08		
TQG-07a	This school is located in a safe neighborhood	TQG-08a		
TQG-07b	I feel safe at this school	TQG-08b		
TQG-07c	This school's security policies and practices are sufficient	TQG-08c		

Exhibit E-2. TIMSS 2019 Grade 4 Teacher Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
TQG-07d	The students behave in an orderly manner	TQG-08d		
TQG-07e	The students are respectful of the teachers	TQG-08e		
TQG-07f	The students respect school property	TQG-08f		
TQG-07g	This school has clear rules about student conduct	TQG-08g		
TQG-07h	This school's rules are enforced in a fair and consistent manner	TQG-08h		
About Being a Teacher				
TQG-08	**How often do you feel the following way about being a teacher?** *Check **one** circle for each line.* 1. Very often 2. Often 3. Sometimes 4. Never or almost never	TQG-09		
TQG-08a	I am content with my profession as a teacher	TQG-09a		
TQG-08b	I find my work full of meaning and purpose	TQG-09b		
TQG-08c	I am enthusiastic about my job	TQG-09c		
TQG-08d	My work inspires me	TQG-09d		
TQG-08e	I am proud of the work I do	TQG-09e		
TQG-09	**Indicate the extent to which you agree or disagree with each of the following statements.** *Check **one** circle for each line.* 1. Agree a lot 2. Agree a little 3. Disagree a little 4. Disagree a lot	TQG-10		
TQG-09a	There are too many students in the classes	TQG-10a		
TQG-09b	I have too much material to cover in class	TQG-10b		
TQG-09c	I have too many teaching hours	TQG-10c		
TQG-09d	I need more time to prepare for class	TQG-10d		
TQG-09e	I need more time to assist individual students	TQG-10e		
TQG-09f	I feel too much pressure from parents	TQG-10f		
TQG-09g	I have difficulty keeping up with all of the changes to the curriculum	TQG-10g		
TQG-09h	I have too many administrative tasks	TQG-10h		
About Teaching the TIMSS Class				
TQG-10A	**How many students are in this class?** *Write in the number.* _____ students	TQG-11A		
TQG-10B	**How many of the students in #G10A are in <fourth grade>?** *Write in the number.* _____ <fourth grade> students	TQG-11B	**How many of the students in question 11A are in fourth grade?** _____ fourth grade students *Write in the number.*	
TQG-11	**How many <fourth grade> students experience difficulties understanding <u>spoken</u> <language of test>?** *Write in the number.* _____ students in this class	TQG-12	fourth-grade English	

Exhibit E-2. TIMSS 2019 Grade 4 Teacher Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
TQG-12	**How often do you do the following in teaching this class?** *Check **one** circle for each line.* 1. Every or almost every lesson 2. About half the lessons 3. Some lessons 4. Never	TQG-13		
TQG-12a	Relate the lesson to students' daily lives	TQG-13a		
TQG-12b	Ask students to explain their answers	TQG-13b		
TQG-12c	Bring interesting materials to class	TQG-13c		
TQG-12d	Ask students to complete challenging exercises that require them to go beyond the instruction	TQG-13d		
TQG-12e	Encourage classroom discussions among students	TQG-13e		
TQG-12f	Link new content to students' prior knowledge	TQG-13f		
TQG-12g	Ask students to decide their own problem solving procedures	TQG-13g		
TQG-12h	Encourage students to express their ideas in class	TQG-13h		
TQG-13	**In your view, to what extent do the following limit how you teach this class?** *Check **one** circle for each line.* 1. Not at all 2. Some 3. A lot	TQG-14		
TQG-13a	Students lacking prerequisite knowledge or skills	TQG-14a		
TQG-13b	Students suffering from lack of basic nutrition	TQG-14b		
TQG-13c	Students suffering from not enough sleep	TQG-14c		
TQG-13d	Students absent from class	TQG-14d		
TQG-13e	Disruptive students	TQG-14e		
TQG-13f	Uninterested students	TQG-14f		
TQG-13g	Students with mental, emotional, or psychological impairment	TQG-14g		
TQG-13h	Students with difficulties understanding the language of instruction	TQG-14h		
Teaching Mathematics to the TIMSS Class				
			Questions 15-16 ask about mathematics instruction for the fourth-grade students in the TIMSS class.	
TQM-01	**In a typical week, how much time do you spend teaching mathematics to the students in this class?** *Write in the number of minutes per week.* *Please convert the number of hours into minutes.* _____ minutes per week	TQM-15	**In a typical week, how much time do you spend teaching mathematics to the students in this class?** _____ minutes per week *Write in the number of minutes per week.* *Please convert the number of hours into minutes.*	

Exhibit E-2. TIMSS 2019 Grade 4 Teacher Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
TQM-02	**In teaching mathematics to this class, how often do you ask students to do the following?** *Check **one** circle for each line.* 1. Every or almost every lesson 2. About half the lessons 3. Some lessons 4. Never	TQM-16		
TQM-02a	Listen to me explain new mathematics content	TQM-16a		
TQM-02b	Listen to me explain how to solve problems	TQM-16b		
TQM-02c	Memorize rules, procedures, and facts	TQM-16c		
TQM-02d	Practice procedures on their own	TQM-16d		
TQM-02e	Apply what they have learned to new problem situations on their own	TQM-16e		
TQM-02f	Work problems together in the whole class with direct guidance from me	TQM-16f		
TQM-02g	Work in mixed ability groups	TQM-16g		
TQM-02h	Work in same ability groups	TQM-16h		
Using Calculators and Computers for Teaching Mathematics to the TIMSS Class				
			Questions 17-18 ask about calculator and computer use for teaching mathematics to the fourth-grade students in the TIMSS class.	
TQM-03	**Are the students in this class permitted to use calculators during mathematics lessons?** *Check **one** circle only.* 1. Yes, with unrestricted use 2. Yes, with restricted use 3. No, calculators are not permitted	TQM-17		
TQM-04A	**Do the students in this class have computers (including tablets) available to use during their mathematics lessons?** *Check **one** circle only.* 1. Yes 2. No *(If No, go to #M5)*	TQM-18A	**Do the students in this class have computers (including tablets) available to use during their mathematics lessons?** *Fill in **one** circle only.* 1. Yes 2. No *(If No, go to question 19)*	
TQM-04B	**If Yes,** **What access do the students have to computers?** *Check **one** circle for each line.* 1. Yes 2. No	TQM-18B		
TQM-04Ba	Each student has a computer	TQM-18Ba		
TQM-04Bb	The class has computers that students can share	TQM-18Bb		
TQM-04Bc	The school has computers that the class can use sometimes	TQM-18Bc		
TQM-04C	**How often do you do activities on computers during mathematics lessons to support learning for:** *Check **one** circle for each line.* 1. Every or almost every day 2. Once or twice a week 3. Once or twice a month 4. Never or almost never	TQM-18C		

Exhibit E-2. TIMSS 2019 Grade 4 Teacher Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
TQM-04Ca	Whole class	TQM-18Ca		
TQM-04Cb	Low-performing students	TQM-18Cb		
TQM-04Cc	High-performing students	TQM-18Cc		
TQM-04Cd	Students with special needs	TQM-18Cd		
Mathematics Topics Taught to the TIMSS Class				
			Question 19 asks about the topics taught and the content covered in teaching mathematics to the fourth-grade students in the TIMSS class.	
TQM-05	**The following list includes the main topics addressed by the TIMSS mathematics test. Choose the response that best describes when the students in this class have been taught each topic. If a topic was in the curriculum before the <fourth grade>, please choose "Mostly taught before this year." If a topic was taught half this year but not yet completed, please choose "Mostly taught this year." If a topic is not in the curriculum, please choose "Not yet taught or just introduced."** *Check **one** circle for each line.* 1. Mostly taught before this year 2. Mostly taught this year 3. Not yet taught or just introduced	TQM-19	fourth grade	
TQM-05A	**Number**	TQM-19A		
TQM-05Aa	Concepts of whole numbers, including place value and ordering	TQM-19Aa		
TQM-05Ab	Adding, subtracting, multiplying, and dividing with whole numbers	TQM-19Ab		
TQM-05Ac	Concepts of multiples and factors; odd and even numbers	TQM-19Ac		
TQM-05Ad	Number sentences (finding the missing number, representing problem situations with number sentences)	TQM-19Ad		
TQM-05Ae	Number patterns (extending number patterns and finding missing terms)	TQM-19Ae		
TQM-05Af	Concepts of fractions, including representing, comparing and ordering, adding and subtracting simple fractions	TQM-19Af		
TQM-05Ag	Concepts of decimals, including place value and ordering, adding and subtracting with decimals	TQM-19Ag		
TQM-05B	**Measurement and Geometry**	TQM-19B		
TQM-05Ba	Solving problems involving length, including measuring and estimating	TQM-19Ba		
TQM-05Bb	Solving problems involving mass, volume, and time	TQM-19Bb		
TQM-05Bc	Finding and estimating perimeter, area, and volume	TQM-19Bc		
TQM-05Bd	Parallel and perpendicular lines	TQM-19Bd		
TQM-05Be	Comparing and drawing angles	TQM-19Be		
TQM-05Bf	Elementary properties of common geometric shapes	TQM-19Bf		

Exhibit E-2. TIMSS 2019 Grade 4 Teacher Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
TQM-05Bg	Three-dimensional shapes, including relationships with their two-dimensional representations	TQM-19Bg		
TQM-05C	**Data**	TQM-19C		
TQM-05Ca	Reading and interpreting data from tables, pictographs, bar graphs, line graphs, and pie charts	TQM-19Ca		
TQM-05Cb	Organizing and representing data to help answer questions	TQM-19Cb		
TQM-05Cc	Drawing conclusions from data displays	TQM195Cc		
Mathematics Homework for the TIMSS Class				
			Question 20 asks about mathematics homework for the fourth-grade students in the TIMSS class.	
TQM-06A	**How often do you usually assign mathematics homework to the students in this class?** *Check **one** circle only.* 1. I do not assign mathematics homework *(Go to #M7)* 2. Less than once a week 3. 1 or 2 times a week 4. 3 or 4 times a week 5. Every day	TQM-20A	**How often do you usually assign mathematics homework to the students in this class?** *Fill in one circle only.* 1. I do not assign mathematics homework *(Go to question 21)* 2. Less than once a week 3. 1 or 2 times a week 4. 3 or 4 times a week 5. Every day	
TQM-06B	**When you assign mathematics homework to the students in this class, about how many minutes do you usually assign? (Consider the time it would take an average student in your class.)** *Check **one** circle only.* 1. 15 minutes or less 2. 16–30 minutes 3. 31–60 minutes 4. More than 60 minutes	TQM-20B		
TQM-06C	**How often do you do the following with the mathematics homework assignments for this class?** *Check **one** circle for each line.* 1. Always or almost always 2. Sometimes 3. Never or almost never	TQM-20C		
TQM-06Ca	Correct assignments and give feedback to students	TQM-20Ca		
TQM-06Cb	Discuss the homework in class	TQM-20Cb		
TQM-06Cc	Monitor whether or not the homework was completed	TQM-20Cc		
Mathematics Assessment of the TIMSS Class				
			Questions 21-22 asks about mathematics assessment for the fourth-grade students in the TIMSS class.	
TQM-07	**How much importance do you place on the following assessment strategies in mathematics?** *Check **one** circle for each line.* 1. A lot 2. Some 3. None	TQM-21		

Exhibit E-2. TIMSS 2019 Grade 4 Teacher Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
TQM-07a	Observing students as they work	TQM-21a		
TQM-07b	Asking students to answer questions during class	TQM-21b		
TQM-07c	Short, regular written assessments	TQM-21c		
TQM-07d	Longer tests (e.g., unit tests or exams)	TQM-21d		
TQM-07e	Long-term projects	TQM-21e		
TQM-08	**About how often do <fourth grade> students in this class take mathematics tests on computers or tablets?** *Check **one** circle only.* 1. More than once a month 2. Once a month 3. Twice a year 4. Once a year 5. Never	TQM-22	fourth-grade	
Professional Development to Teach Mathematics				
TQM-09A	**In the past two years, have you participated in professional development in any of the following?** *Check **one** circle for each line.* 1. Yes 2. No	TQM-23A		
TQM-09Aa	Mathematics content	TQM-23Aa		
TQM-09Ab	Mathematics pedagogy/instruction	TQM-23Ab		
TQM-09Ac	Mathematics curriculum	TQM-23Ac		
TQM-09Ad	Integrating technology into mathematics instruction	TQM-23Ad		
TQM-09Ae	Improving students' critical thinking or problem solving skills	TQM-23Ae		
TQM-09Af	Mathematics assessment	TQM-23Af		
TQM-09Ag	Addressing individual students' needs	TQM-23Ag		
TQM-09B	**Do you need future professional development in any of the following?** *Check **one** circle for each line.* 1. Yes 2. No	TQM-23B		
TQM-09Ba	Mathematics content	TQM-23Ba		
TQM-09Bb	Mathematics pedagogy/instruction	TQM-23Bb		
TQM-09Bc	Mathematics curriculum	TQM-23Bc		
TQM-09Bd	Integrating technology into mathematics instruction	TQM-23Bd		
TQM-09Be	Improving students' critical thinking or problem solving skills	TQM-23Be		
TQM-09Bf	Mathematics assessment	TQM-23Bf		
TQM-09Bg	Addressing individual students' needs	TQM-23Bg		
TQM-10	**In the past two years, how many hours in total have you spent in formal <in-service/professional development> (e.g., workshops, seminars, etc.) for mathematics?** *Check **one** circle only.* 1. None 2. Less than 6 hours 3. 6–15 hours 4. 16–35 hours 5. More than 35 hours	TQM-24	**In the past two years, how many hours in total have you spent in formal in-service/professional development (e.g., workshops, seminars) for mathematics?** *Fill in **one** circle only.* 1. None 2. Less than 6 hours 3. 6–15 hours 4. 16–35 hours 5. More than 35 hours	

Exhibit E-2. TIMSS 2019 Grade 4 Teacher Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
Teaching Science to the TIMSS Class				
			Questions 25-26 ask about science instruction for the fourth-grade students in the TIMSS class.	
TQS-01A	**Is science taught mainly as a separate subject (i.e., not integrated with other subjects) to the students in this class?** *Check **one** circle only.* 1. Yes 2. No	TQS-25A		
TQS-01B	**Please estimate the time that you spend on science topics with students in this class.** *Write in the number of minutes per week.* *Please convert the number of hours into minutes.* _____ minutes per week	TQS-25B		**Please estimate the time that you spend on science topics with students in this class.** _____ minutes per week *Write in the number of minutes per week.* *Please convert the number of hours into minutes.*
TQS-02	**In teaching science to the students in this class, how often do you ask them to do the following?** *Check **one** circle for each line.* 1. Every or almost every lesson 2. About half the lessons 3. Some lessons 4. Never	TQS-26		
TQS-02a	Listen to me explain new science content	TQS-26a		
TQS-02b	Observe natural phenomena such as the weather or a plant growing and describe what they see	TQS-26b		
TQS-02c	Watch me demonstrate an experiment or investigation	TQS-26c		
TQS-02d	Design or plan experiments or investigations	TQS-26d		
TQS-02e	Conduct experiments or investigations	TQS-26e		
TQS-02f	Present data from experiments or investigations	TQS-26f		
TQS-02g	Interpret data from experiments or investigations	TQS-26g		
TQS-02h	Use evidence from experiments or investigations to support conclusions	TQS-26h		
TQS-02i	Read their textbooks or other resource materials	TQS-26i		
TQS-02j	Have students memorize facts and principles	TQS-26j		

Exhibit E-2. TIMSS 2019 Grade 4 Teacher Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
TQS-02k	Do field work outside the class	TQS-26k		
TQS-02l	Work in mixed ability groups	TQS-26l		
TQS-02m	Work in same ability groups	TQS-26m		
Using Computers for Teaching Science to the TIMSS Class				
			Question 27 asks about computer use for teaching science to the fourth-grade students in the TIMSS class.	
TQS-03A	**Do the students in this class have computers (including tablets) available to use during their science lessons?** *Check **one** circle only.* 1. Yes 2. No *(If No, go to #S4)*	TQS-27A	Do the students in this class have computers (including tablets) available to use during their science lessons? Fill in one circle only. 1. Yes 2. No (If No, go to question 28)	
TQS-03B	**If Yes,** **What access do the students have to computers?** *Check **one** circle for each line.* 1. Yes 2. No	TQS-27B		
TQS-03Ba	Each student has a computer	TQS-27Ba		
TQS-03Bb	The class has computers that students can share	TQS-27Bb		
TQS-03Bc	The school has computers that the class can use sometimes	TQS-27Bc		
TQS-03C	**How often do you do activities on computers during science lessons to support learning for:** *Check **one** circle for each line.* 1. Every or almost every day 2. Once or twice a week 3. Once or twice a month 4. Never or almost never	TQS-27C		
TQS-03Ca	Whole class	TQS-27Ca		
TQS-03Cb	Low-performing students	TQS-27Cb		
TQS-03Cc	High-performing students	TQS-27Cc		
TQS-03Cd	Students with special needs	TQS-27Cd		

Exhibit E-2. TIMSS 2019 Grade 4 Teacher Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
Science Topics Taught to the TIMSS Class				
			Question 28 asks about the topics taught and the content covered in teaching science to the fourth-grade students in the TIMSS class.	
TQS-04	**The following list includes the main topics addressed by the TIMSS science test. Choose the response that best describes when the students in this class have been taught each topic. If a topic was in the curriculum before the <fourth grade>, please choose "Mostly taught before this year." If a topic was taught half this year but not yet completed, please choose "Mostly taught this year." If a topic is not in the curriculum, please choose "Not yet taught or just introduced."** *Check **one** circle for each line.* 1. Mostly taught before this year 2. Mostly taught this year 3. Not yet taught or just introduced	TQS-28	fourth grade	
TQS-04A	**Life Science**	TQS-28A		
TQS-04Aa	Physical and behavioral characteristics of living things and major groups of living things (e.g., mammals, birds, insects, flowering plants)	TQS-28Aa		
TQS-04Ab	Major body structures and their functions in humans, other animals, and plants	TQS-28Ab		
TQS-04Ac	Life cycles of common plants and animals (e.g., flowering plants, butterflies, frogs)	TQS-28Ac		
TQS-04Ad	Characteristics of plants and animals that are inherited	TQS-28Ad		
TQS-04Ae	Interactions between organisms and their environments (e.g., physical features and behaviors that help living things survive in their environments)	TQS-28Ae		
TQS-04Af	Relationships in ecosystems (e.g., simple food chains, predator-prey relationships, competition)	TQS-28Af		
TQS-04Ag	Human health (transmission and prevention of diseases, everyday behaviors that promote good health)	TQS-28Ag		
TQS-04B	**Physical Science**	TQS-28B		
TQS-04Ba	States of matter (solid, liquid, gas) and their properties (volume, shape)	TQS-28Ba		
TQS-04Bb	Classifying materials based on physical properties (e.g., weight/mass, volume, state of matter, conductivity of heat or electricity)	TQS-28Bb		
TQS-04Bc	Mixtures, including methods for separating a mixture into its components (e.g., sifting, filtering, evaporation, using a magnet)	TQS-28Bc		

Exhibit E-2. TIMSS 2019 Grade 4 Teacher Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	Item	National Item Number	Item	Recoding instructions
TQS-04Bd	Properties of magnets (e.g., like poles repel and opposite poles attract, magnets can attract some objects)	TQS-28Bd		
TQS-04Be	Physical changes in everyday life (e.g., changes of state, dissolving)	TQS-28Be		
TQS-04Bf	Chemical changes in everyday life (e.g., decaying, burning, rusting, cooking)	TQS-28Bf		
TQS-04Bg	Common sources of energy (e.g., the Sun, wind, oil) and uses of energy (heating and cooling homes, providing light)	TQS-28Bg		
TQS-04Bh	Light and sound in everyday life (e.g., shadows and reflections, vibrating objects make sound)	TQS-28Bh		
TQS-04Bi	Heat transfer (e.g., energy flows from a hot object to a colder object)	TQS-28Bi		
TQS-04Bj	Electricity and simple electrical circuits (e.g., a circuit must be complete to work correctly)	TQS-28Bj		
TQS-04Bk	Forces that cause objects to move (e.g., gravity, pushing/pulling) or change their motion (e.g., friction)	TQS-28Bk		
TQS-04Bl	Simple machines (e.g., levers, pulleys, wheels, ramps) that help make motion easier	TQS-28Bl		
TQS-04C	**Earth Science**	TQS-28C		
TQS-04Ca	Physical makeup of Earth's surface (e.g., land and water in unequal proportions, sources of fresh and salt water)	TQS-28Ca		
TQS-04Cb	Earth's resources used in everyday life (e.g., water, wind, soil, forests, oil, natural gas, minerals)	TQS-28Cb		
TQS-04Cc	Changes in Earth's surface over time (e.g., mountain building, weathering, erosion)	TQS-28Cc		
TQS-04Cd	Fossils and what they can tell us about past conditions on Earth	TQS-28Cd		
TQS-04Ce	Weather and climate (e.g., daily, seasonal, and locational variations versus long term trends)	TQS-28Ce		
TQS-04Cf	Objects in the Solar System (the Sun, the Earth, the Moon, and other planets) and their movements	TQS-28Cf		
TQS-04Cg	Earth's motion and related patterns observed on Earth (e.g., day and night, seasons)	TQS-28Cg		

Exhibit E-2. TIMSS 2019 Grade 4 Teacher Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
Science Homework for the TIMSS Class				
			Question 29 asks about science homework for the fourth-grade students in the TIMSS class.	
TQS-05A	**How often do you usually assign science homework to the students in this class?** *Check **one** circle only.* 1. I do not assign science homework *(Go to #S6)* 2. Less than once a week 3. 1 or 2 times a week 4. 3 or 4 times a week 5. Every day	TQS-29A	How often do you usually assign science homework to the students in this class? Fill in one circle only. 1. I do not assign science homework *(Go to question 30)* 2. Less than once a week 3. 1 or 2 times a week 4. 3 or 4 times a week 5. Every day	
TQS-05B	**When you assign science homework to the students in this class, about how many minutes do you usually assign? (Consider the time it would take an average student in your class.)** *Check **one** circle only.* 1. 15 minutes or less 2. 16–30 minutes 3. 31–60 minutes 4. More than 60 minutes	TQS-29B		
TQS-05C	**How often do you do the following with the science homework assignments for this class?** *Check **one** circle for each line.* 1. Always or almost always 2. Sometimes 3. Never or almost never	TQS-29C		
TQS-05Ca	Correct assignments and give feedback to students	TQS-29Ca		
TQS-05Cb	Discuss the homework in class	TQS-29Cb		
TQS-05Cc	Monitor whether or not the homework was completed	TQS-29Cc		
Science Assessment of the TIMSS Class				
			Questions 30-31 asks about science assessment for the fourth-grade students in the TIMSS class.	
TQS-06	**How much importance do you place on the following assessment strategies in science?** *Check **one** circle for each line.* 1. A lot 2. Some 3. None	TQS-30		
TQS-06a	Observing students as they work	TQS-30a		
TQS-06b	Asking students to answer questions during class	TQS-30b		
TQS-06c	Short, regular written assessments	TQS-30c		
TQS-06d	Longer tests (e.g., unit tests or exams)	TQS-30d		
TQS-06e	Long-term projects	TQS-30e		

Exhibit E-2. TIMSS 2019 Grade 4 Teacher Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
TQS-07	**About how often do <fourth grade> students in this class take science tests on computers or tablets?** *Check **one** circle only.* 1. More than once a month 2. Once a month 3. Twice a year 4. Once a year 5. Never	TQS-31	fourth-grade	
Preparation to Teach Science				
TQS-08A	**In the past two years, have you participated in professional development in any of the following?** *Check **one** circle for each line.* 1. Yes 2. No	TQS-32A		
TQS-08Aa	Science content	TQS-32Aa		
TQS-08Ab	Science pedagogy/instruction	TQS-32Ab		
TQS-08Ac	Science curriculum	TQS-32Ac		
TQS-08Ad	Integrating technology into science instruction	TQS-32Ad		
TQS-08Ae	Improving students' critical thinking or inquiry skills	TQS-32Ae		
TQS-08Af	Science assessment	TQS-32Af		
TQS-08Ag	Addressing individual students' needs	TQS-32Ag		
TQS-08Ah	Integrating science with other subjects (e.g., mathematics, technology)	TQS-32Ah		
TQS-08B	**Do you need future professional development in any of the following?** *Check **one** circle for each line.* 1. Yes 2. No	TQS-32B		
TQS-08Ba	Science content	TQS-32Ba		
TQS-08Bb	Science pedagogy/instruction	TQS-32Bb		
TQS-08Bc	Science curriculum	TQS-32Bc		
TQS-08Bd	Integrating technology into science instruction	TQS-32Bd		
TQS-08Be	Improving students' critical thinking or inquiry skills	TQS-32Be		
TQS-08Bf	Science assessment	TQS-32Bf		
TQS-08Bg	Addressing individual students' needs	TQS-32Bg		
TQS-08Bh	Integrating science with other subjects (e.g., mathematics, technology)	TQS-32Bh		
TQS-09	**In the past two years, how many hours in total have you spent in formal <in-service/professional development> (e.g., workshops, seminars, etc.) for science?** *Check **one** circle only.* 1. None 2. Less than 6 hours 3. 6–15 hours 4. 16–35 hours 5. More than 35 hours	TQS-33	**In the past two years, how many hours in total have you spent in formal in-service/professional development (e.g., workshops, seminars) for science?** *Fill in **one** circle only.* 1. None 2. Less than 6 hours 3. 6–15 hours 4. 16–35 hours 5. More than 35 hours	

Exhibit E-3. TIMSS 2019 Grade 4 Student Questionnaire

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
About you				
SQG-01	**Are you a girl or a boy?** *Fill **one** circle only.* 1. Girl 2. Boy	SQG-01A		
		SQG-01B	**Are you Hispanic or Latino?** Fill in **one** oval only. 1. Yes, I am Hispanic or Latino 2. No, I am not Hispanic or Latino	
		SQG-01C	**Which of the following best describes you?** *Fill in oval for **all** that apply.* 1. White 2. Black or African American 3. Asian 4. American Indian or Alaska Native 5. Native Hawaiian or other Pacific Islander	
SQG-02	**When were you born?** *Fill the circles next to the month and year you were born.*	SQG-02		
SQG-02a	**Month** 1. January 2. February 3. March 4. April 5. May 6. June 7. July 8. August 9. September 10. October 11. November 12. December	SQG-02a	Month A. January B. February C. March D. April E. May F. June G. July H. August I. September J. October K. November L. December	
SQG-02b	**Year** 1. 2006 2. 2007 3. 2008 4. 2009 5. 2010 6. 2011 7. 2012 8. Other	SQG-02b		
SQG-03	**How often do you speak <language of test> at home?** *Fill **one** circle only.* 1. I always speak <language of test> at home 2. I almost always speak <language of test> at home 2. I sometimes speak <language of test> and sometimes speak another language at home 4. I never speak <language of test> at home	SQG-03A	**How often do you speak English at home?** *Fill in **one** oval only.* 1. I always speak English at home *If Always, please go to question 4.* 2. I almost always speak English at home 3. I sometimes speak English and sometimes speak another language at home 4. I never speak English at home *If Almost always, Sometimes, Never, please go to question 3B*	

Exhibit E-3. TIMSS 2019 Grade 4 Student Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
		SQG-03B	**What language do you speak at home (other than English)?** *Fill in one oval only* 1. Spanish 2. Other: Please specify _____	
SQG-04	**About how many books are there in your home? (Do not count magazines, newspapers, or your school books.)** *Fill **one** circle only.* 1. None or very few (0–10 books) This shows 10 books 2. Enough to fill one shelf (11–25 books) This shows 25 books 3. Enough to fill one bookcase (26–100 books) This shows 100 books 4. Enough to fill two bookcases (101–200 books) This shows 200 books 5. Enough to fill three or more bookcases (more than 200) This shows more than 200 books	SQG-04		
SQG-05	**Do you have any of these things at your home?** *Fill **one** circle for each line.* 1. Yes 2. No	SQG-05		
SQG-05a	A computer or tablet	SQG-05a		
SQG-05b	Study desk/table for your use	SQG-05b		
SQG-05c	Your own room	SQG-05c		
SQG-05d	Internet connection	SQG-05d		
SQG-05e	Your own mobile phone	SQG-05e	Your own cell phone	
SQG-05f	<country-specific indicator of wealth>	SQG-05f	A gaming system (e.g., PlayStation, Wii, Xbox)	
SQG-05g	<country-specific indicator of wealth>	SQG-05g	VCR, DVD, or Blu-ray player	
SQG-05h	<country-specific indicator of wealth>	SQG-05h		
SQG-05i	<country-specific indicator of wealth>	SQG-05i		
SQG-06	**The following question is about your <Parent/Guardian A> and <Parent/Guardian B>. <If you have only one parent/guardian, answer for Parent/Guardian A. If you have two parents/guardians, choose one for Parent/Guardian A and the other for Parent/Guardian B.>** **Were your <parents/guardians> born in <country>?** *Fill **one** circle only.* 1. Yes 2. No 3. I don't know 4. Not applicable	SQG-06	**The following question is about your Parent/Guardian A and Parent/Guardian B. If you have only one parent/guardian, answer for Parent/Guardian A. If you have two parents/guardians, choose one for Parent/Guardian A and the other for Parent/Guardian B.** **Were your parents/guardians born in the United States? ("United States" includes the 50 states, its territories, the District of Columbia, and U.S. military bases abroad).** *Fill in **one** oval only.* 1. Yes 2. No 3. I don't know 4. Not applicable	
SQG-06A	**<Parent/Guardian A>**	SQG-06A	**Parent/Guardian A**	
SQG-06B	**<Parent/Guardian B>**	SQG-06B	**Parent/Guardian B**	

Exhibit E-3. TIMSS 2019 Grade 4 Student Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
SQG-07	**Were you born in <country>?** *Fill **one** circle only.* 1. Yes 2. No	SQG-07	the United States	
		SQG-08	**The following questions ask about activities you do outside of school.** *Fill in only **one** oval for each row.* 1. Yes 2. No	
		SQG-08a	Do you play on a sports team outside of school?	
		SQG-08b	Do you often play a musical instrument outside of school?	
		SQG-08c	Are you studying something in a class outside of school?	
		SQG-8d	Do you belong to a club outside of school (like Boy/Girl Scouts, 4-H, or Boys and Girls Club)?	
		SQG-9	**Are you preparing for or have you participated in a science club, a science fair, or a science competition?** *Fill in **one oval** only.* 1. Yes 2. No	
		SQG-10	**Have you ever repeated a grade in elementary school?** *Fill in **one oval** only.* 1. Yes 2. No	
SQG-08	**About how often are you absent from school?** *Fill **one** circle only.* 1. Once a week 2. Once every two weeks 3. Once a month 4. Once every two months 5. Never or almost never	SQG-11A		
		SQG-11B	**How many days were you absent from school in the last month?** *Fill in **one** oval only.* 1. None 2. 1 or 2 days 3. 3 or 4 days 4. 5 to 10 days 5. More than 10 days	
SQG-09	**How often do you feel this way when you arrive at school?** *Fill **one** circle for each line.* 1. Every day 2. Almost every day 3. Sometimes 4. Never	SQG-12		
SQG-09a	I feel tired	SQG-12a		
SQG-09b	I feel hungry	SQG-12b		

Exhibit E-3. TIMSS 2019 Grade 4 Student Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
Your School				
SQG-10	**What do you think about your school? Tell how much you agree with these statements.** *Fill **one** circle for each line.* 1. Agree a lot 2. Agree a little 3. Disagree a little 4. Disagree a lot	SQG-13		
SQG-10a	I like being in school	SQG-13a		
SQG-10b	I feel safe when I am at school	SQG-13b		
SQG-10c	I feel like I belong at this school	SQG-13c		
SQG-10d	Teachers at my school are fair to me	SQG-13d		
SQG-10e	I am proud to go to this school	SQG-13e		
SQG-11	**During this school year, how often have other students from your school done any of the following things to you, including through texting or the Internet?** *Fill **one** circle for each line.* 1. At least once a week 2. Once or twice a month 3. A few times a year 4. Never	SQG-14		
SQG-11a	Made fun of me or called me names	SQG-14a		
SQG-11b	Left me out of their games or activities	SQG-14b		
SQG-11c	Spread lies about me	SQG-14c		
SQG-11d	Stole something from me	SQG-14d		
SQG-11e	Damaged something of mine on purpose	SQG-14e		
SQG-11f	Hit or hurt me *(e.g., shoving, hitting, kicking)*	SQG-14f		
SQG-11g	Made me do things I didn't want to do	SQG-14g		
SQG-11h	Sent me nasty or hurtful messages online	SQG-14h		
SQG-11i	Shared nasty or hurtful things about me online	SQG-14i		
SQG-11j	Shared embarrassing photos of me online	SQG-14j		
SQG-11k	Threatened me	SQG-14k		
Mathematics in school				
SQMS-01	**In mathematics lessons, how often do you work problems on your own?** *Fill **one** circle only.* 1. Every or almost every lesson 2. About half the lessons 3. Some lessons 4. Never	SQMS-15		
SQMS-02	**How much do you agree with these statements about learning mathematics?** *Fill **one** circle for each line.* 1. Agree a lot 2. Agree a little 3. Disagree a little 4. Disagree a lot	SQMS-16		
SQMS-02a	I enjoy learning mathematics	SQMS-16a		

Exhibit E-3. TIMSS 2019 Grade 4 Student Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
SQMS-02b	I wish I did not have to study mathematics	SQMS-16b		
SQMS-02c	Mathematics is boring	SQMS-16c		
SQMS-02d	I learn many interesting things in mathematics	SQMS-16d		
SQMS-02e	I like mathematics	SQMS-16e		
SQMS-02f	I like any schoolwork that involves numbers	SQMS-16f		
SQMS-02g	I like to solve mathematics problems	SQMS-16g		
SQMS-02h	I look forward to mathematics lessons	SQMS-16		
SQMS-02i	Mathematics is one of my favorite subjects	SQMS-16i		
SQMS-03	**How much do you agree with these statements about your mathematics lessons?** *Fill **one** circle for each line.* 1. Agree a lot 2. Agree a little 3. Disagree a little 4. Disagree a lot	SQMS-17		
SQMS-03a	I know what my teacher expects me to do	SQMS-17a		
SQMS-03b	My teacher is easy to understand	SQMS-17b		
SQMS-03c	My teacher has clear answers to my questions	SQMS-17c		
SQMS-03d	My teacher is good at explaining mathematics	SQMS-17d		
SQMS-03e	My teacher does a variety of things to help us learn	SQMS-17e		
SQMS-03f	My teacher explains a topic again when we don't understand	SQMS-17f		
SQMS-04	**How often do these things happen in your mathematics lessons?** *Fill **one** circle for each line.* 1. Every or almost every lesson 2. About half the lessons 3. Some lessons 4. Never	SQMS-18		
SQMS-04a	Students don't listen to what the teacher says	SQMS-18a		
SQMS-04b	There is disruptive noise	SQMS-18b		
SQMS-04c	It is too disorderly for students to work well	SQMS-18c		
SQMS-04d	My teacher has to wait a long time for students to quiet down	SQMS-18d		
SQMS-04e	Students interrupt the teacher	SQMS-18e		
SQMS-04f	My teacher has to keep telling us to follow the classroom rules	SQMS-18f		
SQMS-05	**How much do you agree with these statements about mathematics?** *Fill **one** circle for each line.* 1. Agree a lot 2. Agree a little 3. Disagree a little 4. Disagree a lot	SQMS-19		
SQMS-05a	I usually do well in mathematics	SQMS-19a		
SQMS-05b	Mathematics is harder for me than for many of my classmates	SQMS-19b		

Exhibit E-3. TIMSS 2019 Grade 4 Student Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	Item	National Item Number	Item	Recoding instructions
SQMS-05c	I am just not good at mathematics	SQMS-19c		
SQMS-05d	I learn things quickly in mathematics	SQMS-19d		
SQMS-05e	Mathematics makes me nervous	SQMS-19e		
SQMS-05f	I am good at working out difficult mathematics problems	SQMS-19f		
SQMS-05g	My teacher tells me I am good at mathematics	SQMS-19g		
SQMS-05h	Mathematics is harder for me than any other subject	SQMS-19h		
SQMS-05i	Mathematics makes me confused	SQMS-19i		
Science in school				
SQMS-06	**In science lessons, how often does your teacher ask you to conduct science experiments?** *Fill **one** circle only.* 1. At least once a week 2. Once or twice a month 3. A few times a year 4. Never	SQMS-20		
SQMS-07	**How much do you agree with these statements about learning science?** *Fill **one** circle for each line.* 1. Agree a lot 2. Agree a little 3. Disagree a little 4. Disagree a lot	SQMS-21		
SQMS-07a	I enjoy learning science	SQMS-21a		
SQMS-07b	I wish I did not have to study science	SQMS-21b		
SQMS-07c	Science is boring	SQMS-21c		
SQMS-07d	I learn many interesting things in science	SQMS-21d		
SQMS-07e	I like science	SQMS-21e		
SQMS-07f	I look forward to learning science in school	SQMS-21f		
SQMS-07g	Science teaches me how things in the world work	SQMS-21g		
SQMS-07h	I like to do science experiments	SQMS-21h		
SQMS-07i	Science is one of my favorite subjects	SQMS-21i		
SQMS-08	**How much do you agree with these statements about your <u>science lessons</u>?** *Fill **one** circle for each line.* 1. Agree a lot 2. Agree a little 3. Disagree a little 4. Disagree a lot	SQMS-22		
SQMS-08a	I know what my teacher expects me to do	SQMS-22a		
SQMS-08b	My teacher is easy to understand	SQMS-22b		
SQMS-08c	My teacher has clear answers to my questions	SQMS-22c		
SQMS-08d	My teacher is good at explaining science	SQMS-22d		
SQMS-08e	My teacher does a variety of things to help us learn	SQMS-22e		
SQMS-08f	My teacher explains a topic again when we don't understand	SQMS-22f		

Exhibit E-3. TIMSS 2019 Grade 4 Student Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
SQMS-09	**How much do you agree with these statements about science?** *Fill **one** circle for each line.* 1. Agree a lot 2. Agree a little 3. Disagree a little 4. Disagree a lot	SQMS-23		
SQMS-09a	I usually do well in science	SQMS-23a		
SQMS-09b	Science is harder for me than for many of my classmates	SQMS-23b		
SQMS-09c	I am just not good at science	SQMS-23c		
SQMS-09d	I learn things quickly in science	SQMS-23d		
SQMS-09e	My teacher tells me I am good at science	SQMS-23e		
SQMS-09f	Science is harder for me than any other subject	SQMS-23f		
SQMS-09g	Science makes me confused	SQMS-23g		
		SQMS-24	**How hard was this test compared to most other tests you have taken this year in school?** *Fill in **one** oval only.* 1. Easier than other tests 2. About as hard as other tests 3. Harder than other tests 4. Much harder than other tests	
		SQMS-25	**How hard did you try on this test compared to how hard you tried on most other tests you have taken this year in school?** *Fill in **one** oval only.* 1. Not as hard as on other tests 2. About as hard as on other tests 3. Harder than on other tests 4. Much harder than on other tests	
		SQMS-26	**How important was it to you to do well on this test?** *Fill in **one** oval only.* 1. Not very important 2. Somewhat important 3. Important 4. Very important	

Exhibit E-4. TIMSS 2019 Grade 8 School Questionnaire

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
School Enrollment and Characteristics				
ScQ-01	**What is the total enrollment of students in your school as of <first day of month TIMSS testing begins, 2019>?** *Write in the number.* _____ students	ScQ-01	April 1, 2019	
ScQ-02	**What is the total enrollment of <eighth grade> students in your school as of <first day of month TIMSS testing begins, 2019>?** *Write in the number.* _____ students	ScQ-02	eighth-grade April 1, 2019	
ScQ-03	**Approximately what percentage of students in your school have the following backgrounds?** *Check **one** circle for each line.* 1. 0 to 10% 2. 11 to 25% 3. 26 to 50% 4. More than 50%	ScQ-03		
ScQ-03a	Come from economically disadvantaged homes	ScQ-03a		
ScQ-03b	Come from economically affluent homes	ScQ-03b		
		ScQ-04	**Around the 1st of October 2018, what percentage of students at this school were eligible to receive free or reduced-price lunches through the National School Lunch Program?** _____ percentage of students *Write in the number.*	
ScQ-04	**Approximately what percentage of students in your school have <language of test> as their native language?** *Check **one** circle only.* 1. More than 90% 2. 76 to 90% 3. 51 to 75% 4. 26 to 50% 5. 25% or less	ScQ-05	English	
		ScQ-06	**Of the students currently enrolled in your school, what percentage has been identified as limited-English proficient (LEP)/English language learners (ELL)?** *Fill in **one** circle only.* 1. 0% 2. 1-5% 3. 6-10% 4. 11-25% 5. 26-50% 6. 51-75% 7. 76-90% 8. Over 90%	

Exhibit E-4. TIMSS 2019 Grade 8 School Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
		ScQ-07	**What type of school is this?** *Fill in **one** circle only.* 1. Regular public school 2. A regular public school with a magnet program 3. A magnet school or school with a special program emphasis (e.g., Montessori, science/math school, performing arts school, talented/gifted school, foreign language immersion school) 4. Special education: a school that primarily serves students with disabilities 5. Alternative: a school designed to address the needs of students, typically at risk of educational failure, which cannot be met in regular schools 6. Vocational 7. Charter school 8. Private (independent) 9. Private (religiously affiliated) 10. Other	
ScQ-05A	**How many people live in the city, town, or area where your school is located?** *Check **one** circle only.* 1. More than 500,000 people 2. 100,001 to 500,000 people 3. 50,001 to 100,000 people 4. 30,001 to 50,000 people 5. 15,001 to 30,000 people 6. 3,001 to 15,000 people 7. 3,000 people or fewer	ScQ-08A		
ScQ-05B	**Which best describes the immediate area in which your school is located?** *Check **one** circle only.* 1. Urban–Densely populated 2. Suburban–On fringe or outskirts of urban area 3. Medium size city or large town 4. Small town or village 5. Remote rural	ScQ-08B		
		ScQ-09	**Which best characterizes the average income level of the school's immediate area?** *Fill in **one** circle only.* 1. High 2. Medium 3. Low	
Instructional Time				
ScQ-06A	**For the <eighth grade> students in your school:** **How many <u>days per year</u> is your school open for instruction?** *Write in the number.* _____days	ScQ-10A	eighth-grade	

Exhibit E-4. TIMSS 2019 Grade 8 School Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
ScQ-06B	**What is the <u>total instructional time</u>, excluding breaks, in a <u>typical day</u>?** *Write in the number of minutes per day. Please convert the number of hours into minutes.* _____minutes	ScQ-10B	**What is the <u>total instructional time</u>, excluding breaks, in a <u>typical day</u>?** _____hours _____minutes *Write in the number of hours and minutes per day.*	(Hours x 60) + Minutes
ScQ-06C	**In one <u>calendar week</u>, how many days is the school open for instruction?** *Check **one** circle only.* 1. 6 days 2. 5 1/2 days 3. 5 days 4. 4 1/2 days 5. 4 days 6. Other	ScQ-10C		
Resources and Technology				
ScQ-07	**How many computers (including tablets) does your school have for use by <eighth grade> students?** *Write in the number.* _____computers	ScQ-11	eighth-grade	
ScQ-08A	**Does your school have a science laboratory that can be used by <eighth grade> students?** *Check **one** circle only.* 1. Yes 2. No	ScQ-12A	eighth-grade	
ScQ-08B	**Do teachers usually have assistance available when students are conducting science experiments?** *Check **one** circle only.* 1. Yes 2. No	ScQ-12B		
ScQ-09	**Does your school use an online learning management system to support learning (e.g., teacher-student communication, management of grades, student access to course materials)?** *Check **one** circle only.* 1. Yes 2. No	ScQ-13		
ScQ-10A	**Does your school have a school library?** *Check **one** circle only.* 1. Yes 2. No *(If No, go to #11)*	ScQ-14A	**Does your school have a school library?** *Fill in **one** circle only.* 1. Yes 2. No *(If No, go to question 15)*	
ScQ-10B	**If Yes,** **<u>Approximately</u> how many books (print) with different titles does your school library have (exclude magazines and periodicals)?** *Check **one** circle only.* 1. 2,000 books or fewer 2. More than 2,000 books	ScQ-14B		

Exhibit E-4. TIMSS 2019 Grade 8 School Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
ScQ-11	**Does your school have classroom libraries?** *Check **one** circle only.* 1. Yes 2. No	ScQ-15		
ScQ-12	**Does your school provide students access to digital learning resources (e.g., books, videos)?** *Check **one** circle only.* 1. Yes 2. No	ScQ-16		
ScQ-13	**How much is your school's capacity to provide instruction affected by a shortage or inadequacy of the following?** *Check **one** circle for each line.* 1. Not at all 2. A little 3. Some 4. A lot	ScQ-17		
ScQ-13A	**General School Resources**	ScQ-17A		
ScQ-13Aa	Instructional materials (e.g., textbooks)	ScQ-17Aa		
ScQ-13Ab	Supplies (e.g., papers, pencils, materials)	ScQ-17Ab		
ScQ-13Ac	School buildings and grounds	ScQ-17Ac		
ScQ-13Ad	Heating/cooling and lighting systems	ScQ-17Ad		
ScQ-13Ae	Instructional space (e.g., classrooms)	ScQ-17Ae		
ScQ-13Af	Technologically competent staff	ScQ-17Af		
ScQ-13Ag	Audio-visual resources for delivery of instruction (e.g., interactive white boards, digital projectors)	ScQ-17Ag		
ScQ-13Ah	Computer technology for teaching and learning (e.g., computers or tablets for student use)	ScQ-17Ah		
ScQ-13Ai	Resources for students with disabilities	ScQ-17Ai		
ScQ-13B	**Resources for Mathematics Instruction**	ScQ-17B		
ScQ-13Ba	Teachers with a specialization in mathematics	ScQ-17Ba		
ScQ-13Bb	Computer software/applications for mathematics instruction	ScQ-17Bb		
ScQ-13Bc	Library resources relevant to mathematics instruction	ScQ-17Bc		
ScQ-13Bd	Calculators for mathematics instruction	ScQ-17Bd		
ScQ-13Be	Concrete objects or materials to help students understand quantities or procedures	ScQ-17Be		
ScQ-13C	**Resources for Science Instruction**	ScQ-17C		
ScQ-13Ca	Teachers with a specialization in science	ScQ-17Ca		
ScQ-13Cb	Computer software/applications for science instruction	ScQ-17Cb		
ScQ-13Cc	Library resources relevant to science instruction	ScQ-17Cc		
ScQ-13Cd	Calculators for science instruction	ScQ-17Cd		
ScQ-13Ce	Science equipment and materials for experiments	ScQ-17Ce		

Exhibit E-4. TIMSS 2019 Grade 8 School Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
School Emphasis on Academic Success				
ScQ-14	**How would you characterize each of the following within your school?** *Check **one** circle for each line.* 1. Very high 2. High 3. Medium 4. Low 5. Very low	ScQ-18		
ScQ-14a	Teachers' understanding of the school's curricular goals	ScQ-18a		
ScQ-14b	Teachers' degree of success in implementing the school's curriculum	ScQ-18b		
ScQ-14c	Teachers' expectations for student achievement	ScQ-18c		
ScQ-14d	Teachers' ability to inspire students	ScQ-18d		
ScQ-14e	Parental involvement in school activities	ScQ-18e		
ScQ-14f	Parental commitment to ensure that students are ready to learn	ScQ-18f		
ScQ-14g	Parental expectations for student achievement	ScQ-18g		
ScQ-14h	Parental support for student achievement	ScQ-18h		
ScQ-14i	Students' desire to do well in school	ScQ-18i		
ScQ-14j	Students' ability to reach school's academic goals	ScQ-18j		
ScQ-14k	Students' respect for classmates who excel academically	ScQ-18k		
ScQ-15	**How much do you agree with these statements about mathematics and science education within your school?** *Check **one** circle for each line.* 1. Agree a lot 2. Agree a little 3. Disagree a little 4. Disagree a lot	ScQ-19		
ScQ-15a	The school provides students with information about career options in mathematics and science	ScQ-19a		
ScQ-15b	The school has initiatives to promote student interest in mathematics and science (e.g., student clubs, competitions)	ScQ-19b		
ScQ-15c	The school promotes professional development for teachers of mathematics and science	ScQ-19c		
ScQ-15d	The school provides extra lessons to help students excel in mathematics and science	ScQ-19d		
ScQ-15e	The school provides special activities in mathematics and science for interested students	ScQ-19e		
ScQ-15f	The school has a specific goal to improve mathematics and science education	ScQ-19f		
ScQ-15g	The school encourages students to continue studying mathematics and science in the future	ScQ-19g		

Exhibit E-4. TIMSS 2019 Grade 8 School Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
ScQ-15h	Mathematics and science teachers in this school spend extra time working with students interested in mathematics and science	ScQ-19h		
School Discipline and Safety				
ScQ-16	**To what degree is each of the following a problem among <eighth grade> students in your school?** *Check **one** circle for each line.* 1. Not a problem 2. Minor problem 3. Moderate problem 4. Serious problem	ScQ-20	eighth-grade	
ScQ-16a	Arriving late at school	ScQ-20a		
ScQ-16b	Absenteeism (i.e., unjustified absences)	ScQ-20b		
ScQ-16c	Classroom disturbance	ScQ-20c		
ScQ-16d	Cheating	ScQ-20d		
ScQ-16e	Profanity	ScQ-20e		
ScQ-16f	Vandalism	ScQ-20f		
ScQ-16g	Theft	ScQ-20g		
ScQ-16h	Intimidation or verbal abuse among students (including texting, emailing, etc.)	ScQ-20h		
ScQ-16i	Physical injury to other students	ScQ-20i		
ScQ-16j	Intimidation or verbal abuse of teachers or staff (including texting, emailing, etc.)	ScQ-20j		
ScQ-16k	Physical injury to teachers or staff	ScQ-20k		
ScQ-17	**To what degree is each of the following a problem among teachers in your school?** *Check **one** circle for each line.* 1. Not a problem 2. Minor problem 3. Moderate problem 4. Serious problem	ScQ-21		
ScQ-17a	Arriving late or leaving early	ScQ-21a		
ScQ-17b	Absenteeism	ScQ-21b		
Teachers In Your School				
		ScQ-22	**In your school, are any of the following used to evaluate the practice of eighth-grade mathematics teachers?** *Fill in only **one** circle for each row.* 1. Yes 2. No	
		ScQ-22a	Observations by the principal or senior staff	
		ScQ-22b	Observations by inspectors or other persons external to the school	
		ScQ-22c	Student achievement	
		ScQ-22d	Teacher peer review	

Exhibit E-4. TIMSS 2019 Grade 8 School Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
		ScQ-23	**In your school, are any of the following used to evaluate the practice of eighth-grade science teachers?** *Fill in only **one** circle for each row.* 1. Yes 2. No	
		ScQ-23a	Observations by the principal or senior staff	
		ScQ-23b	Observations by inspectors or other persons external to the school	
		ScQ-23c	Student achievement	
		ScQ-23d	Teacher peer review	
Principal Experience and Education				
ScQ-18	**By the end of this school year, how many years will you have been a principal altogether?** *Please **round** to the nearest whole number.* _____ years	ScQ-24	**By the end of this school year, how many years altogether will you have been a principal?** _____years *Please round to the nearest whole number.*	
ScQ-19	**By the end of this school year, how many years will you have been a principal at this school?** *Please **round** to the nearest whole number.* _____ years	ScQ-25		
ScQ-20	**What is the highest level of formal education you have completed?** *Check **one** circle only.* 1. Did not complete <Bachelor's or equivalent level—ISCED Level 6> 2. <Bachelor's or equivalent level—ISCED Level 6> 3. <Master's or equivalent level—ISCED Level 7> 4. <Doctor or equivalent level—ISCED Level 8>	ScQ-26	**What is the highest level of formal education you have completed?** *Fill in **one** circle only.* 1. Did not complete Bachelor's degree (4-year college program) 2. Bachelor's degree (4-year college program) 3. Master's degree or professional degree (MD, DDS, lawyer, minister) 4. Doctorate (Ph.D., Ed.D.)	Nat -> Int 1 -> 1 2 -> 2 3 -> 3 4 -> 4
ScQ-21	**Do you hold the following qualifications or credentials in <u>educational leadership</u>?** *Check **one** circle for each line.* 1. Yes 2. No	ScQ-27		
ScQ-21a	<Certificate or license>	ScQ-27a	Principal Certification	
ScQ-21b	<Master's or equivalent level—ISCED Level 7>	ScQ-27b	Master's degree or professional degree (MD, DDS, lawyer, minister)	
ScQ-21c	<Doctor or equivalent level—ISCED Level 8>	ScQ-27c	Doctorate (Ph.D., Ed.D.)	

Exhibit E-5. TIMSS 2019 Grade 8 Teacher Math Questionnaire

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
About You				
		TQG-01	**What year did you start teaching?** _____ *Please write in a year.*	
TQG-01	**By the end of this school year, how many years will you have been teaching altogether?** *Please **round** to the nearest whole number.* _____ years	TQG-02	**At the end of this school year, how many years will you have taught altogether?** _____ years *Please **round** to the nearest whole number.*	
TQG-02	**Are you female or male?** *Check **one** circle only.* 1. Female 2. Male	TQG-03		
TQG-03	**How old are you?** *Check **one** circle only.* 1. Under 25 2. 25–29 3. 30–39 4. 40–49 5. 50–59 6. 60 or more	TQG-04		
TQG-04	**What is the highest level of formal education you have completed?** *Check **one** circle only.* 1. Did not complete <Upper secondary education—ISCED Level 3> 2. <Upper secondary education—ISCED Level 3> *(If you have not completed <post-secondary or tertiary education>, go to #6)* 3. <Post-secondary, non-tertiary education—ISCED Level 4> 4. <Short-cycle tertiary education—ISCED Level 5> 5. <Bachelor's or equivalent level—ISCED Level 6> 6. <Master's or equivalent level—ISCED Level 7> 7. <Doctor or equivalent level—ISCED Level 8>	TQG-05	**What is the highest level of formal education you have completed?** *Fill in **one** circle only.* 1. Did not complete high school 2. High school graduate (*If you have not completed more than high school, go to question 7*) 3. Associate's degree (2-year college program) 4. Bachelor's degree (4-year college program) 5. Master's degree or professional degree (MD, DDS, lawyer, minister) 6. Doctorate (Ph.D., Ed.D.)	Nat -> Int 1 -> 1 2 -> 2 3 -> 4 4 -> 5 5 -> 6 6 -> 7 International Category 3 (ISCED Level 4) is not administered
TQG-05	**During your <post-secondary> education, what was your major or main area(s) of study?** *Check **one** circle for each line.* 1. Yes 2. No	TQG-06A	college or university	
TQG-05a	Mathematics	TQG-06a		
TQG-05b	Biology	TQG-06b		
TQG-05c	Physics	TQG-06c		
TQG-05d	Chemistry	TQG-06d		
TQG-05e	<Earth Science>	TQG-06e	Earth Science	
TQG-05f	Education–Mathematics	TQG-06f		
TQG-05g	Education–Science	TQG-06g		
TQG-05h	Education–General	TQG-06h		
TQG-05i	Other	TQG-06i		

Exhibit E-5. TIMSS 2019 Grade 8 Teacher Math Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
School Emphasis on Academic Success				
TQG-06	**How would you characterize each of the following within your school?** *Check **one** circle for each line.* 1. Very high 2. High 3. Medium 4. Low 5. Very low	TQG-07		
TQG-06a	Teachers' understanding of the school's curricular goals	TQG-07a		
TQG-06b	Teachers' degree of success in implementing the school's curriculum	TQG-07b		
TQG-06c	Teachers' expectations for student achievement	TQG-07c		
TQG-06d	Teachers' ability to inspire students	TQG-07d		
TQG-06e	Parental involvement in school activities	TQG-07e		
TQG-06f	Parental commitment to ensure that students are ready to learn	TQG-07f		
TQG-06g	Parental expectations for student achievement	TQG-07g		
TQG-06h	Parental support for student achievement	TQG-07h		
TQG-06i	Students' desire to do well in school	TQG-07i		
TQG-06j	Students' ability to reach school's academic goals	TQG-07j		
TQG-06k	Students' respect for classmates who excel academically	TQG-07k		
TQG-06l	Collaboration between school leadership (including master teachers) and teachers to plan instruction	TQG-07l		
School Environment				
TQG-07	**Thinking about your current school, indicate the extent to which you agree or disagree with each of the following statements.** *Check **one** circle for each line.* 1. Agree a lot 2. Agree a little 3. Disagree a little 4. Disagree a lot	TQG-08		
TQG-07a	This school is located in a safe neighborhood	TQG-08a		
TQG-07b	I feel safe at this school	TQG-08b		
TQG-07c	This school's security policies and practices are sufficient	TQG-08c		
TQG-07d	The students behave in an orderly manner	TQG-08d		
TQG-07e	The students are respectful of the teachers	TQG-08e		
TQG-07f	The students respect school property	TQG-08f		
TQG-07g	This school has clear rules about student conduct	TQG-08g		
TQG-07h	This school's rules are enforced in a fair and consistent manner	TQG-08h		

Exhibit E-5. TIMSS 2019 Grade 8 Teacher Math Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
About Being a Teacher				
TQG-08	**How often do you feel the following way about being a teacher?** *Check **one** circle for each line.* 1. Very often 2. Often 3. Sometimes 4. Never or almost never	TQG-09		
TQG-08a	I am content with my profession as a teacher	TQG-09a		
TQG-08b	I find my work full of meaning and purpose	TQG-09b		
TQG-08c	I am enthusiastic about my job	TQG-09c		
TQG-08d	My work inspires me	TQG-09d		
TQG-08e	I am proud of the work I do	TQG-09e		
TQG-09	**Indicate the extent to which you agree or disagree with each of the following statements.** *Check **one** circle for each line.* 1. Agree a lot 2. Agree a little 3. Disagree a little 4. Disagree a lot	TQG-10		
TQG-09a	There are too many students in the classes	TQG-10a		
TQG-09b	I have too much material to cover in class	TQG-10b		
TQG-09c	I have too many teaching hours	TQG-10c		
TQG-09d	I need more time to prepare for class	TQG-10d		
TQG-09e	I need more time to assist individual students	TQG-10e		
TQG-09f	I feel too much pressure from parents	TQG-10f		
TQG-09g	I have difficulty keeping up with all of the changes to the curriculum	TQG-10g		
TQG-09h	I have too many administrative tasks	TQG-10h		
About Teaching the TIMSS Class				
			Questions 11-14 ask about instruction for the eighth-grade students in the TIMSS class.	
TQG-10	**How many students are in this class?** *Write in the number.* _____ students	TQG-11		
TQG-11	**How many <eighth grade> students experience difficulties understanding <u>spoken</u> <language of test>?** *Write in the number.* _____ students in this class	TQG-12	eighth-grade English	
TQG-12	**How often do you do the following in teaching this class?** *Check **one** circle for each line.* 1. Every or almost every lesson 2. About half the lessons 3. Some lessons 4. Never	TQG-13		
TQG-12a	Relate the lesson to students' daily lives	TQG-13a		
TQG-12b	Ask students to explain their answers	TQG-13b		

Exhibit E-5. TIMSS 2019 Grade 8 Teacher Math Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
TQG-12c	Ask students to complete challenging exercises that require them to go beyond the instruction	TQG-13c		
TQG-12d	Encourage classroom discussions among students	TQG-13d		
TQG-12e	Link new content to students' prior knowledge	TQG-13e		
TQG-12f	Ask students to decide their own problem solving procedures	TQG-13f		
TQG-12g	Encourage students to express their ideas in class	TQG-13g		
TQG-13	**In your view, to what extent do the following limit how you teach this class?** *Check **one** circle for each line.* 1. Not at all 2. Some 3. A lot	TQG-14		
TQG-13a	Students lacking prerequisite knowledge or skills	TQG-14a		
TQG-13b	Students suffering from lack of basic nutrition	TQG-14b		
TQG-13c	Students suffering from not enough sleep	TQG-14c		
TQG-13d	Students absent from class	TQG-14d		
TQG-13e	Disruptive students	TQG-14e		
TQG-13f	Uninterested students	TQG-14f		
TQG-13g	Students with mental, emotional, or psychological impairment	TQG-14g		
TQG-13h	Students with difficulties understanding the language of instruction	TQG-14h		
Teaching Mathematics to the TIMSS Class				
			Questions 15-17 ask about mathematics instruction for the eighth-grade students in the TIMSS class.	
TQM-14	**In a typical week, how much time do you spend teaching mathematics to the students in this class?** *Write in the number of minutes per week.* *Please convert the number of hours into minutes.* _____ minutes per week	TQM-15	**In a typical week, how much time do you spend teaching mathematics to the students in this class?** _____ minutes per week *Write in the number of minutes per week.* *Please convert the number of hours into minutes.*	
TQM-15	**In teaching mathematics to this class, how often do you ask students to do the following?** *Check **one** circle for each line.* 1. Every or almost every lesson 2. About half the lessons 3. Some lessons 4. Never	TQM-16		
TQM-15a	Listen to me explain new mathematics content	TQM-16a		
TQM-15b	Listen to me explain how to solve problems	TQM-16b		
TQM-15c	Memorize rules, procedures, and facts	TQM-16c		

Exhibit E-5. TIMSS 2019 Grade 8 Teacher Math Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
TQM-15d	Practice procedures on their own	TQM-16d		
TQM-15e	Apply what they have learned to new problem situations on their own	TQM-16e		
TQM-15f	Work problems together in the whole class with direct guidance from me	TQM-16f		
TQM-15g	Work in mixed ability groups	TQM-16g		
TQM-15h	Work in same ability groups	TQM-16h		
		TQM-17	**Which best describes the mathematics course you are teaching to the class with the TIMSS students?** *Fill in **one** circle only.* 1. Basic or general eighth-grade math (not algebra or pre-algebra) 2. Pre-algebra or introduction to algebra 3. Two-year pre-algebra 4. Algebra I (one-year course) 5. Algebra I (first year of a two-year Algebra I course) 6. Algebra I (second year of two-year Algebra I course) 7. Geometry 8. Algebra II 9. Integrated or sequential math 10. Other math class	
Using Calculators and Computers for Teaching Mathematics to the TIMSS Class				
			Questions 18-19 ask about calculator and computer use for teaching mathematics to the eighth-grade students in the TIMSS class.	
TQM-16	**Are the students in this class permitted to use calculators during mathematics lessons?** *Check **one** circle only.* 1. Yes, with unrestricted use 2. Yes, with restricted use 3. No, calculators are not permitted	TQM-18		
TQM-17A	**Do the students in this class have computers (including tablets) available to use during their mathematics lessons?** *Check **one** circle only.* 1. Yes 2. No *(If No, go to #18)*	TQM-19A	**Do the students in this class have computers (including tablets) available to use during their mathematics lessons?** *Fill in **one** circle only.* 1. Yes 2. No *(If No, go to question 20)*	
TQM-17B	**If Yes,** **What access do the students have to computers?** *Check **one** circle for each line.* 1. Yes 2. No	TQM-19B		
TQM-17Ba	Each student has a computer	TQM-19Ba		
TQM-17Bb	The class has computers that students can share	TQM-19Bb		
TQM-17Bc	The school has computers that the class can use sometimes	TQM-19Bc		

Exhibit E-5. TIMSS 2019 Grade 8 Teacher Math Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
TQM-17C	**How often do you do activities on computers during mathematics lessons to support learning for:** *Check **one** circle for each line.* 1. Every or almost every day 2. Once or twice a week 3. Once or twice a month 4. Never or almost never	TQM-19C		
TQM-17Ca	Whole class	TQM-19Ca		
TQM-17Cb	Low-performing students	TQM-19Cb		
TQM-17Cc	High-performing students	TQM-19Cc		
TQM-17Cd	Students with special needs	TQM-19Cd		
Mathematics Topics Taught to the TIMSS Class				
			Question 20 asks about the topics taught and the content covered in teaching mathematics to the eighth-grade students in the TIMSS class.	
TQM-18	**The following list includes the main topics addressed by the TIMSS mathematics test. Choose the response that best describes when the students in this class have been taught each topic. If a topic was in the curriculum before the <eighth grade>, please choose "Mostly taught before this year." If a topic was taught half this year but not yet completed, please choose "Mostly taught this year." If a topic is not in the curriculum, please choose "Not yet taught or just introduced."** *Check **one** circle for each line.* 1. Mostly taught before this year 2. Mostly taught this year 3. Not yet taught or just introduced	TQM-20	eighth grade	
TQM-18A	**Number**	TQM-20A		
TQM-18Aa	Computing with negative numbers	TQM-20Aa		
TQM-18Ab	Concepts of fractions and decimals	TQM-20Ab		
TQM-18Ac	Solving problems involving proportions and percents	TQM-20Ac		
TQM-18B	**Algebra**	TQM-20B		
TQM-18Ba	Simplifying and evaluating algebraic expressions	TQM-20Ba		
TQM-18Bb	Simple linear equations	TQM-20Bb		
TQM-18Bc	Simple linear inequalities	TQM-20Bc		
TQM-18Bd	Simultaneous (two variables) equations	TQM-20Bd		
TQM-18Be	Representation of linear and quadratic functions in tables, graphs, words, or equations	TQM-20Be		
TQM-18Bf	Properties of functions (slopes, intercepts, etc.)	TQM-20Bf		
TQM-18Bg	Numeric, algebraic, and geometric patterns or sequences (extension, missing terms, generalization of patterns)	TQM-20Bg		
TQM-18C	**Geometry**	TQM-20C		

Exhibit E-5. TIMSS 2019 Grade 8 Teacher Math Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
TQM-18Ca	Geometric properties of angles, pairs of lines, and geometric shapes (triangles, quadrilaterals, and other common polygons)	TQM-20Ca		
TQM-18Cb	Solving problems involving perimeters, circumferences, and areas	TQM-20Cb		
TQM-18Cc	Solving problems involving the Pythagorean Theorem	TQM-20Cc		
TQM-18Cd	Translation, reflection, and rotation	TQM-20Cd		
TQM-18Ce	Congruent figures and similar triangles	TQM-20Ce		
TQM-18Cf	Solving problems with three-dimensional shapes	TQM-20Cf		
TQM-18D	**Data and Probability**	TQM-20D		
TQM-18Da	Reading and interpreting data from one or more sources to solve problems (interpolating, extrapolating, drawing conclusions)	TQM-20Da		
TQM-18Db	Identifying appropriate procedures for collecting data	TQM-20Db		
TQM-18Dc	Organizing and representing data to help answer questions	TQM-20Dc		
TQM-18Dd	Calculating and interpreting statistics summarizing data distributions	TQM-20Dd		
TQM-18De	Theoretical and empirical probability of simple events	TQM-20De		
TQM-18Df	Theoretical and empirical probability of compound events	TQM-20Df		
Mathematics Homework for the TIMSS Class				
			Question 21 asks about mathematics homework for the eighth-grade students in the TIMSS class.	
TQM-19A	**How often do you usually assign mathematics homework to the students in this class?** *Check **one** circle only.* 1. I do not assign mathematics homework *(Go to #20)* 2. Less than once a week 3. 1 or 2 times a week 4. 3 or 4 times a week 5. Every day	TQM-21A	**How often do you usually assign mathematics homework to the students in this class?** *Fill in **one** circle only.* 1. I do not assign mathematics homework *(Go to question 22)* 2. Less than once a week 3. 1 or 2 times a week 4. 3 or 4 times a week 5. Every day	
TQM-19B	**When you assign mathematics homework to the students in this class, about how many minutes do you usually assign? (Consider the time it would take an average student in your class.)** *Check **one** circle only.* 1. 15 minutes or less 2. 16–30 minutes 3. 31–60 minutes 4. 61–90 minutes 5. More than 90 minutes	TQM-21B		

Exhibit E-5. TIMSS 2019 Grade 8 Teacher Math Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
TQM-19C	**How often do you do the following with the mathematics homework assignments for this class?** *Check **one** circle for each line.* 1. Always or almost always 2. Sometimes 3. Never or almost never	TQM-21C		
TQM-19Ca	Correct assignments and give feedback to students	TQM-21Ca		
TQM-19Cb	Have students correct their own homework	TQM-21Cb		
TQM-19Cc	Discuss the homework in class	TQM-21Cc		
TQM-19Cd	Monitor whether or not the homework was completed	TQM-21Cd		
TQM-19Ce	Use the homework to contribute towards students' grades or marks	TQM-21Ce		
Mathematics Assessment of the TIMSS Class				
			Questions 22-23 asks about mathematics assessment for the eighth-grade students in the TIMSS class.	
TQM-20	**How much importance do you place on the following assessment strategies in mathematics?** *Check **one** circle for each line.* 1. A lot 2. Some 3. None	TQM-22		
TQM-20a	Observing students as they work	TQM-22a		
TQM-20b	Asking students to answer questions during class	TQM-22b		
TQM-20c	Short, regular written assessments	TQM-22c		
TQM-20d	Longer tests (e.g., unit tests or exams)	TQM-22d		
TQM-20e	Long-term projects	TQM-22e		
TQM-21	**About how often do <eighth grade> students in this class take mathematics tests on computers or tablets?** *Check **one** circle only.* 1. More than once a month 2. Once a month 3. Twice a year 4. Once a year 5. Never	TQM-23	eighth-grade	
Professional Development to Teach Mathematics				
TQM-22A	**In the past two years, have you participated in professional development in any of the following?** *Check **one** circle for each line.* 1. Yes 2. No	TQM-24A		
TQM-22Aa	Mathematics content	TQM-24Aa		
TQM-22Ab	Mathematics pedagogy/instruction	TQM-24Ab		
TQM-22Ac	Mathematics curriculum	TQM-24Ac		
TQM-22Ad	Integrating technology into mathematics instruction	TQM-24Ad		
TQM-22Ae	Improving students' critical thinking or problem solving skills	TQM-24Ae		
TQM-22Af	Mathematics assessment	TQM-24Af		

Exhibit E-5. TIMSS 2019 Grade 8 Teacher Math Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
TQM-22Ag	Addressing individual students' needs	TQM-24Ag		
TQM-22B	**Do you need future professional development in any of the following?** *Check **one** circle for each line.* 1. Yes 2. No	TQM-24B		
TQM-22Ba	Mathematics content	TQM-24Ba		
TQM-22Bb	Mathematics pedagogy/instruction	TQM-24Bb		
TQM-22Bc	Mathematics curriculum	TQM-24Bc		
TQM-22Bd	Integrating technology into mathematics instruction	TQM-24Bd		
TQM-22Be	Improving students' critical thinking or problem solving skills	TQM-24Be		
TQM-22Bf	Mathematics assessment	TQM-24Bf		
TQM-22Bg	Addressing individual students' needs	TQM-24Bg		
TQM-23	**In the past two years, how many hours in total have you spent in formal <in-service/professional development> (e.g., workshops, seminars, etc.) for mathematics?** *Check **one** circle only.* 1. None 2. Less than 6 hours 3. 6–15 hours 4. 16–35 hours 5. More than 35 hours	TQM-25	**In the past two years, how many hours in total have you spent in formal in-service/professional development (e.g., workshops, seminars) for mathematics?** *Fill in **one** circle only.* 1. None 2. Less than 6 hours 3. 6–15 hours 4. 16–35 hours 5. More than 35 hours	

Exhibit E-6. TIMSS 2019 Grade 8 Teacher Science Questionnaire

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
About You				
		TQG-01	**What year did you start teaching?** _____ *Please write in a year.*	
TQG-01	**By the end of this school year, how many years will you have been teaching altogether?** *Please **round** to the nearest whole number.* _____ years	TQG-02	**At the end of this school year, how many years will you have taught altogether?** _____ years *Please **round** to the nearest whole number.*	
TQG-02	**Are you female or male?** *Check **one** circle only.* 1. Female 2. Male	TQG-03		
TQG-03	**How old are you?** *Check **one** circle only.* 1. Under 25 2. 25–29 3. 30–39 4. 40–49 5. 50–59 6. 60 or more	TQG-04		
TQG-04	**What is the highest level of formal education you have completed?** *Check **one** circle only.* 1. Did not complete <Upper secondary education—ISCED Level 3> 2. <Upper secondary education—ISCED Level 3> *(If you have not completed <post-secondary or tertiary education>, go to #6)* 3. <Post-secondary, non-tertiary education—ISCED Level 4> 4. <Short-cycle tertiary education—ISCED Level 5> 5. <Bachelor's or equivalent level—ISCED Level 6> 6. <Master's or equivalent level—ISCED Level 7> 7. <Doctor or equivalent level—ISCED Level 8>	TQG-05	**What is the highest level of formal education you have completed?** *Fill in **one** circle only.* 1. Did not complete high school 2. High school graduate (*If you have not completed more than high school, go to question 7*) 3. Associate's degree (2-year college program) 4. Bachelor's degree (4-year college program) 5. Master's degree or professional degree (MD, DDS, lawyer, minister) 6. Doctorate (Ph.D., Ed.D.)	Nat -> Int 1 -> 1 2 -> 2 3 -> 4 4 -> 5 5 -> 6 6 -> 7 International Category 3 (ISCED Level 4) is not administered
TQG-05	**During your <post-secondary> education, what was your major or main area(s) of study?** *Check **one** circle for each line.* 1. Yes 2. No	TQG-06A	college or university	
TQG-05a	Mathematics	TQG-06a		
TQG-05b	Biology	TQG-06b		
TQG-05c	Physics	TQG-06c		
TQG-05d	Chemistry	TQG-06d		
TQG-05e	<Earth Science>	TQG-06e	Earth Science	
TQG-05f	Education–Mathematics	TQG-06f		
TQG-05g	Education–Science	TQG-06g		
TQG-05h	Education–General	TQG-06h		
TQG-05i	Other	TQG-06i		

Exhibit E-6. TIMSS 2019 Grade 8 Teacher Science Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	Item	National Item Number	Item	Recoding instructions
School Emphasis on Academic Success				
TQG-06	**How would you characterize each of the following within your school?** *Check **one** circle for each line.* 1. Very high 2. High 3. Medium 4. Low 5. Very low	TQG-07		
TQG-06a	Teachers' understanding of the school's curricular goals	TQG-07a		
TQG-06b	Teachers' degree of success in implementing the school's curriculum	TQG-07b		
TQG-06c	Teachers' expectations for student achievement	TQG-07c		
TQG-06d	Teachers' ability to inspire students	TQG-07d		
TQG-06e	Parental involvement in school activities	TQG-07e		
TQG-06f	Parental commitment to ensure that students are ready to learn	TQG-07f		
TQG-06g	Parental expectations for student achievement	TQG-07g		
TQG-06h	Parental support for student achievement	TQG-07h		
TQG-06i	Students' desire to do well in school	TQG-07i		
TQG-06j	Students' ability to reach school's academic goals	TQG-07j		
TQG-06k	Students' respect for classmates who excel academically	TQG-07k		
TQG-06l	Collaboration between school leadership (including master teachers) and teachers to plan instruction	TQG-07l		
School Environment				
TQG-07	**Thinking about your current school, indicate the extent to which you agree or disagree with each of the following statements.** *Check **one** circle for each line.* 1. Agree a lot 2. Agree a little 3. Disagree a little 4. Disagree a lot	TQG-08		
TQG-07a	This school is located in a safe neighborhood	TQG-08a		
TQG-07b	I feel safe at this school	TQG-08b		
TQG-07c	This school's security policies and practices are sufficient	TQG-08c		
TQG-07d	The students behave in an orderly manner	TQG-08d		
TQG-07e	The students are respectful of the teachers	TQG-08e		
TQG-07f	The students respect school property	TQG-08f		
TQG-07g	This school has clear rules about student conduct	TQG-08g		
TQG-07h	This school's rules are enforced in a fair and consistent manner	TQG-08h		

Exhibit E-6. TIMSS 2019 Grade 8 Teacher Science Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
About Being a Teacher				
TQG-08	**How often do you feel the following way about being a teacher?** *Check **one** circle for each line.* 1. Very often 2. Often 3. Sometimes 4. Never or almost never	TQG-09		
TQG-08a	I am content with my profession as a teacher	TQG-09a		
TQG-08b	I find my work full of meaning and purpose	TQG-09b		
TQG-08c	I am enthusiastic about my job	TQG-09c		
TQG-08d	My work inspires me	TQG-09d		
TQG-08e	I am proud of the work I do	TQG-09e		
TQG-09	**Indicate the extent to which you agree or disagree with each of the following statements.** *Check **one** circle for each line.* 1. Agree a lot 2. Agree a little 3. Disagree a little 4. Disagree a lot	TQG-10		
TQG-09a	There are too many students in the classes	TQG-10a		
TQG-09b	I have too much material to cover in class	TQG-10b		
TQG-09c	I have too many teaching hours	TQG-10c		
TQG-09d	I need more time to prepare for class	TQG-10d		
TQG-09e	I need more time to assist individual students	TQG-10e		
TQG-09f	I feel too much pressure from parents	TQG-10f		
TQG-09g	I have difficulty keeping up with all of the changes to the curriculum	TQG-10g		
TQG-09h	I have too many administrative tasks	TQG-10h		

Exhibit E-6. TIMSS 2019 Grade 8 Teacher Science Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
About Teaching the <TIMSS Class/Class with the TIMSS students>				
			Questions 11-14 ask about instruction for the eighth-grade students in the TIMSS class.	
TQG-10	**How many students are in this class?** *Write in the number.* _____ students	TQG-11		
TQG-11	**How many <eighth grade> students experience difficulties understanding spoken <language of test>?** *Write in the number.* _____ students in this class	TQG-12	eighth-grade English	
TQG-12	**How often do you do the following in teaching this class?** *Check **one** circle for each line.* 1. Every or almost every lesson 2. About half the lessons 3. Some lessons 4. Never	TQG-13		
TQG-12a	Relate the lesson to students' daily lives	TQG-13a		
TQG-12b	Ask students to explain their answers	TQG-13b		
TQG-12c	Ask students to complete challenging exercises that require them to go beyond the instruction	TQG-13c		
TQG-12d	Encourage classroom discussions among students	TQG-13d		
TQG-12e	Link new content to students' prior knowledge	TQG-13e		
TQG-12f	Ask students to decide their own problem solving procedures	TQG-13f		
TQG-12g	Encourage students to express their ideas in class	TQG-13g		
TQG-13	**In your view, to what extent do the following limit how you teach this class?** *Check **one** circle for each line.* 1. Not at all 2. Some 3. A lot	TQG-14		
TQG-13a	Students lacking prerequisite knowledge or skills	TQG-14a		
TQG-13b	Students suffering from lack of basic nutrition	TQG-14b		
TQG-13c	Students suffering from not enough sleep	TQG-14c		
TQG-13d	Students absent from class	TQG-14d		
TQG-13e	Disruptive students	TQG-14e		
TQG-13f	Uninterested students	TQG-14f		
TQG-13g	Students with mental, emotional, or psychological impairment	TQG-14g		
TQG-13h	Students with difficulties understanding the language of instruction	TQG-14h		

Exhibit E-6. TIMSS 2019 Grade 8 Teacher Science Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
Teaching Science to the <TIMSS Class/Class with the TIMSS students>				
			Questions 15-17 ask about science instruction for the eighth-grade students in the TIMSS class.	
TQS-14	**In a typical week, how much time do you spend teaching science to the students in this class?** *Write in the number of minutes per week.* *Please convert the number of hours into minutes.* _____ minutes per week	TQS-15		
TQS-15	**In teaching science to the students in this class, how often do you ask them to do the following?** *Check **one** circle for each line.* 1. Every or almost every lesson 2. About half the lessons 3. Some lessons 4. Never	TQS-16		
TQS-15a	Listen to me explain new science content	TQS-16a		
TQS-15b	Observe natural phenomena and describe what they see	TQS-16b		
TQS-15c	Watch me demonstrate an experiment or investigation	TQS-16c		
TQS-15d	Design or plan experiments or investigations	TQS-16d		
TQS-15e	Conduct experiments or investigations	TQS-16e		
TQS-15f	Present data from experiments or investigations	TQS-16f		
TQS-15g	Interpret data from experiments or investigations	TQS-16g		
TQS-15h	Use evidence from experiments or investigations to support conclusions	TQS-16h		
TQS-15i	Read their textbooks or other resource materials	TQS-16i		
TQS-15j	Have students memorize facts and principles	TQS-16j		
TQS-15k	Use scientific formulas and laws to solve routine problems	TQS-16k		
TQS-15l	Do field work outside of class	TQS-16l		
TQS-15m	Work in mixed ability groups	TQS-16m		
TQS-15n	Work in same ability groups	TQS-16n		
		TQS-17	**Which best describes the science course you are teaching to the class with the TIMSS students?** *Fill in **one** circle only* 1. General science (several content areas of science taught separately) 2. Integrated science (several content areas of science combined and taught together throughout the year) 3. Life science (e.g., biology, ecosystems, human health) 4. Physical science (e.g., physics or chemistry) 5. Earth science (e.g., geology, Earth and the solar system, fossils)	

Exhibit E-6. TIMSS 2019 Grade 8 Teacher Science Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
Using Computers for Teaching Science to the <TIMSS Class/Class with the TIMSS students>				
			Question 18 asks about computer use for teaching science to the eighth-grade students in the TIMSS class.	
TQS-16A	**Do the students in this class have computers (including tablets) available to use during their science lessons?** *Check **one** circle only.* 1. Yes 2. No *(If No, go to #17)*	TQS-18A	**Do the students in this class have computers (including tablets) available to use during their science lessons?** *Fill in **one** circle only.* 1. Yes 2. No *(If No, go to question 19)*	
TQS-16B	**If Yes,** **What access do the students have to computers?** *Check **one** circle for each line.* 1. Yes 2. No	TQS-18B		
TQS-16Ba	Each student has a computer	TQS-18Ba		
TQS-16Bb	The class has computers that students can share	TQS-18Bb		
TQS-16Bc	The school has computers that the class can use sometimes	TQS-18Bc		
TQS-16C	**How often do you do activities on computers during science lessons to support learning for:** *Check **one** circle for each line.* 1. Every or almost every day 2. Once or twice a week 3. Once or twice a month 4. Never or almost never	TQS-18C		
TQS-16Ca	Whole class	TQS-18Ca		
TQS-16Cb	Low-performing students	TQS-18Cb		
TQS-16Cc	High-performing students	TQS-18Cc		
TQS-16Cd	Students with special needs	TQS-18Cd		
Science Topics Taught to the <TIMSS Class/Class with the TIMSS students>				
			Question 19 asks about the topics taught and the content covered in teaching science to the eighth-grade students in the TIMSS class.	
TQS-17	**The following list includes the main topics addressed by the TIMSS science test. Choose the response that best describes when the students in this class have been taught each topic. If a topic was in the curriculum before the <eighth grade>, please choose "Mostly taught before this year." If a topic was taught half this year but not yet completed, please choose "Mostly taught this year." If a topic is not in the curriculum, please choose "Not yet taught or just introduced."** *Check **one** circle for each line.* 1. Mostly taught before this year 2. Mostly taught this year 3. Not yet taught or just introduced	TQS-19	eighth grade	

Exhibit E-6. TIMSS 2019 Grade 8 Teacher Science Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	Item	National Item Number	Item	Recoding instructions
TQS-17A	**Biology**	TQS-19A		
TQS-17Aa	Differences among major taxonomic groups of organisms (plants, animals, fungi, mammals, birds, reptiles, fish, amphibians, insects)	TQS-19Aa		
TQS-17Ab	Major organs and organ systems in humans and other organisms (structure/function, life processes)	TQS-19Ab		
TQS-17Ac	Cells, their structure and functions, including respiration and photosynthesis as cellular processes	TQS-19Ac		
TQS-17Ad	Life cycles, sexual reproduction, and heredity (inherited versus acquired/learned characteristics)	TQS-19Ad		
TQS-17Ae	Role of variation and adaptation in survival/extinction of species (including fossil evidence)	TQS-19Ae		
TQS-17Af	Interdependence of populations of organisms in an ecosystem (e.g., carbon and water cycles, energy flow, food webs, competition, predation, human impacts on ecosystems)	TQS-19Af		
TQS-17Ag	Human health (e.g., causes, transmission, and prevention of common infectious diseases, immunity) and the importance of diet, exercise, and other lifestyle choices in maintaining health	TQS-19Ag		
TQS-17B	**Chemistry**	TQS-19B		
TQS-17Ba	Particulate structure, classification, and composition of matter (protons, neutrons, electrons, atoms, molecules, elements, compounds, mixtures)	TQS-19Ba		
TQS-17Bb	The periodic table as an organizing principle for the known elements	TQS-19Bb		
TQS-17Bc	Physical and chemical properties of matter	TQS-19Bc		
TQS-17Bd	Mixtures and solutions (e.g., solvent, solute, concentration/dilution)	TQS-19Bd		
TQS-17Be	Properties of common acids and bases (e.g., acids have pH less than 7, reactions with indicators produce color changes, acids and bases neutralize each other)	TQS-19Be		
TQS-17Bf	Characteristics of chemical reactions (e.g., transformation of reactants, evidence of chemical change)	TQS-19Bf		
TQS-17Bg	Matter and energy in chemical reactions (conservation of matter, familiar exothermic and endothermic reactions, factors affecting reaction rates)	TQS-19Bg		
TQS-17Bh	The role of electrons in chemical bonds	TQS-19Bh		
TQS-17C	**Physics**	TQS-19C		
TQS-17Ca	Physical states and changes in matter (explanations of properties in terms of movement and distance between particles; phase change, changes in volume and/or pressure, physical changes)	TQS-19Ca		

Exhibit E-6. TIMSS 2019 Grade 8 Teacher Science Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
TQS-17Cb	Energy transformation and transfer (e.g., forms of energy, energy conservation, heat temperature, equilibrium)	TQS-19Cb		
TQS-17Cc	Basic properties/behaviors of light (reflection, refraction, color, shadows, simple ray diagrams)	TQS-19Cc		
TQS-17Cd	Basic properties/behaviors of sound (vibrations that produce sound, transmission through media, loudness, pitch)	TQS-19Cd		
TQS-17Ce	Electric circuits (e.g., electrical conductors/insulators and the flow of electricity in series/parallel circuits)	TQS-19Ce		
TQS-17Cf	Properties and uses of permanent magnets and electromagnets	TQS-19Cf		
TQS-17Cg	Motion and forces (e.g., basic description of motion, common mechanical forces, properties of forces, effects of forces, simple machines, buoyancy, effects of density and pressure)	TQS-19Cg		
TQS-17D	**Earth Science**	TQS-19D		
TQS-17Da	Earth's structure and physical features (e.g., Earth's crust, mantle, and core; composition and relative distribution of water; composition of Earth's atmosphere)	TQS-19Da		
TQS-17Db	Earth's processes, cycles, and history (e.g., rock cycle, major geological events, formation of fossils and fossil fuels, water cycle, weather versus climate)	TQS-19Db		
TQS-17Dc	Earth's resources, their use, and conservation (e.g., renewable/nonrenewable resources, human use of land and water resources)	TQS-19Dc		
TQS-17Dd	Earth in the Solar System and the universe (phenomena on Earth: seasons, eclipses, tides, phases of moon; members of the Solar System; physical features of Earth)	TQS-19Dd		
Science Homework for the <TIMSS Class/Class with the TIMSS students>				
			Question 20 asks about science homework for the eighth-grade students in the TIMSS class.	
TQS-18A	**How often do you usually assign science homework to the students in this class?** *Check **one** circle only.* 1. I do not assign science homework *(Go to #19)* 2. Less than once a week 3. 1 or 2 times a week 4. 3 or 4 times a week 5. Every day	TQS-20A	**How often do you usually assign science homework to the students in this class?** *Fill in **one** circle only.* 1. I do not assign science homework *(Go to question 21)* 2. Less than once a week 3. 1 or 2 times a week 4. 3 or 4 times a week 5. Every day	

Exhibit E-6. TIMSS 2019 Grade 8 Teacher Science Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	Item	National Item Number	Item	Recoding instructions
TQS-18B	**When you assign science homework to the students in this class, about how many minutes do you usually assign? (Consider the time it would take an average student in your class.)** *Check **one** circle only.* 1. 15 minutes or less 2. 16–30 minutes 3. 31–60 minutes 4. 61–90 minutes 5. More than 90 minutes	TQS-20B		
TQS-18C	**How often do you do the following with the science homework assignments for this class?** *Check **one** circle for each line.* 1. Always or almost always 2. Sometimes 3. Never or almost never	TQS-20C		
TQS-18Ca	Correct assignments and give feedback to students	TQS-20Ca		
TQS-18Cb	Have students correct their own homework	TQS-20Cb		
TQS-18Cc	Discuss the homework in class	TQS-20Cc		
TQS-18Cd	Monitor whether or not the homework was completed	TQS-20Cd		
TQS-18Ce	Use the homework to contribute towards students' grades or marks	TQS-20Ce		
Science Assessment of the <TIMSS Class/Class with the TIMSS students>				
			Questions 21-22 asks about science assessment for the eighth-grade students in the TIMSS class.	
TQS-19	**How much importance do you place on the following assessment strategies in science?** *Check **one** circle for each line.* 1. A lot 2. Some 3. None	TQS-21		
TQS-19a	Observing students as they work	TQS-21a		
TQS-19b	Asking students to answer questions during class	TQS-21b		
TQS-19c	Short, regular written assessments	TQS-21c		
TQS-19d	Longer tests (e.g., unit tests or exams)	TQS-21d		
TQS-19e	Long-term projects	TQS-21e		
TQS-20	**About how often do <eighth grade> students in this class take science tests on computers or tablets?** *Check **one** circle only.* 1. More than once a month 2. Once a month 3. Twice a year 4. Once a year 5. Never	TQS-22	eighth-grade	

Exhibit E-6. TIMSS 2019 Grade 8 Teacher Science Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
Professional Development to Teach Science				
TQS-21A	**In the past two years, have you participated in professional development in any of the following?** *Check **one** circle for each line.* 1. Yes 2. No	TQS-23A		
TQS-21Aa	Science content	TQS-23Aa		
TQS-21Ab	Science pedagogy/instruction	TQS-23Ab		
TQS-21Ac	Science curriculum	TQS-23Ac		
TQS-21Ad	Integrating technology into science instruction	TQS-23Ad		
TQS-21Ae	Improving students' critical thinking or inquiry skills	TQS-23Ae		
TQS-21Af	Science assessment	TQS-23Af		
TQS-21Ag	Addressing individual students' needs	TQS-23Ag		
TQS-21B	**Do you need future professional development in any of the following?** *Check **one** circle for each line.* 1. Yes 2. No	TQS-23B		
TQS-21Ba	Science content	TQS-23Ba		
TQS-21Bb	Science pedagogy/instruction	TQS-23Bb		
TQS-21Bc	Science curriculum	TQS-23Bc		
TQS-21Bd	Integrating technology into science instruction	TQS-23Bd		
TQS-21Be	Improving students' critical thinking or inquiry skills	TQS-23Be		
TQS-21Bf	Science assessment	TQS-23Bf		
TQS-21Bg	Addressing individual students' needs	TQS-23Bg		
TQS-22	**In the past two years, how many hours in total have you spent in formal <in-service/professional development> (e.g., workshops, seminars, etc.) for science?** *Check **one** circle only.* 1. None 2. Less than 6 hours 3. 6–15 hours 4. 16–35 hours 5. More than 35 hours	TQS-24	**In the past two years, how many hours in total have you spent in formal in-service/professional development (e.g., workshops, seminars) for science?** *Fill in **one** circle only.* 1. None 2. Less than 6 hours 3. 6–15 hours 4. 16–35 hours 5. More than 35 hours	

Exhibit E-7. TIMSS 2019 Grade 8 Student Questionnaire

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
About you				
SQG-01	**Are you a girl or a boy?** *Fill **one** circle only.* 1. Girl 2. Boy	SQG-01A		
		SQG-01B	**Are you Hispanic or Latino?** *Fill in **one** oval only.* 1. Yes, I am Hispanic or Latino 2. No, I am not Hispanic or Latino	
		SQG-01C	**Which of the following best describes you?** *Fill in oval for **all** that apply.* 1. White 2. Black or African American 3. Asian 4. American Indian or Alaska Native 5. Native Hawaiian or other Pacific Islander	
SQG-02	**When were you born?** *Fill the circles next to the month and year you were born.*	SQG-02		
SQG-02a	**Month** 1. January 2. February 3. March 4. April 5. May 6. June 7. July 8. August 9. September 10. October 11. November 12. December	SQG-02a	**Month** A. January B. February C. March D. April E. May F. June G. July H. August I. September J. October K. November L. December	
SQG-02b	**Year** 1. 2001 2. 2002 3. 2003 4. 2004 5. 2005 6. 2006 7. 2007 8. 2008 9. 2009 10. Other	SQG-02b		
SQG-03	**How often do you speak <language of test> at home?** *Fill **one** circle only.* 1. Always 2. Almost always 3. Sometimes 4. Never	SQG-03a	**How often do you speak English at home?** *Fill in **one** oval only.* 1. Always *If **Always**, please go to question 4.* 2. Almost always 3. Sometimes 4. Never *If **Almost always, Sometimes, Never,** please go to question 3B*	

Exhibit E-7. TIMSS 2019 Grade 8 Student Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
		SQG-03b	**What language do you speak at home (other than English)?** *Fill in **one** oval only.* 1. Spanish 2. Other: Please specify _____	
SQG-04	**About how many books are there in your home? (Do not count magazines, newspapers, or your school books.)** *Fill **one** circle only.* 1. None or very few (0–10 books) 2. Enough to fill one shelf (11–25 books) 3. Enough to fill one bookcase (26–100 books) 4. Enough to fill two bookcases (101–200 books) 5. Enough to fill three or more bookcases (more than 200)	SQG-04		
SQG-05	**Do you have any of these things at your home?** *Fill **one** circle for each line.* 1. Yes 2. No	SQG-05		
SQG-05a	A computer or tablet	SQG-05a		
SQG-05b	Study desk/table for your use	SQG-05b		
SQG-05c	Your own room	SQG-05c		
SQG-05d	Internet connection	SQG-05d		
SQG-05e	Your own mobile phone	SQG-05e	Your own cell phone	
SQG-05f	<country-specific indicator of wealth>	SQG-05f	A gaming system (e.g., PlayStation, Wii, Xbox)	
SQG-05g	<country-specific indicator of wealth>	SQG-05g	VCR, DVD, or Blu-ray player	
SQG-05h	<country-specific indicator of wealth>			
SQG-05i	<country-specific indicator of wealth>			

Exhibit E-7. TIMSS 2019 Grade 8 Student Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
SQG-06	**The following questions are about your <Parent/Guardian A> and <Parent/Guardian B>. <If you have only one parent/guardian, answer for Parent/Guardian A. If you have two parents/guardians, choose one for Parent/Guardian A and the other for Parent/Guardian B.>** **What is the highest level of education completed by your <parents/guardians>?** *Fill **one** circle only.* 1. Some <Primary education— ISCED Level 1 or Lower secondary education—ISCED Level 2> or did not go to school 2. <Lower secondary education—ISCED Level 2> 3. <Upper secondary education—ISCED Level 3> 4. <Post-secondary, non-tertiary education—ISCED Level 4> 5. <Short-cycle tertiary education—ISCED Level 5> 6. <Bachelor's or equivalent level—ISCED Level 6> 7. <Postgraduate degree: Master's—ISCED Level 7 or Doctor—ISCED Level 8> 8. I don't know 9. Not applicable	SQG-06	**The following questions are about your Parent/Guardian A and Parent/Guardian B. If you have only one parent/guardian, answer for Parent/Guardian A. If you have two parents/guardians, choose one for Parent/Guardian A and the other for Parent/Guardian B**. **What is the highest level of education completed by your parents/guardians?** *Fill in one oval only.* 1. Less than high school 2. Some high school 3. High school graduate 4. Associate's degree (2-year college program) 5. Bachelor's degree (4-year college program) 6. Master's degree or professional degree (MD, DDS, lawyer, minister) 7. Doctorate (Ph.D., Ed.D.) 8. I don't know 9. Not applicable	Nat -> Int 1 -> 1 2 -> 2 3 -> 3 4 -> 5 5 -> 6 6 -> 7 7 -> 7 8 -> 8 9 ->9 International Category 4 (ISCED Level 4) is not administered
SQG-06A	**<Parent/Guardian A>**	SQG-06A	Parent/Guardian A	
SQG-06B	**<Parent/Guardian B>**	SQG-06B	Parent/Guardian B	
SQG-07	**How far in your education do you expect to go?** *Fill **one** circle only.* 1. Finish <Lower secondary education—ISCED Level 2> 2. Finish <Upper secondary education—ISCED Level 3> 3. Finish <Post-secondary, non-tertiary education—ISCED Level 4> 4. Finish <Short-cycle tertiary education—ISCED Level 5> 5. Finish <Bachelor's or equivalent level—ISCED Level 6> 6. Finish <Postgraduate degree: Master's—ISCED Level 7 or Doctor—ISCED Level 8>	SQG-07	1. Finish middle school 2. Finish high school 3. Finish Associate's degree (2-year college program) 4. Finish Bachelor's degree (4-year college program) 5. Finish Master's degree or professional degree (MD, DDS, lawyer, minister) 6. Finish Doctorate (Ph.D., Ed.D.)	Nat -> Int 1 -> 1 2 -> 2 3 -> 4 4 -> 5 5 -> 6 6 -> 6 International Category 4 (ISCED Level 4) is not administered
SQG-08	**Were your <parents/guardians> born in <country>?** *Fill **one** circle only.* 1. Yes 2. No 3. I don't know 4. Not applicable	SQG-08	**Were your parents/guardians born in the United States? ("United States" includes the 50 states, its territories, the District of Columbia, and U.S. military bases abroad).** *Fill in one oval only.* 1. Yes 2. No 3. I don't know 4. Not applicable	
SQG-08A	**<Parent/Guardian A>**	SQG-08A	Parent/Guardian A	
SQG-08B	**<Parent/Guardian B>**	SQG-08B	Parent/Guardian B	

Exhibit E-7. TIMSS 2019 Grade 8 Student Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
SQG-09A	**Were you born in <country>?** *Fill **one** circle only.* 1. Yes *(If Yes, go to #10)* 2. No	SQG-09A	the United States *(If Yes, go to question 10)*	
SQG-09B	**If No,** **If you were not born in <country>, how old were you when you came to <country>?** *Fill **one** circle only.* 1. Older than 10 years old 2. 5 to 10 years old 3. Younger than 5 years old	SQG-09B	the United States the United States	
		SQG-10	**The following questions ask about activities you do outside of school.** *Fill in only **one** oval for each row* 1. Yes 2. No	
		SQG-10a	Do you play on a sports team outside of school?	
		SQG-10b	Do you often play a musical instrument outside of school?	
		SQG-10c	Are you studying something in a class outside of school?	
		SQG-10d	Do you belong to a club outside of school (like Boy/Girl Scouts, 4-H, or Boys and Girls Club)?	
		SQG-11	**In this school year, are you preparing for or have you participated in any of the following activities?** *Fill in only **one** oval for each row.* 1. Yes 2. No	
		SQG-11a	Science fair	
		SQG-11b	Science club	
		SQG-11c	Science competition	
SQG-10	**About how often are you absent from school?** *Fill **one** circle only.* 1. Once a week 2. Once every two weeks 3. Once a month 4. Once every two months 5. Never or almost never	SQG-12A		
		SQG-12B	**How many days were you absent from school in the last month?** *Fill in **one** oval only.* 1. None 2. 1 or 2 days 3. 3 or 4 days 4. 5 to 10 days 5. More than 10 days	
		SQG-13	**Have you ever repeated a grade?** *Fill in only **one** oval for each row.* 1. Yes 2. No	
		SQG-13A	In elementary school	
		SQG-13B	In middle or junior high school	

Exhibit E-7. TIMSS 2019 Grade 8 Student Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
SQG-11	**How often do you feel this way when you arrive at school?** *Fill **one** circle for each line.* 1. Every day 2. Almost every day 3. Sometimes 4. Never	SQG-14		
SQG-11a	I feel tired	SQG-14a		
SQG-11b	I feel hungry	SQG-14b		
SQG-12	**Do you use the Internet to do any of the following tasks for schoolwork (including classroom tasks, homework, studying outside of class)?** *Fill **one** circle for each line.* 1. Yes 2. No	SQG-15		
SQG-12a	Access the textbook or other course materials	SQG-15a		
SQG-12b	Access assignments posted online by my teacher	SQG-15b		
SQG-12c	Collaborate with classmates on assignments or projects	SQG-15c		
SQG-12d	Communicate with the teacher	SQG-15d		
SQG-12e	Find information, articles, or tutorials to aid in understanding mathematics or science	SQG-15e		
SQG-12f	Access learning games or activities related to mathematics or science	SQG-15f		
Your School				
SQG-13	**What do you think about your school? Tell how much you agree with these statements.** *Fill **one** circle for each line.* 1. Agree a lot 2. Agree a little 3. Disagree a little 4. Disagree a lot	SQG-16		
SQG-13a	I like being in school	SQG-16a		
SQG-13b	I feel safe when I am at school	SQG-16b		
SQG-13c	I feel like I belong at this school	SQG-16c		
SQG-13d	Teachers at my school are fair to me	SQG-16d		
SQG-13e	I am proud to go to this school	SQG-16e		
SQG-14	**During this school year, how often have other students from your school done any of the following things to you, including through texting or the Internet?** *Fill **one** circle for each line.* 1. At least once a week 2. Once or twice a month 3. A few times a year 4. Never	SQG-17		
SQG-14a	Said mean things about my physical appearance (e.g., my hair, my size)	SQG-17a		
SQG-14b	Spread lies about me	SQG-17b		
SQG-14c	Shared my secrets with others	SQG-17c		

Exhibit E-7. TIMSS 2019 Grade 8 Student Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
SQG-14d	Refused to talk to me	SQG-17d		
SQG-14e	Insulted a member of my family	SQG-17e		
SQG-14f	Stole something from me	SQG-17f		
SQG-14g	Made me do things I didn't want to do	SQG-17g		
SQG-14h	Sent me nasty or hurtful messages online	SQG-17h		
SQG-14i	Shared nasty or hurtful things about me online	SQG-17i		
SQG-14j	Shared embarrassing photos of me online	SQG-17j		
SQG-14k	Threatened me	SQG-17k		
SQG-14l	Physically hurt me	SQG-17l		
SQG-14m	Excluded me from their group (e.g., parties, messaging)	SQG-17m		
SQG-14n	Damaged something of mine on purpose	SQG-17n		
Mathematics in School				
SQM-15	**In mathematics lessons, how often do you work problems on your own?** *Fill **one** circle only.* 1. Every or almost every lesson 2. About half the lessons 3. Some lessons 4. Never	SQM-18		
SQM-16	**How much do you agree with these statements about learning mathematics?** *Fill **one** circle for each line.* 1. Agree a lot 2. Agree a little 3. Disagree a little 4. Disagree a lot	SQM-19		
SQM-16a	I enjoy learning mathematics	SQM-19a		
SQM-16b	I wish I did not have to study mathematics	SQM-19b		
SQM-16c	Mathematics is boring	SQM-19c		
SQM-16d	I learn many interesting things in mathematics	SQM-19d		
SQM-16e	I like mathematics	SQM-19e		
SQM-16f	I like any schoolwork that involves numbers	SQM-19f		
SQM-16g	I like to solve mathematics problems	SQM-19g		
SQM-16h	I look forward to mathematics class	SQM-19h		
SQM-16i	Mathematics is one of my favorite subjects	SQM-19i		
SQM-17	**How much do you agree with these statements about your <u>mathematics lessons</u>?** *Fill **one** circle for each line.* 1. Agree a lot 2. Agree a little 3. Disagree a little 4. Disagree a lot	SQM-20		
SQM-17a	I know what my teacher expects me to do	SQM-20a		
SQM-17b	My teacher is easy to understand	SQM-20b		
SQM-17c	My teacher has clear answers to my questions	SQM-20c		

Exhibit E-7. TIMSS 2019 Grade 8 Student Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
SQM-17d	My teacher is good at explaining mathematics	SQM-20d		
SQM-17e	My teacher does a variety of things to help us learn	SQM-20e		
SQM-17f	My teacher links new lessons to what I already know	SQM-20f		
SQM-17g	My teacher explains a topic again when we don't understand	SQM-20g		
SQM-18	**How often do these things happen in your mathematics lessons?** *Fill **one** circle for each line.* 1. Every or almost every lesson 2. About half the lessons 3. Some lessons 4. Never	SQM-21		
SQM-18a	Students don't listen to what the teacher says	SQM-21a		
SQM-18b	There is disruptive noise	SQM-21b		
SQM-18c	It is too disorderly for students to work well	SQM-21c		
SQM-18d	My teacher has to wait a long time for students to quiet down	SQM-21d		
SQM-18e	Students interrupt the teacher	SQM-21e		
SQM-18f	My teacher has to keep telling us to follow the classroom rules	SQM-21f		
SQM-19	**How much do you agree with these statements about mathematics?** *Fill **one** circle for each line.* 1. Agree a lot 2. Agree a little 3. Disagree a little 4. Disagree a lot	SQM-22		
SQM-19a	I usually do well in mathematics	SQM-22a		
SQM-19b	Mathematics is more difficult for me than for many of my classmates	SQM-22b		
SQM-19c	Mathematics is not one of my strengths	SQM-22c		
SQM-19d	I learn things quickly in mathematics	SQM-22d		
SQM-19e	Mathematics makes me nervous	SQM-22e		
SQM-19f	I am good at working out difficult mathematics problems	SQM-22f		
SQM-19g	My teacher tells me I am good at mathematics	SQM-22g		
SQM-19h	Mathematics is harder for me than any other subject	SQM-22h		
SQM-19i	Mathematics makes me confused	SQM-22i		
SQM-20	**How much do you agree with these statements about mathematics?** *Fill **one** circle for each line.* 1. Agree a lot 2. Agree a little 3. Disagree a little 4. Disagree a lot	SQM-23		
SQM-20a	I think learning mathematics will help me in my daily life	SQM-23a		
SQM-20b	I need mathematics to learn other school subjects	SQM-23b		
SQM-20c	I need to do well in mathematics to get into the <university> of my choice	SQM-23c	college or university	

Exhibit E-7. TIMSS 2019 Grade 8 Student Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
SQM-20d	I need to do well in mathematics to get the job I want	SQM-23d		
SQM-20e	I would like a job that involves using mathematics	SQM-23e		
SQM-20f	It is important to learn about mathematics to get ahead in the world	SQM-23f		
SQM-20g	Learning mathematics will give me more job opportunities when I am an adult	SQM-23g		
SQM-20h	My parents think that it is important that I do well in mathematics	SQM-23h		
SQM-20i	It is important to do well in mathematics	SQM-23i		
Science in School				
SQIS-21	**In science lessons, how often does your teacher ask you to conduct science experiments?** *Fill **one** circle only.* 1. At least once a week 2. Once or twice a month 3. A few times a year 4. Never	SQIS-24		
SQIS-22	**How much do you agree with these statements about learning science?** *Fill **one** circle for each line.* 1. Agree a lot 2. Agree a little 3. Disagree a little 4. Disagree a lot	SQIS-25		
SQIS-22a	I enjoy learning science	SQIS-25a		
SQIS-22b	I wish I did not have to study science	SQIS-25b		
SQIS-22c	Science is boring	SQIS-25c		
SQIS-22d	I learn many interesting things in science	SQIS-25d		
SQIS-22e	I like science	SQIS-25e		
SQIS-22f	I look forward to learning science in school	SQIS-25f		
SQIS-22g	Science teaches me how things in the world work	SQIS-25g		
SQIS-22h	I like to conduct science experiments	SQIS-25h		
SQIS-22i	Science is one of my favorite subjects	SQIS-25i		
SQIS-23	**How much do you agree with these statements about your <u>science lessons</u>?** *Fill **one** circle for each line.* 1. Agree a lot 2. Agree a little 3. Disagree a little 4. Disagree a lot	SQIS-26		
SQIS-23a	I know what my teacher expects me to do	SQIS-26a		
SQIS-23b	My teacher is easy to understand	SQIS-26b		
SQIS-23c	My teacher has clear answers to my questions	SQIS-26c		
SQIS-23d	My teacher is good at explaining science	SQIS-26d		
SQIS-23e	My teacher does a variety of things to help us learn	SQIS-26e		
SQIS-23f	My teacher links new lessons to what I already know	SQIS-26f		

Exhibit E-7. TIMSS 2019 Grade 8 Student Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
SQIS-23g	My teacher explains a topic again when we don't understand	SQIS-26g		
SQIS-24	**How much do you agree with these statements about science?** *Fill **one** circle for each line.* 1. Agree a lot 2. Agree a little 3. Disagree a little 4. Disagree a lot	SQIS-27		
SQIS-24a	I usually do well in science	SQIS-27a		
SQIS-24b	Science is more difficult for me than for many of my classmates	SQIS-27b		
SQIS-24c	Science is not one of my strengths	SQIS-27c		
SQIS-24d	I learn things quickly in science	SQIS-27d		
SQIS-24e	I am good at working out difficult science problems	SQIS-27e		
SQIS-24f	My teacher tells me I am good at science	SQIS-27f		
SQIS-24g	Science is harder for me than any other subject	SQIS-27g		
SQIS-24h	Science makes me confused	SQIS-27h		
SQIS-25	**How much do you agree with these statements about science?** *Fill **one** circle for each line.* 1. Agree a lot 2. Agree a little 3. Disagree a little 4. Disagree a lot	SQIS-28		
SQIS-25a	I think learning science will help me in my daily life	SQIS-28a		
SQIS-25b	I need science to learn other school subjects	SQIS-28b		
SQIS-25c	I need to do well in science to get into the <university> of my choice	SQIS-28c	college or university	
SQIS-25d	I need to do well in science to get the job I want	SQIS-28d		
SQIS-25e	I would like a job that involves using science	SQIS-28e		
SQIS-25f	It is important to learn about science to get ahead in the world	SQIS-28f		
SQIS-25g	Learning science will give me more job opportunities when I am an adult	SQIS-28g		
SQIS-25h	My parents think that it is important that I do well in science	SQIS-28h		
SQIS-25i	It is important to do well in science	SQIS-28i		
Homework				
SQIS-26A	**How often does your teacher give you homework in the following subjects?** *Fill **one** circle for each line.* 1. Every day 2. 3 or 4 times a week 3. 1 or 2 times a week 4. Less than once a week 5. Never	SQIS-29A		
SQIS-26Aa	Mathematics	SQIS-29Aa		
SQIS-26Ab	Science	SQIS-29Ab		

Exhibit E-7. TIMSS 2019 Grade 8 Student Questionnaire—Continued

Questions that Require National Adaptations				
2019 International Version		2019 U.S. Adapted Version		
International Item Number	**Item**	**National Item Number**	**Item**	**Recoding instructions**
SQIS-26B	**When your teacher gives you homework in the following subjects, about how many minutes do you usually spend on your homework?** *Fill **one** circle for each line.* 1. My teacher never gives me homework in… 2. 1-15 minutes 3. 16-30 minutes 4. 31-60 minutes 5. 61-90 minutes 6. More than 90 minutes	SQIS-29B		
SQIS-26Ba	Mathematics	SQIS-29Ba		
SQIS-26Bb	Science	SQIS-29Bb		
SQIS-27A	**During the last 12 months, have you attended extra lessons or tutoring not provided by the school in the following subjects?** *Fill **one** circle for each line.* 1. Yes, to excel in class 2. Yes, to keep up in class 3. No	SQIS-30A		
SQIS-27Aa	Mathematics	SQIS-30Aa		
SQIS-27Ab	Science	SQIS-30Ab		
SQIS-27B	**For how many of the last 12 months have you attended extra lessons or tutoring?** *Fill **one** circle for each line.* 1. Did not attend 2. Less than 4 months 3. 4-8 months 4. More than 8 months	SQIS-30B		
SQIS-27Ba	Mathematics	SQIS-30Ba		
SQIS-27Bb	Science	SQIS-30Bb		
		SQIS-31	**How hard was this test compared to most other tests you have taken this year in school?** *Fill in **one** oval only.* 1. Easier than other tests 2. About as hard as other tests 3. Harder than other tests 4. Much harder than other tests	
		SQIS-32	**How hard did you try on this test compared to how hard you tried on most other tests you have taken this year in school?** *Fill in **one oval** only.* 1. Not as hard as on other tests 2. About as hard as on other tests 3. Harder than on other tests 4. Much harder than on other tests	
		SQIS-33	**How important was it to you to do well on this test?** *Fill in **one oval** only.* 1. Not very important 2. Somewhat important 3. Important 4. Very important	

Appendix F

U.S. TIMSS 2019 Nonresponse Bias Analysis

Appendix F: U.S. TIMSS 2019 Nonresponse Bias Analysis

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1. INTRODUCTION

The Trends in International Mathematics and Science Study (TIMSS) is a large international comparative study of the knowledge, skills, and competencies of fourth- and eighth-grade students in the domains of mathematics and science. In 2019, the study was carried out in more than 50 education systems, including the United States. The student population sampled in TIMSS is defined as all students in each country or other education system who were enrolled in the grade that represents four and eight years of schooling, counting from the first year of International Standard Classification of Education (ISCED) Level 1, provided that the mean age at the time of testing is at least 9.5 and 13.5 years. In most participating nations, including the United States, this corresponds to all fourth-graders and eighth-graders.

The U.S. TIMSS 2019 study, conducted by the National Center for Education Statistics (NCES), utilized a two-stage stratified cluster sampling design. The first stage made use of a systematic probability-proportionate-to-size technique to select schools. Though efforts were made to secure the participation of all schools selected in the first stage, it was anticipated that not all schools would choose to participate. Therefore, as each school was selected in the sample, the two neighboring schools in the sorted sampling frame (immediately following and preceding it) were designated as the first and second replacement schools, respectively. The sampling frame was sorted by explicit strata and secondarily by implicit strata, so the replacement schools were within the same strata as the original school. If an original school refused to participate, the first replacement was then contacted. If that school also refused to participate, the second replacement school was then contacted. More information on sampling can be found in Chapter 2.

The second stage of sampling consisted of selecting classrooms within sampled schools. At the classroom level, TIMSS sampled intact mathematics classes that were available to students in the target grades. Where feasible, two classrooms were selected per school in the United States. In schools containing only one class, this class was selected. The TIMSS 2019 national data collection was fielded April through June 2019.

A bridge study was necessary for countries, including the U.S., transitioning to digital TIMSS (eTIMSS) in 2019 from the paper assessment conducted in previous TIMSS cycles. An additional sample of students was required to administer paper TIMSS booklets (paperTIMSS) containing the TIMSS 2015 trend assessment blocks. Therefore, a separate sample of schools was included in the bridge study. In public schools selected to participate in the bridge study, the paperTIMSS assessment was conducted in one classroom, and the eTIMSS assessment was conducted in the other classroom. For public schools that have only one classroom, schools were randomly assigned such that half of the schools received the paperTIMSS assessment and half of the schools received the eTIMSS assessment. In private schools, both classrooms in schools selected for the bridge study received the paperTIMSS assessment. For both public and private schools, classrooms in schools not selected for the bridge study received the eTIMSS assessment.

Only schools that administered the eTIMSS assessment are included in this analysis because TIMSS 2019 scores were computed based on the performance of the U.S. students in the eTIMSS sample. For this analysis, there were 329 schools in the original sample at grade 4 (hereafter referred to as TIMSS-4). Of these 329 sampled schools, 325 were determined to be eligible (the eligible original school sample) containing at least one fourth-grade class, and of these, 249 participated (the participating original sample) for an initial weighted response rate of 76.2 percent. An additional 38 replacement schools participated for a total of 287 participating schools after replacement (the participating final sample). The weighted response rate increased to 87.8 percent. The school participation rates for this report are summarized in table F-1.

For this analysis, there were 325 schools in the original sample at grade 8 (hereafter referred to as TIMSS-8). Of these 325 sampled schools, 321 were determined to be eligible (the eligible original school sample) containing at least one eighth-grade class, and of these, 231 participated (the participating original sample) for an initial weighted response rate of 71.7 percent. An additional 42 substitute schools participated for a total of 273 participating schools after replacement (the participating final sample). The weighted response rate increased to 85.0 percent.

The weighted student response rate for TIMSS-4 was 95.9 percent within responding schools. The weighted student response rate for TIMSS-8 was 93.6 percent within responding schools.

Table F-1. Selected characteristics for the nonresponse bias analysis of the U.S. TIMSS grades 4 and 8 final school samples: 2019

			Number of participating schools		Percent (Weighted)	
Grade	Schools in original sample	Eligible schools in sample	Before replacement	After replacement	School participation rate before replacement	School participation rate after replacement
4	329	325	249	287	76.2	87.8
8	325	321	231	273	71.7	85.0

SOURCE: International Association for the Evaluation of Education Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2019.

The National Center for Education Statistics (NCES) standards for assessment surveys stipulate that a nonresponse bias analysis is required at any stage of data collection when the weighted unit response rate is less than 85 percent (before replacement). Since the U.S. TIMSS 2019 weighted school response rates before replacement are below 85 percent, NCES requires an investigation into the potential magnitude of nonresponse bias at the school level in the U.S. sample. Since the U.S. TIMSS 2019 weighted student response rates are 85 percent or above, a nonresponse bias analysis at the student level is not required. The methodology used to investigate nonresponse bias in the TIMSS-4 and TIMSS-8 U.S. samples is provided in section 2 of this report, and the results are provided in sections 3 and 4.

2. METHODOLOGY

To measure the potential nonresponse bias at the school level, the characteristics of participating schools were compared to those of the total eligible sample of schools. This was conducted in a way so that the tests of statistical significance that were applied account for the fact that the participating schools are a subset of the eligible schools, and not a distinct group.

The general approach taken involves an analysis in three parts as described below.

- Analysis of the participating original sample: The distribution for TIMSS-4 of the participating original school sample (N = 249) was compared with that of the total eligible original school sample (N = 325). The distribution for TIMSS-8 of the participating original school sample (N = 231) was compared with that of the total eligible original school sample (N = 321).The participating original sample is the sample before substitution. In each sample, schools were weighted by their size-adjusted school base weights[1], excluding any nonresponse adjustment factor. The base weight for each original school is the reciprocal of its selection probability.

- Analysis of the participating final sample with substitutes: The distribution for TIMSS-4 of the participating final school sample (N = 287), which includes 38 participating substitutes that were used as replacements for nonresponding schools from the eligible original sample, was compared to the total eligible final school sample (N = 325). The distribution for TIMSS-8 of the participating final school sample (N = 273), which includes 42 participating substitutes that were used as replacements for nonresponding schools from the eligible original sample, was compared to the total eligible final school sample (N = 321). The total eligible final sample includes the participating final sample plus those original nonrespondents that were not replaced by substitutes. Again, schools were weighted by their size-adjusted school base weights for both the eligible sample and the participating schools. The base weight for each substitute school is set to the base weight of the original school that it replaced.

- Analysis of the nonresponse adjusted final sample with substitutes: The same sets of schools were compared as in the second analysis, but this time, when analyzing the participating final schools alone, schools were weighted by their size-adjusted school base weights with school nonresponse adjustments applied. The international weighting procedures form nonresponse adjustment classes by explicit stratum by cross-classifying the explicit stratification variables[2]. The eligible sample were again weighted by their size-adjusted school base weights.

The first analysis indicates the potential for nonresponse bias that was introduced through school nonresponse. The second analysis suggests the remaining potential for nonresponse bias after the mitigating effects of substitution have been accounted for. The third analysis indicates the potential for bias after accounting for the mitigating effects of both substitution and nonresponse weight adjustments. Both the second and third analyses, however, may provide an overly optimistic scenario, resulting from

[1] The size-adjusted weight modifies the PPS weight so that schools with relatively small number of students (and large school base weights) won't influence the results more than schools with relatively large number of students (and small school base weights).

[2] The explicit stratification variables are defined separately by school control. For public schools, they are census region and poverty level. For private schools, it is only type of private school (Roman Catholic or other). Their cross-classification resulted in 10 explicit strata. For more information on the variables, see their descriptions below.

the fact that substitution and nonresponse adjustments may correct somewhat for deficiencies in the characteristics examined here, but there is no guarantee that they are equally as effective for other characteristics and, in particular, for student achievement.

Participating TIMSS schools and the total eligible TIMSS school sample were compared on as many school sampling frame characteristics as possible that might provide information about the presence of nonresponse bias. Comparing frame characteristics between participating schools and the total eligible school sample is not an ideal measure of nonresponse bias if the characteristics are unrelated or weakly related to more substantive items in the survey; however, often it is the only approach available since other data are not available for nonparticipating schools. While the school-level characteristics used in these analyses are limited to those available in the sampling frame, each of the variables had a demonstrated relationship to achievement in previous TIMSS cycles.

Frame characteristics for public schools were from the 2016-17 Common Core of Data (CCD) and, for private schools, from the 2015-16 Private School Universe Survey (PSS).

The following categorical variables were available in the sampling frame for all schools:

- School control—indicates whether the school is under public control (operated by publicly elected or appointed officials) or private control (operated by privately elected or appointed officials and derives its major source of funds from private sources);
- Locale—urban-centric locale code (i.e., central city, suburb, town, rural);
- Census region[3]—Northeast, Midwest, South and West; and
- Poverty level[4]—for public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the national free- or reduced-price lunch (FRPL) program, and a low poverty school is defined as one in which fewer than 50 percent are eligible.
- School size—grade enrollment of school (as shown on school samples frame) divided into three equally sized categories (small, medium, and large)[5].

The following continuous variables were available in the sampling frame for all schools:

- Estimated number of grade 4 or grade 8 students enrolled;
- Total number of students; and

[3] States in each region: Northeast: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. Midwest: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. South: Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia, and the District of Columbia. West: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

[4] The sample frame did not contain a direct measure of poverty. No FRPL program data were available for private schools, thus all private schools are treated as low-poverty schools.

[5] Small schools had less than or equal to 72 and 105 grades 4 and 8 students, respectively. Medium schools had less than or equal to 105 and 302 grades 4 and 8 students, respectively. Large schools had more than 105 and 302 grades 4 and 8 students, respectively.

- Percentage of students in seven race/ethnicity categories (White; Black; Hispanic; Asian; American Indian or Alaska Native; Hawaiian/Pacific Islander and Two or more races).[6]

An additional continuous variable, the percentage of students eligible to participate in the FRPL program, was available only for public schools on the school frame. The poverty level variable mentioned among the categorical variable is the recoded version of this continuous variable.[7]

For categorical variables, the distribution of frame characteristics for participating schools was compared with the distribution for the total eligible school sample. The hypothesis of independence between the characteristic and participation status was tested using a Rao-Scott modified Chi-square statistic at the 5 percent level (Rao and Thomas 2003). For continuous variables, summary means were calculated and the difference between means was tested using a *t* test. The *p* values for the tests are presented in the tables that follow. The statistical significance of differences between participants and the total eligible sample is identical to that which would result from comparing participants and nonparticipants, since all significance tests account for the fact that the participants are a subset of the full sample. The bias and relative bias are also shown in each table. The bias is calculated as the difference between the respective estimates for the participants and the eligible sample. The relative bias is calculated as the bias divided by the estimate from the total eligible school sample and is a measure of the size of the bias compared to the total eligible school sample (i.e., the unbiased) estimate.

In addition to these tests, logistic regression models were used to provide a multivariate analysis that examined the conditional independence of these school characteristics as predictors of participation. The logistic regression compared frame characteristics for participating schools with non-participating schools which is effectively the same as comparing to the eligible sample as in the bivariate analysis.

Multivariate analysis can provide additional insights, over and above those gained through the bivariate analysis. It may be that only one or two variables are actually related to participation status. However, if these variables are also related to the other variables examined in the analyses, then other variables, which are not related to participation status, will appear as significant in simple bivariate tables. Multivariate analysis, in contrast, examines the conditional relationships with participation after controlling for the other predictor variables—thereby, testing the robustness of the relationships between school characteristics and participation.

Dummy variables were created for each component of the categorical variables so that each component was included separately. The last component of each categorical variable is used as the reference category. The *p* value of a dummy variable indicates whether there is a significant difference at the 5 percent level from the effect of the (omitted) reference category. It is not possible to include all the frame characteristics in a single model because the seven race/ethnicity variables are linearly dependent (i.e., they sum up to 100 percent for every school). Therefore, two models were used. In the first model, six race/ethnicities[8] (Black; Hispanic; Asian; American Indian or Alaska Native; Hawaiian/Pacific Islander; and Two or more races) were included in the model with "percentage White" as the omitted category. In addition, an *F* test was used to determine whether the parameter estimates of these six characteristics were simultaneously equal to zero. In the second model, the summed percentage of the six race/ethnicities[9] (Black; Hispanic; Asian; American Indian or Alaska Native; Hawaiian/Pacific Islander; and Two or more races) replaced the six race/ethnicity variables with "percentage White" again as the

[6] Black includes African American, and Hispanic includes Latino. Racial categories exclude Hispanic origin.
[7] The continuous variable percentage of students eligible to participate in the FRPL program is missing for private schools; however, private schools are treated as low poverty for the categorical variable poverty level.
[8] Racial categories exclude Hispanic origin.
[9] Racial categories exclude Hispanic origin.

omitted category. The second model permits the analysis of differences in the percentages of White students, which is not possible in the first model. All other frame characteristics were included in both models.

Because the percentage of students eligible for FRPL was not included in the main logistic regression analysis, a separate analysis with public schools only was conducted. To include FRPL eligibility in a model, public schools were modeled separately using a third model with the summed race/ethnicity percentage and adding the percentage of students eligible for FRPL. Since poverty is derived from the percentage of students eligible for FRPL, an interaction term[10] between the two characteristics was also included in the model.

The multivariate regression analysis cannot be conducted after the school nonresponse adjustments are applied to the weights. The concept of nonresponse-adjusted weights does not apply to the nonresponding units, and, thus, we cannot conduct an analysis that compares respondents with nonrespondents using nonresponse-adjusted weights.

The bivariate analysis and the logistic regression were both performed using replicate weights to properly account for the complex sample design. The JK2 method was used to create the replicate weights (Westat 2007).

[10] The interaction term can be interpreted as indicating whether the marginal effect of a one percentage-point increase in FRPL is diminished or amplified for schools above the 50 percent cut point, relative to those below the cut point.

3. RESULTS—TIMSS GRADE 4

3.1 Original Respondent Sample

This section presents the nonresponse bias analysis based on the original sample of 325 eligible schools for TIMSS-4. The distribution of the participating original sample was compared to the schools in the total eligible original sample. Size-adjusted school base weights were used for both the eligible sample and the participating schools. The weighted school response rate for TIMSS-4 was 76.2 percent before replacement, with 249 out of 325 schools participating.

3.1.1 Categorical Variables (TIMSS-4)

The distribution of participating and eligible schools by five characteristics is shown in table F-2. The Chi-square statistics for school control, Census region, and school size are significant and suggest that there is evidence of relationships with participation in the assessment. In particular, public schools were overrepresented among participating schools (95.3 vs. 92.4 percent, respectively), and private schools were underrepresented among participating schools (4.7 vs. 7.6 percent, respectively). Similarly, schools in the Midwest were underrepresented among participating schools relative to eligible schools (18.5 vs. 20.8 percent, respectively), while schools in the South were overrepresented among participating schools (44.0 vs. 38.6 percent, respectively). Lastly, small sized schools were underrepresented among participating schools relative to eligible schools (29.5 percent versus 34.5 percent, respectively), while large sized schools were overrepresented among participating schools (35.5 percent versus 32.7 percent, respectively). There are no statistically significant relationships between participation status and any of the other characteristics shown in table F-2.

Table F-2. Percentage distribution of eligible and participating schools in the U.S. TIMSS fourth-grade original sample, by selected school characteristics: 2019

School characteristic	Sample schools: Eligible (percent) (N = 325)	Sample schools: Participating (percent) (N = 249)	Bias	Relative bias	Chi-square *p* value
School control					0.013
Public	92.4	95.3	2.86	0.031	
Private	7.6	4.7	-2.86	-0.377	
Locale					0.688
Central city	31.8	31.1	-0.72	-0.023	
Suburb	39.6	38.9	-0.73	-0.018	
Town	11.4	11.6	0.26	0.023	
Rural	17.2	18.4	1.19	0.069	
Census region					0.007
Northeast	15.5	13.9	-1.57	-0.101	
Midwest	20.8	18.5	-2.35	-0.113	
South	38.6	44.0	5.41	0.140	
West	25.1	23.6	-1.50	-0.060	
Poverty level					0.483
High	46.4	47.5	1.08	0.023	
Low	53.6	52.5	-1.08	-0.020	
School size					0.002
Small	34.5	29.5	-5.01	-0.145	
Medium	32.8	35.1	2.26	0.069	
Large	32.7	35.5	2.75	0.084	

NOTE: Detail may not sum to totals because of rounding. Census region is the state-based region of the country (see appendix F, section 2 for state listing). For public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the free- or reduced-price lunch (FRPL) program; all private schools are treated as low-poverty schools. Eligible schools contained at least one fourth-grade class. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Schools were weighted by their size-adjusted school base weights that did not include a nonresponse adjustment factor.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2019.

3.1.2 Continuous Variables (TIMSS-4)

Summary means for each continuous variable for participating and eligible schools are shown in tables F-3 and F-4. No data on FRPL eligibility were available for private schools, so private schools are not included in the FRPL analysis. Seventeen public schools had missing values for FRPL, and these schools were dropped from the analysis in table F-4.

The *t* test statistic for grade 4 enrollment is significant and suggests that there is evidence of relationships with participation in the assessment. In particular, participating schools had a higher mean grade 4 enrollment than the eligible sample (99.9 versus 96.2, respectively; table F-3). There were no statistically significant differences between participating and eligible schools with respect to race/ethnicity percentage or FRPL (tables F-3 and F-4).

Table F-3. Mean values of various characteristics for eligible and participating schools in the U.S. TIMSS fourth-grade original sample: 2019

School characteristic	Sample schools: Eligible (mean) (N = 325)	Sample schools: Participating (mean) (N = 249)	Bias	Relative bias	*t* test *p* value
Enrollment					
Total school	574.2	588.7	14.53	0.025	0.135
Grade 4	96.2	99.9	3.73	0.039	0.030
Race/ethnicity percentage					
White	48.7	48.9	0.12	0.002	0.913
Black	13.8	13.8	0.02	0.001	0.978
Hispanic	26.4	26.5	0.11	0.004	0.917
Asian	5.5	5.0	-0.41	-0.075	0.265
American Indian or Alaska Native	1.0	1.0	0.05	0.051	0.714
Hawaiian/Pacific Islander	0.4	0.4	0.00	-0.009	0.944
Two or more races	4.3	4.4	0.12	0.029	0.289

NOTE: Black includes African American, and Hispanic includes Latino. Racial categories exclude Hispanic origin. Eligible schools contained at least one fourth-grade class. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Schools were weighted by their size-adjusted school base weights that did not include a nonresponse adjustment factor.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2019.

Table F-4. Mean percentage of students eligible for free or reduced-price lunch, in eligible and participating public schools in the U.S. TIMSS fourth-grade original sample: 2019

School characteristic	Sample schools: Eligible (percent) (N = 289)	Sample schools: Participating (percent) (N = 226)	Bias	Relative bias	*t* test *p* value
Percentage of students eligible for free or reduced-price lunch	55.6	55.3	-0.33	-0.006	0.746

NOTE: Information on percentage of students eligible for free or reduced-price lunch (FRPL) is missing for 17 of the 306 public schools in the eligible original sample and 14 of the 240 public schools that participated. Eligible schools contained at least one fourth-grade class. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Schools were weighted by their size-adjusted school base weights that did not include a nonresponse adjustment factor.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2019.

3.1.3 Logistic Regression Model (TIMSS-4)

To examine the joint relationship of various characteristics to school nonresponse, the analysis used a logistic regression model with participation status as the binary dependent variable and frame characteristics as predictor variables. Since public and private schools were modeled together using the variables available for all schools, the percentage of students eligible for FRPL was not included in the main logistic regression analysis.

Standard errors and tests of hypotheses for the full model parameter estimates are presented in table F-5 (with six race/ethnicity variables) and table F-5 (with summed race/ethnicity percentage). Private schools are treated as low poverty for the categorical variable poverty level. Private schools was a significant predictor of school participation in table F-5. The negative parameter estimate indicates that relative to public schools, private schools were somewhat underrepresented among the participating schools. The *F* test statistic to determine whether the race/ethnicity characteristics are simultaneously equal to 0 was 0.79 with a *p* value of 0.5780, which indicates that no significant relationship with participation was detected.

Private schools and the South region were significant predictors of school participation in table F-6. The positive parameter estimate indicates that relative to schools in the West region, schools in the South region were somewhat overrepresented among the participating schools.

Because the percentage of students eligible for FRPL was not included in the main logistic regression analysis, a separate analysis with public schools only was conducted. To include FRPL eligibility in a model, public schools were modeled separately using a model with the summed race/ethnicity percentage and adding the percentage of students eligible for FRPL. Since poverty is derived from the percentage of students eligible for FRPL, an interaction term[11] was also included in the model. Standard errors and tests of hypotheses for the full model parameter estimates are presented in table F-7. The South region was a significant predictor of school participation among public schools only.

[11] The interaction term can be interpreted as indicating whether the marginal effect of a one percentage-point increase in FRPL is diminished or amplified for schools above the 50 percent cut point, relative to those below the cut point.

Table F-5. Logistic regression model parameters (with six race/ethnicity variables) using the U.S. TIMSS fourth-grade original school sample: 2019

Parameter	Parameter estimate	Standard error	*t* test for H_0: parameter = 0	*p* value
Intercept	1.970	1.0337	1.9059	0.0605
Private school	-1.230	0.5901	-2.0847	0.0405
Central city	0.110	0.5348	0.2062	0.8372
Suburb	0.251	0.5243	0.4785	0.6337
Town	-0.024	0.4463	-0.0543	0.9568
Northeast	-0.197	0.4513	-0.4371	0.6633
Midwest	-0.421	0.4545	-0.9257	0.3576
South	0.883	0.5136	1.7193	0.0897
High poverty	0.038	0.3955	0.0954	0.9243
Small	-1.084	0.5611	-1.9321	0.0571
Medium	-0.199	0.4914	-0.4051	0.6865
Total school enrollment	0.000	0.0009	0.1307	0.8964
Fourth grade enrollment	-0.004	0.0036	-1.1387	0.2585
Black (percent)	-0.008	0.0089	-0.9049	0.3684
Hispanic (percent)	-0.006	0.0090	-0.6880	0.4936
Asian (percent)	-0.018	0.0142	-1.2993	0.1978
American Indian or Alaska Native (percent)	0.006	0.0126	0.4736	0.6371
Hawaiian/Pacific Islander (percent)	-0.011	0.0335	-0.3263	0.7451
Two or more races (percent)	0.063	0.0437	1.4533	0.1503

NOTE: Census region is the state-based region of the country (see appendix F, section 2 for state listing). For public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the free- or reduced-price lunch (FRPL) program; all private schools are treated as low poverty schools. Black includes African American, and Hispanic includes Latino. Racial categories exclude Hispanic origin. Schools were weighted by their size-adjusted school base weights that did not include a nonresponse adjustment factor.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2019.

Table F-6. Logistic regression model parameters (with summed race/ethnicity percentage) using the U.S. TIMSS fourth-grade original school sample: 2019

Parameter	Parameter estimate	Standard error	*t* test for H0: parameter = 0	*p* value
Intercept	2.411	0.9170	2.6293	0.0104
Private school	-1.292	0.5919	-2.1824	0.0322
Central city	0.047	0.4794	0.0978	0.9224
Suburb	0.057	0.4974	0.1142	0.9094
Town	-0.115	0.3889	-0.2961	0.7679
Northeast	-0.305	0.4108	-0.7417	0.4606
Midwest	-0.380	0.4240	-0.8960	0.3731
South	0.829	0.4021	2.0608	0.0428
High poverty	0.061	0.3245	0.1872	0.8520
Small	-1.048	0.5401	-1.9405	0.0561
Medium	-0.203	0.4868	-0.4166	0.6782
Total school enrollment	0.000	0.0008	0.0530	0.9579
Fourth grade enrollment	-0.004	0.0035	-1.1217	0.2656
Summed race/ethnicity percentage	-0.008	0.0064	-1.3129	0.1932

NOTE: Census region is the state-based region of the country (see appendix F, section 2 for state listing). For public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the free- or reduced-price lunch (FRPL) program; all private schools are treated as low poverty schools. Summed race/ethnicity percentage includes Black; Hispanic; Asian; American Indian or Alaska Native; Hawaiian/Pacific Islander; and Two or more races. Black includes African American, and Hispanic includes Latino. Racial categories exclude Hispanic origin. Schools were weighted by their size-adjusted school base weights that did not include a nonresponse adjustment factor.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2019.

Table F-7. Logistic regression model parameters (with summed race/ethnicity percentage) using the U.S. TIMSS fourth-grade original public school sample: 2019

Parameter	Parameter estimate	Standard error	*t* test for H0: parameter = 0	*p* value
Intercept	1.437	0.9747	1.4741	0.1447
Central city	0.106	0.4427	0.2402	0.8109
Suburb	0.376	0.5696	0.6603	0.5111
Town	0.172	0.4164	0.4133	0.6806
Northeast	-0.114	0.4272	-0.2665	0.7906
Midwest	-0.108	0.4573	-0.2363	0.8138
South	1.004	0.4164	2.4101	0.0184
High poverty	1.988	1.5173	1.3099	0.1942
Small	-0.940	0.5105	-1.8422	0.0694
Medium	-0.035	0.4779	-0.0730	0.9420
Free or reduced-price lunch eligibility (percent)	0.009	0.0128	0.7099	0.4800
High poverty and free or reduced-price lunch eligibility, interaction term	-0.029	0.0238	-1.2169	0.2274
Total school enrollment	0.000	0.0009	0.4617	0.6456
Fourth grade enrollment	-0.004	0.0036	-1.2078	0.2309
Summed race/ethnicity percentage	-0.007	0.0080	-0.9309	0.3549

NOTE: Census region is the state-based region of the country (see appendix F, section 2 for state listing). For public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the free- or reduced-price lunch (FRPL) program. Black includes African American, and Hispanic includes Latino. Summed race/ethnicity percentage includes Black; Hispanic; Asian; American Indian or Alaska Native; Hawaiian/Pacific Islander; and Two or more races. Racial categories exclude Hispanic origin. Schools were weighted by their size-adjusted school base weights that did not include a nonresponse adjustment factor.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2019.

3.2 Participating Final Sample With Substitutes

This section presents the nonresponse bias analysis based on the final sample of 325 eligible schools for TIMSS-4 including participating substitute schools. The distribution of the participating final sample was compared to the schools in the total eligible final sample. The total eligible final sample includes participating final sample plus those original nonrespondents who were not replaced by substitutes. Size-adjusted school base weights were used for both the eligible sample and the participating schools. Through the use of substitute schools, the weighted school response rate for TIMSS-4 was 87.8 percent after replacement, with 287 out of 325 schools participating.

3.2.1 Categorical Variables (TIMSS-4)

The distribution of participating and eligible schools by five characteristics is shown in table F-8. Chi-square statistics for school control, Census region, and school size are significant and suggest that there is evidence of relationships with participation in the assessment. In particular, public schools were overrepresented among participating schools (95.0 vs. 92.4 percent, respectively), and private schools were underrepresented among participating schools (5.0 vs. 7.6 percent, respectively). Similarly, schools in the Northeast were underrepresented among participating schools relative to eligible schools (14.1 vs. 15.5 percent, respectively), while schools in the South were overrepresented among participating schools (41.4 vs. 38.6 percent, respectively). Lastly, small sized schools were underrepresented among participating schools relative to eligible schools (32.0 percent versus 34.5 percent, respectively), while large sized schools were overrepresented among participating schools (34.6 percent versus 33.0 percent, respectively). There are no statistically significant relationships between participation status and any of the other characteristics shown in table F-8.

Table F-8. Percentage distribution of eligible and participating schools in the U.S. TIMSS fourth-grade final sample, by selected school characteristics: 2019

School characteristic	Sample schools: Eligible (percent) (N = 325)	Sample schools: Participating (percent) (N = 287)	Bias	Relative bias	Chi-square *p* value
School control					0.008
Public	92.4	95.0	2.57	0.028	
Private	7.6	5.0	-2.57	-0.340	
Locale					0.286
Central city	31.8	31.5	-0.25	-0.008	
Suburb	39.6	38.3	-1.33	-0.033	
Town	11.4	12.2	0.78	0.068	
Rural	17.2	18.0	0.80	0.046	
Census region					0.032
Northeast	15.5	14.1	-1.36	-0.088	
Midwest	20.8	19.5	-1.34	-0.065	
South	38.6	41.4	2.75	0.071	
West	25.1	25.1	-0.05	-0.002	
Poverty level					0.315
High	46.5	47.4	0.97	0.021	
Low	53.5	52.6	-0.97	-0.018	
School size					0.039
Small	34.5	32.0	-2.50	-0.073	
Medium	32.5	33.5	0.99	0.031	
Large	33.0	34.6	1.51	0.046	

NOTE: Detail may not sum to totals because of rounding. Census region is the state-based region of the country (see appendix F, section 2 for state listing). For public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the free- or reduced-price lunch (FRPL) program; all private schools are treated as low poverty schools. Eligible schools contained at least one fourth-grade class. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Schools were weighted by their size-adjusted school base weights that did not include a nonresponse adjustment factor.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2019.

3.2.2 Continuous Variables (TIMSS-4)

Summary means for each continuous variable for participating and eligible schools are shown in tables F-8 and F-10. No data on FRPL eligibility was available for private schools, and so private schools are not included in the FRPL analysis. Seventeen public schools had missing values for FRPL, and these schools were dropped from the analysis in table 3-9.

There were no statistically significant differences between participating and eligible schools with respect to student enrollment, race/ethnicity percentage or FRPL (tables F-9 and F-10).

Table F-9. Mean values of various characteristics for eligible and participating schools in the U.S. TIMSS fourth-grade final sample: 2019

School characteristic	Sample schools: Eligible (mean) (N = 325)	Sample schools: Participating (mean) (N = 287)	Bias	Relative bias	*t* test *p* value
Enrollment					
Total school	573.7	575.4	1.66	0.003	0.817
Grade 4	96.0	97.7	1.73	0.018	0.151
Race/ethnicity percentage					
White	48.1	48.4	0.34	0.007	0.633
Black	13.1	13.2	0.17	0.013	0.606
Hispanic	27.5	27.3	-0.15	-0.006	0.824
Asian	5.7	5.3	-0.35	-0.062	0.223
American Indian or Alaska Native	1.0	0.9	-0.02	-0.018	0.850
Hawaiian/Pacific Islander	0.4	0.4	-0.02	-0.054	0.581
Two or more races	4.3	4.4	0.03	0.007	0.708

NOTE: Black includes African American, and Hispanic includes Latino. Racial categories exclude Hispanic origin. Eligible schools contained at least one fourth-grade class. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Schools were weighted by their size-adjusted school base weights that did not include a nonresponse adjustment factor.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2019.

Table F-10. Mean percentage of students eligible for free or reduced-price lunch, in eligible and participating public schools in the U.S. TIMSS fourth-grade final sample: 2019

School characteristic	Sample schools: Eligible (percent) (N = 289)	Sample schools: Participating (percent) (N = 261)	Bias	Relative bias	*t* test *p* value
Percentage of students eligible for free- or reduced-price lunch	55.4	55.1	-0.23	-0.004	0.672

NOTE: Information on percentage of students eligible for free- or reduced-price lunch (FRPL) is missing for 17 of the 306 public schools in the eligible final sample and 15 of the 276 public schools that participated. Eligible schools contained at least one fourth-grade class. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Schools were weighted by their size-adjusted school base weights that did not include a nonresponse adjustment factor.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2019.

3.2.3 Logistic Regression Model (TIMSS-4)

To examine the joint relationship of various characteristics to school nonresponse, the analysis used a logistic regression model with participation status as the binary dependent variable and frame characteristics as predictor variables. Since public and private schools were modeled together using the variables available for all schools, the percentage of students eligible for FRPL was not included in the main logistic regression analysis.

Standard errors and tests of hypotheses for the full model parameter estimates are presented in table F-11 (with six race/ethnicity variables) and table F-12 (with summed race/ethnicity percentage). Private schools are treated as low poverty for the categorical variable poverty level. Private schools and the Midwest region were significant predictors of school participation in table F-11. The negative parameter estimate indicates that relative to public schools, private schools were somewhat underrepresented among the participating schools. Similarly, the negative parameter estimate indicates that relative to schools in the West region, schools in the Midwest region were somewhat underrepresented among the participating schools. The *F* test statistic to determine whether the race/ethnicity characteristics are simultaneously equal to 0 was 1.24 with a *p* value of 0.2953, which indicates no significant relationship was detected with participation.

Private schools was again a significant predictor of school participation in table F-12.

Because the percentage of students eligible for FRPL was not included in the main logistic regression analysis, a separate analysis with public schools only was conducted. To include FRPL eligibility in a model, public schools were modeled separately using a model with the summed race/ethnicity percentage and adding the percentage of students eligible for FRPL. Since poverty is derived from the percentage of students eligible for FRPL, an interaction term was also included in the model. Standard errors and tests of hypotheses for the full model parameter estimates are presented in table F-13. There were no significant predictors of school participation among public schools only.

Table F-11. Logistic regression model parameters (with six race/ethnicity variables) using the U.S. TIMSS fourth-grade final school sample: 2019

Parameter	Parameter estimate	Standard error	*t* test for H_0: parameter = 0	*p* value
Intercept	5.884	2.1608	2.7229	0.0080
Private school	-2.183	0.5334	-4.0920	0.0001
Central city	-0.659	1.3699	-0.4808	0.6320
Suburb	-0.685	1.5028	-0.4558	0.6498
Town	-1.118	1.4408	-0.7761	0.4401
Northeast	-1.043	0.5717	-1.8248	0.0720
Midwest	-1.261	0.5340	-2.3607	0.0208
South	0.423	0.5723	0.7386	0.4625
High poverty	-0.015	0.5127	-0.0294	0.9766
Small	-1.630	0.8842	-1.8432	0.0693
Medium	-0.688	0.7598	-0.9054	0.3681
Total school enrollment	-0.001	0.0010	-0.5743	0.5675
Fourth grade enrollment	-0.007	0.0042	-1.6900	0.0952
Black (percent)	-0.007	0.0097	-0.7676	0.4451
Hispanic (percent)	-0.015	0.0116	-1.2771	0.2055
Asian (percent)	-0.022	0.0197	-1.1075	0.2716
American Indian or Alaska Native (percent)	-0.024	0.0202	-1.2075	0.2311
Hawaiian/Pacific Islander (percent)	-0.089	0.0566	-1.5691	0.1208
Two or more races (percent)	0.045	0.0573	0.7819	0.4368

NOTE: Census region is the state-based region of the country (see appendix F, section 2 for state listing). For public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the free- or reduced-price lunch (FRPL) program; all private schools are treated as low poverty schools. Black includes African American, and Hispanic includes Latino. Racial categories exclude Hispanic origin. Schools were weighted by their size-adjusted school base weights that did not include a nonresponse adjustment factor.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2019.

Table F-12. Logistic regression model parameters (with summed race/ethnicity percentage) using the U.S. TIMSS fourth-grade final school sample: 2019

Parameter	Parameter estimate	Standard error	*t* test for H_0: parameter = 0	*p* value
Intercept	5.728	1.6565	3.4577	0.0009
Private school	-2.175	0.5333	-4.0778	0.0001
Central city	-0.278	0.8990	-0.3094	0.7579
Suburb	-0.574	1.0412	-0.5517	0.5828
Town	-0.806	0.9381	-0.8587	0.3933
Northeast	-0.905	0.5190	-1.7431	0.0854
Midwest	-0.983	0.5056	-1.9446	0.0556
South	0.683	0.4811	1.4205	0.1596
High poverty	0.033	0.4288	0.0766	0.9392
Small	-1.588	0.8848	-1.7950	0.0767
Medium	-0.703	0.7654	-0.9179	0.3616
Total school enrollment	-0.001	0.0009	-0.7608	0.4492
Fourth grade enrollment	-0.007	0.0041	-1.7006	0.0932
Summed race/ethnicity percentage	-0.015	0.0086	-1.7279	0.0881

NOTE: Census region is the state-based region of the country (see appendix F, section 2 for state listing). For public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the free- or reduced-price lunch (FRPL) program; all private schools are treated as low poverty schools. Summed race/ethnicity percentage includes Black; Hispanic; Asian; American Indian or Alaska Native; Hawaiian/Pacific Islander; and Two or more races. Black includes African American, and Hispanic includes Latino. Racial categories exclude Hispanic origin. Schools were weighted by their size-adjusted school base weights that did not include a nonresponse adjustment factor.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2019.

Table F-13. Logistic regression model parameters (with summed race/ethnicity percentage) using the U.S. TIMSS fourth-grade final public school sample: 2019

Parameter	Parameter estimate	Standard error	*t* test for H_0: parameter = 0	*p* value
Intercept	5.092	11.6232	0.4380	0.6626
Central city	-0.871	11.7171	-0.0744	0.9409
Suburb	-0.492	11.5888	-0.0424	0.9663
Town	-1.156	11.6870	-0.0989	0.9215
Northeast	-0.528	0.5399	-0.9782	0.3311
Midwest	-0.424	0.5725	-0.7397	0.4618
South	1.022	0.5595	1.8261	0.0718
High poverty	1.143	1.5282	0.7482	0.4567
Small	-1.364	0.8843	-1.5422	0.1272
Medium	-0.319	0.7661	-0.4163	0.6784
Free or reduced-price lunch eligibility (percent)	0.009	0.0169	0.5555	0.5802
High poverty and free or reduced-price lunch eligibility, interaction term	-0.016	0.0270	-0.5923	0.5554
Total school enrollment	-0.000	0.0010	-0.3927	0.6957
Fourth grade enrollment	-0.006	0.0049	-1.3084	0.1947
Summed race/ethnicity percentage	-0.019	0.0103	-1.8100	0.0743

NOTE: Census region is the state-based region of the country (see appendix F, section 2 for state listing). For public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the free- or reduced-price lunch (FRPL) program. Summed race/ethnicity percentage includes Black; Hispanic; Asian; American Indian or Alaska Native; Hawaiian/Pacific Islander; and Two or more races. Black includes African American, and Hispanic includes Latino. Racial categories exclude Hispanic origin. Schools were weighted by their size-adjusted school base weights that did not include a nonresponse adjustment factor.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2019.

3.3 Nonresponse-Adjusted Final Sample With Substitutes

This section presents the nonresponse bias analysis based on the final sample of 325 eligible schools for TIMSS-4. The distribution of the participating final sample, including participating substitute schools, was compared to the schools in the total eligible final sample, just like the previous section. However, in the analyses that follow, size-adjusted school base weights were used for the eligible sample of schools, whereas size-adjusted school nonresponse-adjusted weights were used for the participating schools.

3.3.1 Categorical Variables (TIMSS-4)

The distribution of participating and eligible schools by five characteristics is shown in table F-14. There are no statistically significant relationships between participation status and any of the other characteristics shown in table F-14.

Table F-14. Percentage distribution of eligible and participating schools in the U.S. TIMSS fourth-grade nonresponse-adjusted sample, by selected school characteristics: 2019

School characteristic	Sample schools: Eligible (percent) (N = 325)	Sample schools: Participating (percent) (N = 287)	Bias	Relative bias	Chi-square *p* value
School control					1.000
Public	92.4	92.4	0.00	0.000	
Private	7.6	7.6	0.00	0.000	
Locale					0.416
Central city	31.8	32.3	0.48	0.015	
Suburb	39.6	38.1	-1.53	-0.039	
Town	11.4	12.2	0.82	0.072	
Rural	17.2	17.5	0.24	0.014	
Census region					0.375
Northeast	15.5	15.3	-0.15	-0.010	
Midwest	20.8	19.5	-1.35	-0.065	
South	38.6	38.8	0.19	0.005	
West	25.1	26.4	1.32	0.052	
Poverty level					0.998
High	46.5	46.5	0.00	0.000	
Low	53.5	53.5	0.00	0.000	
School size					0.659
Small	34.5	33.6	-0.87	-0.025	
Medium	32.5	32.7	0.23	0.007	
Large	33.0	33.7	0.64	0.019	

NOTE: Detail may not sum to totals because of rounding. Census region is the state-based region of the country (see appendix F, section 2 for state listing). For public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the free- or reduced-price lunch (FRPL) program; all private schools are treated as low poverty schools. Eligible schools contained at least one fourth-grade class. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Participating schools were weighted by their size-adjusted school nonresponse adjusted weights. The eligible sample were weighted by their size-adjusted school base weights.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2019.

3.3.2 Continuous Variables (TIMSS-4)

Summary means for each continuous variable for participating and eligible schools are shown in tables F-15 and F-16. No data on FRPL eligibility was available for private schools, and so private schools are not included in the FRPL analysis. Seventeen public schools had missing values for FRPL, and these schools were dropped from the analysis in table F-16.

There were no statistically significant differences between participating and eligible schools with respect to student enrollment, race/ethnicity percentage or FRPL (tables F-15 and F-16).

Table F-15. Mean values of various characteristics for eligible and participating schools in the U.S. TIMSS fourth-grade nonresponse-adjusted sample: 2019

	Sample schools				
School characteristic	Eligible (mean) (N = 325)	Participating (mean) (N = 287)	Bias	Relative bias	*t* test *p* value
Enrollment					
Total school	573.7	571.4	-2.39	-0.004	0.796
Grade 4	96.0	95.8	-0.19	-0.002	0.899
Race/ethnicity percentage					
White	48.1	48.8	0.70	0.015	0.399
Black	13.1	12.9	-0.19	-0.015	0.604
Hispanic	27.5	26.8	-0.64	-0.023	0.391
Asian	5.7	5.7	0.04	0.007	0.912
American Indian or Alaska Native	1.0	0.9	-0.02	-0.022	0.834
Hawaiian/Pacific Islander	0.4	0.4	-0.02	-0.058	0.552
Two or more races	4.3	4.5	0.14	0.033	0.164

NOTE: Black includes African American, and Hispanic includes Latino. Racial categories exclude Hispanic origin. Eligible schools contained at least one fourth-grade class. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Participating schools were weighted by their size-adjusted school nonresponse adjusted weights. The eligible sample were weighted by their size-adjusted school base weights.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2019.

Table F-16. Mean percentage of students eligible for free or reduced-price lunch, in eligible and participating public schools in the U.S. TIMSS fourth-grade nonresponse-adjusted sample: 2019

School characteristic	Sample schools: Eligible (percent) (N = 289)	Sample schools: Participating (percent) (N = 261)	Bias	Relative bias	*t* test *p* value
Percentage of students eligible for free or reduced-price lunch	55.4	55.1	-0.26	-0.005	0.651

NOTE: Information on percentage of students eligible for free- or reduced-price lunch (FRPL) is missing for 17 of the 306 public schools in the eligible final sample and 15 of the 276 public schools that participated. Eligible schools contained at least one fourth-grade class. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Participating schools were weighted by their size-adjusted school nonresponse adjusted weights. The eligible sample were weighted by their size-adjusted school base weights.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2019.

3.4 Summary—Grade 4

The investigation into nonresponse bias at the school level for the U.S. TIMSS-4 sample shows statistically significant relationships between response status and some of the available school characteristics that were examined in the analysis.

For original sample schools, four variables were found to be statistically significantly related to participation in the bivariate analysis: school control (table F-2); Census region (table F-2); school size (table F-2) and fourth grade enrollment (table F-3). Although each of these findings indicates some potential for nonresponse bias, when all of these factors were considered simultaneously in a regression analysis, private schools was a significant predictor of participation (table F-5). The second model showed that private schools and South region were significant predictors of participation (table F-6, with summed race/ethnicity percentage). The third model showed South region was a significant predictor of school participation among public schools only (table F-7).

For final sample schools (with substitutes), three variables were found to be statistically significantly related to participation in the bivariate analysis: school control (table F-8); Census region (table F-8); and school size (table F-8). When all of these factors were considered simultaneously in a regression analysis, private schools and Midwest region were significant predictors of participation (table F-11). The second model showed that private schools was a significant predictor of participation (table F-12, with summed race/ethnicity percentage). The third model showed that there were no significant predictors of school participation among public schools only (table F-13).

For final sample schools with size-adjusted school nonresponse adjustments applied to the weights, no variables were found to be statistically significantly related to participation in the bivariate analysis. The multivariate regression analysis cannot be conducted after the school nonresponse adjustments are applied to the weights. The concept of nonresponse-adjusted weights does not apply to the nonresponding units, and, thus, we cannot conduct an analysis that compares respondents with nonrespondents using nonresponse-adjusted weights. The results of the analyses are summarized in table F-17.

These results suggest that there is some potential for nonresponse bias in the U.S. TIMSS-4 original sample based on the characteristics studied. It also suggests that, while there is some evidence that the use of substitute schools reduced the potential for bias, it has not reduced it substantially. However, after the application of school nonresponse adjustments, there is no evidence of resulting potential bias in the available frame variables in the final sample. Since there is no evidence of potential bias in the frame variables that were included in the evaluation, then there is no evidence of a risk of bias in substantive variables that are correlated with these frame variables. There is still a possibility of unobserved bias in variables that were not included in this evaluation.

Table F-17. Characteristics with *p* values less than 0.05 and absolute relative bias greater than 10 percent, U.S. TIMSS fourth-grade schools: 2019

Analysis	Characteristics with *p* values less than 0.05	Additional characteristics with absolute relative bias greater than 10 percent
Original sample	School control, Census region, school size, fourth grade enrollment	None
Regression model a	Private schools	†
Regression model b	Private schools, South region	†
Regression model c	South region	†
Sample with substitutes	School control, Census region, school size	None
Regression model a	Private schools, Midwest region	†
Regression model b	Private schools	†
Regression model c	None	†
Nonresponse adjusted	None	None

† Not applicable.
NOTE: Differences between the regression models were as follows: regression model a included six race/ethnicity variables, regression model b included summed race/ethnicity percentage, and for regression model c only public schools were modeled and included summed race/ethnicity percentage and added percentage of students eligible for free- or reduced-price lunch (FRPL).
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2019.

4. RESULTS—TIMSS GRADE 8

4.1 Original Respondent Sample

This section presents the nonresponse bias analysis based on the original sample of 321 eligible schools for TIMSS-8. The distribution of the participating original sample was compared to the schools in the total eligible original sample. Size-adjusted school base weights were used for both the eligible sample and the participating schools. The weighted school response rate for TIMSS-8 was 71.7 percent before replacement, with 231 out of 321 schools participating.

4.1.1 Categorical Variables (TIMSS-8)

The distribution of participating and eligible schools by five characteristics is shown in table F-18. The Chi-square statistics for school control and Census region are significant and suggest that there is evidence of relationships with participation in the assessment. In particular, public schools were overrepresented among participating schools (94.6 vs. 92.4 percent, respectively), and private schools were underrepresented among participating schools (5.4 vs. 7.6 percent, respectively). Schools in the Northeast were underrepresented among participating schools relative to eligible schools (10.0 vs. 15.5 percent, respectively), while schools in the South were overrepresented among participating schools (45.2 vs. 38.9 percent, respectively). There are no statistically significant relationships between participation status and any of the other characteristics shown in table F-18.

Table F-18. Percentage distribution of eligible and participating schools in the U.S. TIMSS eighth-grade original sample, by school characteristics: 2019

School characteristic	Sample schools: Eligible (percent) (N = 321)	Sample schools: Participating (percent) (N = 231)	Bias	Relative bias	Chi-square *p* value
School control					0.002
Public	92.4	94.6	2.27	0.025	
Private	7.6	5.4	-2.27	-0.297	
Locale					0.885
Central city	30.1	30.4	0.32	0.011	
Suburb	40.0	39.2	-0.73	-0.018	
Town	10.8	10.4	-0.40	-0.036	
Rural	19.1	19.9	0.81	0.042	
Census region					<0.001
Northeast	15.5	10.0	-5.45	-0.352	
Midwest	22.7	21.7	-0.93	-0.041	
South	38.9	45.2	6.32	0.162	
West	23.0	23.0	0.06	0.002	
Poverty level					0.464
High	41.5	42.9	1.35	0.033	
Low	58.5	57.1	-1.35	-0.023	
School size					0.386
Small	32.2	30.2	-1.98	-0.062	
Medium	34.4	35.1	0.77	0.023	
Large	33.4	34.6	1.21	0.036	

NOTE: Detail may not sum to totals because of rounding. Census region is the state-based region of the country (see appendix F, section 2 for state listing). For public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the free- or reduced-price lunch (FRPL) program; all private schools are treated as low-poverty schools. Eligible schools contained at least one eighth-grade class. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Schools were weighted by their size-adjusted school base weights that did not include a nonresponse adjustment factor.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2019.

4.1.2 Continuous Variables (TIMSS-8)

Summary means for each continuous variable for participating and eligible schools are shown in tables F-19 and F-20. No data on FRPL eligibility was available for private schools, and so private schools are not included in the FRPL analysis. Fourteen public schools had missing values for FRPL, and these schools were dropped from the analysis in table F-20.

There were no statistically significant differences between participating and eligible schools with respect to student enrollment, race/ethnicity percentage or FRPL (tables F-19 and F-20). However, the absolute value of the relative bias for American Indian or Alaska Native is greater than 10 percent, though this is due mostly to the eligible percentage being equal to 1.0 percent, as the absolute bias is small (table F-19).

Table F-19. Mean values of various characteristics for eligible and participating schools in the U.S. TIMSS eighth-grade original sample: 2019

School characteristic	Sample schools: Eligible (mean) (N = 321)	Sample schools: Participating (mean) (N = 231)	Bias	Relative bias	*t* test *p* value
Enrollment					
Total school	777.2	781.8	4.58	0.006	0.779
Grade 8	242.9	248.7	5.83	0.024	0.207
Race/ethnicity percentage					
White	50.4	50.4	0.04	0.001	0.976
Black	14.0	14.7	0.77	0.055	0.275
Hispanic	25.3	25.1	-0.16	-0.006	0.879
Asian	5.4	5.1	-0.29	-0.054	0.524
American Indian or Alaska Native	1.0	0.7	-0.28	-0.290	0.373
Hawaiian/Pacific Islander	0.6	0.6	-0.05	-0.080	0.727
Two or more races	3.4	3.3	-0.03	-0.009	0.828

NOTE: Black includes African American, and Hispanic includes Latino. Racial categories exclude Hispanic origin. Eligible schools contained at least one eighth-grade class. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Schools were weighted by their size-adjusted school base weights that did not include a nonresponse adjustment factor.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2019.

Table F-20. Mean percentage of students eligible for free- or reduced-price lunch, in eligible and participating public schools in the U.S. TIMSS eighth-grade original sample: 2019

School characteristic	Sample schools: Eligible (percent) (N = 287)	Sample schools: Participating (percent) (N = 214)	Bias	Relative bias	*t* test *p* value
Percentage of students eligible for free- or reduced-price lunch	51.2	50.6	-0.65	-0.013	0.470

NOTE: Information on percentage of students eligible for free- or reduced-price lunch (FRPL) is missing for 14 of the 301 public schools in the eligible original sample and 7 of the 221 public schools that participated. Eligible schools contained at least one eighth-grade class. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Schools were weighted by their size-adjusted school base weights that did not include a nonresponse adjustment factor.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2019.

4.1.3 Logistic Regression Model (TIMSS-8)

To examine the joint relationship of various characteristics to school nonresponse, the analysis used a logistic regression model with participation status as the binary dependent variable and frame characteristics as predictor variables. Since public and private schools were modeled together using the variables available for all schools, the percentage of students eligible for FRPL was not included in the main logistic regression analysis.

Standard errors and tests of hypotheses for the full model parameter estimates are presented in table F-21 (with six race/ethnicity variables) and table F-22 (with summed race/ethnicity percentage). Private schools are treated as low poverty for the categorical variable poverty level. Private schools and the Northeast region were significant predictors of school participation in table F-21. The negative parameter estimate indicates that relative to public schools, private schools were somewhat underrepresented among the participating schools. Similarly, the negative parameter estimate indicates that relative to schools in the West region, schools in the Northeast region were somewhat underrepresented among the participating schools. The F test statistic to determine whether the race/ethnicity characteristics are simultaneously equal to 0 was 0.50 with a p value of 0.8029, which indicates that no significant relationship with participation was detected.

Private schools and the Northeast and South regions were significant predictors of school participation in table F-22. The positive parameter estimate indicates that relative to schools in the West region, schools in the South region were somewhat overrepresented among the participating schools.

Because the percentage of students eligible for FRPL was not included in the main logistic regression analysis, a separate analysis with public schools only was conducted. To include FRPL eligibility in a model, public schools were modeled separately using a model with the summed race/ethnicity percentage and adding the percentage of students eligible for FRPL. Since poverty is derived from the percentage of students eligible for FRPL, an interaction term[12] was also included in the model. Standard errors and tests of hypotheses for the full model parameter estimates are presented in table F-23. The South region was a significant predictor of school participation among public schools only.

[12] The interaction term can be interpreted as indicating whether the marginal effect of a one percentage-point increase in FRPL is diminished or amplified for schools above the 50 percent cut point, relative to those below the cut point.

Table F-21. Logistic regression model parameters (with six race/ethnicity variables) using the U.S. TIMSS eighth-grade original school sample: 2019

Parameter	Parameter estimate	Standard error	*t* test for H_0: parameter = 0	*p* value
Intercept	1.124	1.0488	1.0714	0.2874
Private school	-1.248	0.5618	-2.2212	0.0294
Central city	0.680	0.5707	1.1909	0.2375
Suburb	0.228	0.5232	0.4360	0.6641
Town	0.505	0.5594	0.9029	0.3695
Northeast	-1.405	0.4691	-2.9951	0.0037
Midwest	-0.347	0.4549	-0.7624	0.4482
South	0.545	0.4097	1.3310	0.1872
High poverty	0.156	0.4249	0.3670	0.7147
Small	0.392	0.7336	0.5343	0.5947
Medium	0.085	0.4410	0.1925	0.8478
Total school enrollment	-0.000	0.0005	-0.8122	0.4192
Eighth grade enrollment	0.001	0.0022	0.5128	0.6096
Black (percent)	-0.003	0.0075	-0.4437	0.6585
Hispanic (percent)	-0.011	0.0081	-1.3202	0.1908
Asian (percent)	-0.010	0.0112	-0.9329	0.3539
American Indian or Alaska Native (percent)	-0.035	0.0536	-0.6610	0.5107
Hawaiian/Pacific Islander (percent)	-0.014	0.0527	-0.2568	0.7981
Two or more races (percent)	-0.041	0.0515	-0.7887	0.4328

NOTE: Census region is the state-based region of the country (see appendix F, section 2 for state listing). For public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the free- or reduced-price lunch (FRPL) program; all private schools are treated as low poverty schools. Black includes African American, and Hispanic includes Latino. Racial categories exclude Hispanic origin. Schools were weighted by their size-adjusted school base weights that did not include a nonresponse adjustment factor.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2019.

Table F-22. Logistic regression model parameters (with summed race/ethnicity percentage) using the U.S. TIMSS eighth-grade original school sample: 2019

Parameter	Parameter estimate	Standard error	*t* test for H_0: parameter = 0	*p* value
Intercept	0.875	1.0204	0.8578	0.3938
Private school	-1.210	0.5219	-2.3186	0.0231
Central city	0.707	0.5469	1.2921	0.2003
Suburb	0.259	0.5043	0.5136	0.6091
Town	0.541	0.5453	0.9920	0.3244
Northeast	-1.245	0.4340	-2.8688	0.0053
Midwest	-0.236	0.4167	-0.5661	0.5730
South	0.718	0.3464	2.0735	0.0416
High poverty	0.218	0.3887	0.5602	0.5770
Small	0.353	0.7685	0.4595	0.6472
Medium	0.078	0.4487	0.1744	0.8620
Total school enrollment	-0.000	0.0005	-0.7329	0.4659
Eighth grade enrollment	0.001	0.0023	0.4174	0.6776
Summed race/ethnicity percentage	-0.009	0.0058	-1.5448	0.1266

NOTE: Census region is the state-based region of the country (see appendix F, section 2 for state listing). For public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the free- or reduced-price lunch (FRPL) program; all private schools are treated as low poverty schools. Summed race/ethnicity percentage includes Black; Hispanic; Asian; American Indian or Alaska Native; Hawaiian/Pacific Islander; and Two or more races. Black includes African American, and Hispanic includes Latino. Racial categories exclude Hispanic origin. Schools were weighted by their size-adjusted school base weights that did not include a nonresponse adjustment factor.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2019.

Table F-23. Logistic regression model parameters (with summed race/ethnicity percentage) using the U.S. TIMSS eighth-grade original public school sample: 2019

Parameter	Parameter estimate	Standard error	*t* test for H_0: parameter = 0	*p* value
Intercept	0.557	1.3049	0.4269	0.6707
Central city	0.792	0.5928	1.3368	0.1853
Suburb	0.420	0.5198	0.8090	0.4211
Town	0.811	0.5935	1.3671	0.1757
Northeast	-1.060	0.5751	-1.8427	0.0693
Midwest	-0.410	0.4858	-0.8431	0.4019
South	1.058	0.4056	2.6075	0.0110
High poverty	1.167	1.2372	0.9432	0.3486
Small	0.660	0.8676	0.7604	0.4494
Medium	0.089	0.5219	0.1707	0.8649
Free or reduced-price lunch eligibility (percent)	-0.005	0.0147	-0.3406	0.7344
High poverty and free or reduced-price lunch eligibility, interaction term	-0.015	0.0209	-0.7062	0.4822
Total school enrollment	-0.000	0.0008	-0.2882	0.7740
Eighth grade enrollment	0.001	0.0027	0.2088	0.8352
Summed race/ethnicity percentage	-0.002	0.0104	-0.1873	0.8520

NOTE: Census region is the state-based region of the country (see appendix F, section 2 for state listing). For public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the free- or reduced-price lunch (FRPL) program. Summed race/ethnicity percentage includes Black; Hispanic; Asian; American Indian or Alaska Native; Hawaiian/Pacific Islander; and Two or more races. Black includes African American, and Hispanic includes Latino. Racial categories exclude Hispanic origin. Schools were weighted by their size-adjusted school base weights that did not include a nonresponse adjustment factor.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2019.

4.2 Participating Final Sample With Substitutes

This section presents the nonresponse bias analysis based on the final sample of 321 eligible schools for TIMSS-8 including participating substitute schools. The distribution of the participating final sample was compared to the schools in the total eligible final sample. The total eligible final sample includes participating final sample plus those original nonrespondents who were not replaced by substitutes. Size-adjusted school base weights were used for both the eligible sample and the participating schools. Through the use of substitute schools, the weighted school response rate for TIMSS-8 was 85.0 percent after replacement, with 273 out of 321 schools participating.

4.2.1 Categorical Variables (TIMSS-8)

The distribution of participating and eligible schools by five characteristics is shown in table F-24. The Chi-square statistic for Census region is significant and suggests that there is evidence of a relationship with participation in the assessment. In particular, schools in the Northeast were underrepresented among participating schools relative to eligible schools (12.5 vs. 14.7 percent, respectively), while schools in the South were overrepresented among participating schools (42.3 vs. 38.9 percent, respectively). There are no statistically significant relationships between participation status and any of the other characteristics shown in table F-24. Additionally, the absolute value of the relative bias for private schools is greater than 10 percent, which indicates potential bias for school control though substantially reduced after substitution. Note that the relative bias for private schools is much higher than for public schools due to the binary nature of the variable as the absolute bias is the same for both public and private. This is because the eligible percentage for private schools is so much lower than for public schools, so for a given absolute bias, the relative bias will always be higher for private schools.

Table F-24. Percentage distribution of eligible and participating schools in the U.S. TIMSS eighth-grade final sample, by school characteristics: 2019

	Sample schools				
School characteristic	Eligible (percent) (N = 321)	Participating (percent) (N = 273)	Bias	Relative bias	Chi-square *p* value
School control					0.174
Public	92.4	93.6	1.22	0.013	
Private	7.6	6.4	-1.22	-0.159	
Locale					0.612
Central city	30.1	29.5	-0.63	-0.021	
Suburb	40.0	40.6	0.62	0.016	
Town	10.8	10.3	-0.59	-0.054	
Rural	19.1	19.7	0.60	0.031	
Census region					0.006
Northeast	14.7	12.5	-2.16	-0.147	
Midwest	23.5	22.9	-0.61	-0.026	
South	38.9	42.3	3.35	0.086	
West	23.0	22.4	-0.58	-0.025	
Poverty level					0.580
High	41.5	40.9	-0.63	-0.015	
Low	58.5	59.1	0.63	0.011	
School size					0.923
Small	32.2	32.1	-0.12	-0.004	
Medium	34.7	35.1	0.40	0.012	
Large	33.1	32.9	-0.28	-0.009	

NOTE: Detail may not sum to totals because of rounding. Census region is the state-based region of the country (see appendix F, section 2 for state listing). For public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the free- or reduced-price lunch (FRPL) program; all private schools are treated as low poverty schools. Eligible schools contained at least one eighth-grade class. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Schools were weighted by their size-adjusted school base weights that did not include a nonresponse adjustment factor.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2019.

4.2.2 Continuous Variables (TIMSS-8)

Summary means for each continuous variable for participating and eligible schools are shown in tables F-25 and F-26. No data on FRPL eligibility was available for private schools, and so private schools are not included in the FRPL analysis. Fourteen public schools had missing values for FRPL, and these schools were dropped from the analysis in table F-26.

The *t* test statistic for Black is significant and suggests that there is evidence of a relationship with participation in the assessment. In particular, participating schools had a higher mean percentage of Black students than the eligible sample (14.7 percent versus 13.7 percent, respectively; table F-25). There were no other statistically significant differences between participating and eligible schools with respect to student enrollment, race/ethnicity percentage or FRPL (tables F-25 and F-26).

Table F-25. Mean values of various characteristics for eligible and participating schools in the U.S. TIMSS eighth-grade final sample: 2019

School characteristic	Sample schools: Eligible (mean) (N = 321)	Sample schools: Participating (mean) (N = 273)	Bias	Relative bias	*t* test *p* value
Enrollment					
Total school	770.1	758.7	-11.36	-0.015	0.386
Grade 8	242.8	239.1	-3.69	-0.015	0.331
Race/ethnicity percentage					
White	50.6	51.1	0.47	0.009	0.509
Black	13.7	14.7	0.99	0.072	0.001
Hispanic	25.8	24.5	-1.35	-0.052	0.081
Asian	5.2	5.1	-0.07	-0.014	0.685
American Indian or Alaska Native	0.7	0.6	-0.03	-0.041	0.685
Hawaiian/Pacific Islander	0.7	0.6	-0.06	-0.083	0.637
Two or more races	3.3	3.3	0.05	0.014	0.545

NOTE: Black includes African American, and Hispanic includes Latino. Racial categories exclude Hispanic origin. Eligible schools contained at least one eighth-grade class. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Schools were weighted by their size-adjusted school base weights that did not include a nonresponse adjustment factor.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2019.

Table F-26. Mean percentage of students eligible for free or reduced-price lunch, in eligible and participating public schools in the U.S. TIMSS eighth-grade final sample: 2019

School characteristic	Sample schools: Eligible (percent) (N = 287)	Sample schools: Participating (percent) (N = 246)	Bias	Relative bias	*t* test *p* value
Percentage of students eligible for free- or reduced-price lunch	51.4	50.7	-0.67	-0.013	0.318

NOTE: Information on percentage of students eligible for free- or reduced-price lunch (FRPL) is missing for 14 of the 301 public schools in the eligible final sample and 13 of the 259 public schools that participated. Eligible schools contained at least one eighth-grade class. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Schools were weighted by their size-adjusted school base weights that did not include a nonresponse adjustment factor.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2019.

4.2.3 Logistic Regression Model (TIMSS-8)

To examine the joint relationship of various characteristics to school nonresponse, the analysis used a logistic regression model with participation status as the binary dependent variable and frame characteristics as predictor variables. Since public and private schools were modeled together using the variables available for all schools, the percentage of students eligible for FRPL was not included in the main logistic regression analysis.

Standard errors and tests of hypotheses for the full model parameter estimates are presented in table F-27 (with six race/ethnicity variables) and table F-28 (with summed race/ethnicity percentage). Private schools are treated as low poverty for the categorical variable poverty level. Private schools was a significant predictor of school participation in table F-27. The negative parameter estimate indicates that relative to public schools, private schools were somewhat underrepresented among the participating schools. The *F* test statistic to determine whether the race/ethnicity characteristics are simultaneously equal to 0 was 0.66 with a *p* value of 0.6803, which indicates no significant relationship was detected with participation.

Private schools and South region were significant predictors of school participation in table F-28. The positive parameter estimate indicates that relative to schools in the West region, schools in the South region were somewhat overrepresented among the participating schools.

Because the percentage of students eligible for FRPL was not included in the main logistic regression analysis, a separate analysis with public schools only was conducted. To include FRPL eligibility in a model, public schools were modeled separately using a model with the summed race/ethnicity percentage and adding the percentage of students eligible for FRPL. Since poverty is derived from the percentage of students eligible for FRPL, an interaction term was also included in the model. Standard errors and tests of hypotheses for the full model parameter estimates are presented in table F-29. The South region and schools located in towns were significant predictors of school participation among public schools only. The positive parameter estimate indicates that relative to schools in rural areas, schools located in towns were somewhat overrepresented among the participating schools.

Table F-27. Logistic regression model parameters (with six race/ethnicity variables) using the U.S. TIMSS eighth-grade final school sample: 2019

Parameter	Parameter estimate	Standard error	*t* test for H_0: parameter = 0	*p* value
Intercept	3.685	1.1266	3.2707	0.0016
Private school	-2.049	0.8719	-2.3505	0.0214
Central city	0.702	0.6245	1.1236	0.2648
Suburb	0.364	0.5537	0.6580	0.5126
Town	0.900	0.6051	1.4881	0.1409
Northeast	-1.154	0.6188	-1.8658	0.0660
Midwest	-0.498	0.6100	-0.8167	0.4167
South	0.684	0.5440	1.2578	0.2124
High poverty	-0.204	0.5300	-0.3842	0.7019
Small	-0.788	0.9426	-0.8355	0.4061
Medium	-0.724	0.6296	-1.1497	0.2539
Total school enrollment	-0.001	0.0009	-0.6024	0.5487
Eighth grade enrollment	-0.004	0.0029	-1.4011	0.1653
Black (percent)	0.014	0.0124	1.1342	0.2603
Hispanic (percent)	-0.011	0.0092	-1.1852	0.2397
Asian (percent)	-0.001	0.0173	-0.0330	0.9737
American Indian or Alaska Native (percent)	-0.068	0.1134	-0.5990	0.5510
Hawaiian/Pacific Islander (percent)	-0.021	0.0970	-0.2159	0.8296
Two or more races (percent)	0.007	0.0791	0.0825	0.9345

NOTE: Census region is the state-based region of the country (see appendix F, section 2 for state listing). For public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the free- or reduced-price lunch (FRPL) program; all private schools are treated as low poverty schools. Black includes African American, and Hispanic includes Latino. Racial categories exclude Hispanic origin. Schools were weighted by their size-adjusted school base weights that did not include a nonresponse adjustment factor.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2019.

Table F-28. Logistic regression model parameters (with summed race/ethnicity percentage) using the U.S. TIMSS eighth-grade final school sample: 2019

Parameter	Parameter estimate	Standard error	*t* test for H0: parameter = 0	*p* value
Intercept	3.698	1.0819	3.4180	0.0010
Private school	-2.085	0.7943	-2.6252	0.0105
Central city	0.838	0.5958	1.4060	0.1639
Suburb	0.421	0.5399	0.7799	0.4379
Town	0.967	0.5988	1.6147	0.1106
Northeast	-0.901	0.5183	-1.7380	0.0863
Midwest	-0.176	0.5299	-0.3316	0.7411
South	0.983	0.4767	2.0621	0.0427
High poverty	-0.286	0.4514	-0.6346	0.5276
Small	-1.057	0.9170	-1.1524	0.2528
Medium	-0.803	0.6125	-1.3113	0.1938
Total school enrollment	-0.000	0.0009	-0.5221	0.6031
Eighth grade enrollment	-0.005	0.0029	-1.7011	0.0931
Summed race/ethnicity percentage	-0.005	0.0065	-0.7485	0.4565

NOTE: Census region is the state-based region of the country (see appendix F, section 2 for state listing). For public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the free- or reduced-price lunch (FRPL) program; all private schools are treated as low poverty schools. Summed race/ethnicity percentage includes Black; Hispanic; Asian; American Indian or Alaska Native; Hawaiian/Pacific Islander; and Two or more races. Black includes African American, and Hispanic includes Latino. Racial categories exclude Hispanic origin. Schools were weighted by their size-adjusted school base weights that did not include a nonresponse adjustment factor.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2019.

Table F-29. Logistic regression model parameters (with summed race/ethnicity percentage) using the U.S. TIMSS eighth-grade final public school sample: 2019

Parameter	Parameter estimate	Standard error	*t* test for H0: parameter = 0	*p* value
Intercept	3.055	1.4653	2.0847	0.0405
Central city	0.990	0.7003	1.4144	0.1614
Suburb	0.756	0.5679	1.3318	0.1869
Town	1.600	0.7635	2.0953	0.0395
Northeast	-1.022	0.6760	-1.5113	0.1349
Midwest	-0.756	0.6367	-1.1866	0.2391
South	1.600	0.5655	2.8292	0.0060
High poverty	1.063	1.4637	0.7265	0.4698
Small	-0.561	1.0249	-0.5474	0.5858
Medium	-0.644	0.7232	-0.8908	0.3759
Free or reduced-price lunch eligibility (percent)	0.007	0.0217	0.3039	0.7620
High poverty and free or reduced-price lunch eligibility, interaction term	-0.020	0.0254	-0.8050	0.4233
Total school enrollment	-0.000	0.0010	-0.4556	0.6500
Eighth grade enrollment	-0.005	0.0032	-1.4724	0.1451
Summed race/ethnicity percentage	-0.007	0.0110	-0.6275	0.5323

NOTE: Census region is the state-based region of the country (see appendix F, section 2 for state listing). For public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the free- or reduced-price lunch (FRPL) program. Summed race/ethnicity percentage includes Black; Hispanic; Asian; American Indian or Alaska Native; Hawaiian/Pacific Islander; and Two or more races. Black includes African American, and Hispanic includes Latino. Racial categories exclude Hispanic origin. Schools were weighted by their size-adjusted school base weights that did not include a nonresponse adjustment factor.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2019.

4.3 Nonresponse-Adjusted Final Sample With Substitutes

This section presents the nonresponse bias analysis based on the final sample of 321 eligible schools for TIMSS-8. The distribution of the participating final sample, including participating substitute schools, was compared to the schools in the total eligible final sample, just like the previous section. However, in the analyses that follow, size-adjusted school base weights were used for the eligible sample of schools, whereas size-adjusted school nonresponse-adjusted weights were used for the participating schools.

4.3.1 Categorical Variables (TIMSS-8)

The distribution of participating and eligible schools by five characteristics is shown in table F-30. There are no statistically significant relationships between participation status and any of the characteristics shown in table F-30.

Table F-30. Percentage distribution of eligible and participating schools in the U.S. TIMSS eighth-grade nonresponse-adjusted sample, by school characteristics: 2019

	Sample schools				
School characteristic	Eligible (percent) (N = 321)	Participating (percent) (N = 273)	Bias	Relative bias	Chi-square *p* value
School control					0.909
Public	92.4	92.2	-0.12	-0.001	
Private	7.6	7.8	0.12	0.016	
Locale					0.809
Central city	30.1	29.9	-0.16	-0.005	
Suburb	40.0	40.7	0.70	0.018	
Town	10.8	10.2	-0.65	-0.060	
Rural	19.1	19.2	0.11	0.006	
Census region					0.742
Northeast	14.7	14.1	-0.60	-0.041	
Midwest	23.5	24.4	0.95	0.041	
South	38.9	38.2	-0.72	-0.018	
West	23.0	23.3	0.36	0.016	
Poverty level					0.967
High	41.5	41.5	-0.05	-0.001	
Low	58.5	58.5	0.05	0.001	
School size					0.142
Small	32.2	34.3	2.11	0.066	
Medium	34.7	34.3	-0.40	-0.011	
Large	33.1	31.4	-1.72	-0.052	

NOTE: Detail may not sum to totals because of rounding. Census region is the state-based region of the country (see appendix F, section 2 for state listing). For public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the free- or reduced-price lunch (FRPL) program; all private schools are treated as low poverty schools. Eligible schools contained at least one eighth-grade class. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Participating schools were weighted by their size-adjusted school nonresponse adjusted weights. The eligible sample were weighted by their size-adjusted school base weights.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2019.

4.3.2 Continuous Variables (TIMSS-8)

Summary means for each continuous variable for participating and eligible schools are shown in tables F-31 and F-32. No data on FRPL eligibility was available for private schools, and so private schools are not included in the FRPL analysis. Fourteen public schools had missing values for FRPL, and these schools were dropped from the analysis in table F-32.

The *t* test statistics for grade 8 enrollment and Black are significant and suggests that there is evidence of relationships with participation in the assessment. In particular, participating schools had a smaller mean grade 8 enrollment than the eligible sample (232.6 versus 242.8, respectively; table F-31). Also, participating schools had a higher mean percentage of Black students than the eligible sample (14.4 percent versus 13.7 percent, respectively; table F-31). There were no other statistically significant differences between participating and eligible schools with respect to race/ethnicity percentage or FRPL (tables F-31 and F-32).

Table F-31. Mean values of various characteristics for eligible and participating schools in the U.S. TIMSS eighth-grade nonresponse-adjusted sample: 2019

	Sample schools				
School characteristic	Eligible (mean) (N = 321)	Participating (mean) (N = 273)	Bias	Relative bias	*t* test *p* value
Enrollment					
Total school	770.1	748.1	-21.98	-0.029	0.082
Grade 8	242.8	232.6	-10.15	-0.042	0.014
Race/ethnicity percentage					
White	50.6	51.1	0.52	0.010	0.510
Black	13.7	14.4	0.68	0.050	0.048
Hispanic	25.8	24.7	-1.08	-0.042	0.191
Asian	5.2	5.1	-0.10	-0.019	0.604
American Indian or Alaska Native	0.7	0.6	-0.05	-0.070	0.481
Hawaiian/Pacific Islander	0.7	0.7	-0.03	-0.041	0.822
Two or more races	3.3	3.3	0.05	0.017	0.541

NOTE: Black includes African American, and Hispanic includes Latino. Racial categories exclude Hispanic origin. Eligible schools contained at least one eighth-grade class. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Participating schools were weighted by their size-adjusted school nonresponse adjusted weights. The eligible sample were weighted by their size-adjusted school base weights.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2019.

Table F-32. Mean percentage of students eligible for free or reduced-price lunch, in eligible and participating public schools in the U.S. TIMSS eighth-grade nonresponse-adjusted sample: 2019

School characteristic	Sample schools: Eligible (percent) (N = 287)	Sample schools: Participating (percent) (N = 246)	Bias	Relative bias	*t* test *p* value
Percentage of students eligible for free or reduced-price lunch	51.4	51.4	0.00	0.000	0.998

NOTE: Information on percentage of students eligible for free or reduced-price lunch (FRPL) is missing for 14 of the 301 public schools in the eligible final sample and 13 of the 259 public schools that participated. Eligible schools contained at least one eighth-grade class. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Participating schools were weighted by their size-adjusted school nonresponse adjusted weights. The eligible sample were weighted by their size-adjusted school base weights.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2019.

4.4 Summary—Grade 8

The investigation into nonresponse bias at the school level for the U.S. TIMSS-8 sample shows statistically significant relationships between response status and some of the available school characteristics that were examined in the analysis.

For original sample schools, two variables were found to be statistically significantly related to participation in the bivariate analysis: school control (table F-18) and Census region (table F-18). Also, the absolute value of the relative bias for American Indian or Alaska Native is greater than 10 percent, though this is due mostly to the eligible percentage being equal to 1.0 percent, as the absolute bias is small (table F-19). Although each of these findings indicates some potential for nonresponse bias, when all of these factors were considered simultaneously in a regression analysis, private schools and the Northeast region were significant predictors of participation (table F-21). The second model showed that private schools and the Northeast and South regions were significant predictors of participation (table F-22, with summed race/ethnicity percentage). The third model showed the South region was a significant predictor of school participation among public schools only (table F-23). These results suggest that there is some potential for nonresponse bias in the TIMSS-8 participating sample based on the characteristics studied.

For final sample schools (with substitutes), Census region (table F-24) and Black (table F-25) were found to be statistically significantly related to participation in the bivariate analysis. When all of these factors were considered simultaneously in a regression analysis, private schools was a significant predictor of participation (table F-27). The second model showed that private schools and the South region were significant predictors of participation (table F-28, with summed race/ethnicity percentage). The third model showed the South region and schools located in towns were significant predictors of school participation among public schools only (table F-29).

For final sample schools with size-adjusted school nonresponse adjustments applied to the weights, eighth grade enrollment and Black were found to be statistically significantly related to participation in the bivariate analysis (table F-31). The multivariate regression analysis cannot be conducted after the school nonresponse adjustments are applied to the weights. The concept of nonresponse-adjusted weights does

not apply to the nonresponding units, and, thus, we cannot conduct an analysis that compares respondents with nonrespondents using nonresponse-adjusted weights. The results of the analyses are summarized in table F-33.

These results suggest that there is some potential for nonresponse bias in the U.S. TIMSS-8 original sample based on the characteristics studied. In parts two and three of the analysis, some characteristics that previously showed significant bias no longer did; but significant bias was introduced in other characteristics. Therefore, the net effect of substitution and nonresponse adjustment on the validity of TIMSS-8 estimates is ambiguous but has not added substantially to the bias. However, it may also be worth noting that, for the two characteristics that show statistically significant bias after nonresponse adjustment (eighth grade enrollment and percent Black), the relative bias is still fairly small in practical terms (5 percent or lower). Since there is bias in some of the frame variables that were included in the evaluation, this may indicate a risk of bias in substantive variables that are correlated with these frame variables. There is also still a possibility of unobserved bias in variables that were not included in this evaluation.

Table F-33. Characteristics with *p* values less than 0.05 and absolute relative bias greater than 10 percent, U.S. TIMSS eighth-grade schools: 2019

Analysis	Characteristics with *p* values less than 0.05	Additional characteristics with absolute relative bias greater than 10 percent
Original sample	School control, Census region	American Indian or Alaska Native
Regression model a	Private schools, Northeast region	†
Regression model b	Private schools, Northeast region, South region	†
Regression model c	South region	†
Sample with substitutes	Census region, Black	Private schools
Regression model a	Private schools	†
Regression model b	Private schools, South region	†
Regression model c	Town, South region	†
Nonresponse adjusted	Eighth grade enrollment, Black	None

† Not applicable.
NOTE: Differences between the regression models were as follows: regression model a included six race/ethnicity variables (where racial categories exclude Hispanic origin), regression model b included summed race/ethnicity percentage, and for regression model c only public schools were modeled and included summed race/ethnicity percentage and added percentage of students eligible for free or reduced-price lunch (FRPL).
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2019.

5. REFERENCES

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