

CHAPTER 2

Updating the TIMSS 2019 Instruments for Describing the Contexts for Student Learning

Ina V.S. Mullis
Bethany Fishbein

Introduction

Beginning with the first TIMSS assessments in 1995, each TIMSS assessment cycle has collected an array of information from each participating country about the national, home, school, and classroom contexts in which students learn mathematics and science. The purpose for collecting these data is to learn more about the educational factors that are related to mathematics and science achievement by examining these factors internationally across and within countries. The fundamental idea is for countries to learn from each other about possible ways to improve their own education systems.

Considering countries' mathematics and science achievement together with the factors that can facilitate that achievement is at the core of TIMSS. Collecting comparable data across countries about students' opportunities for learning mathematics and science is as central to TIMSS as collecting comparable data about students' mathematics and science achievement.

The areas of the student learning contexts addressed in the TIMSS 2019 context questionnaire instruments were described in the [TIMSS 2019 Context Questionnaire Framework](#). Because TIMSS has been administered every four years since 1995, making TIMSS 2019 the seventh TIMSS administration, many aspects of collecting the contextual data have become relatively stable across cycles. Similar to previous TIMSS assessments, in TIMSS 2019:

- The home, school, teacher, and student context questionnaires were administered together with the mathematics and science assessments
- Substantial portions of the [TIMSS 2019 International Results in Mathematics and Science](#) were devoted to reporting the data collected via the home, school, teacher, and student

questionnaires in relation to countries' achievement on the mathematics and science assessments

- The [TIMSS 2019 Encyclopedia](#) was based on countries' responses to the TIMSS 2019 Curriculum Questionnaire and each country wrote a chapter for the *Encyclopedia* describing its mathematics and science curricula and general education policies
- Many of the topics covered in the context questionnaires and the information provided by countries for their chapters in the [TIMSS 2019 Encyclopedia](#) were similar to those in previous assessments, although updated for TIMSS 2019.

Description of the TIMSS 2019 Context Questionnaires

This section describes the TIMSS 2019 Home, School, Teacher, Student, and Curriculum Questionnaires, including who was responsible for completing each questionnaire, the content covered, and the method for administering the questionnaire. The TIMSS 2019 context questionnaires can be viewed in their entirety on the [TIMSS 2019 Context Questionnaires webpage](#).

Home Questionnaire

The Home Questionnaire (also known as the “Early Learning Survey”) was administered at the fourth grade to the students' parents or guardians. It asked about home resources for fostering literacy and numeracy skills, the parents' highest level of education, employment situations, opinions about their child's school, their child's attendance in preprimary education programs, the emphasis on literacy and numeracy activities in the home before the child attended school (such as reading books, singing songs, writing words and numbers, and counting), and the level of their child's literacy and numeracy skills when beginning school. Countries asked students' parents or guardians to complete the questionnaire online or sent it to the students' homes in paper-and-pencil format.

School Questionnaire

The School Questionnaire was administered at the fourth and eighth grades to the principals of the students' schools. It asked about the level of students' literacy and numeracy skills when they first enter the school, the availability of instructional resources, the socioeconomic background of the students attending the school, the school's emphasis on academic success, the need for discipline, and the principals' education. Countries administered the questionnaire either online or via paper-and-pencil.

Teacher Questionnaires

A single version of the Teacher Questionnaire was administered at the fourth grade to students' teachers, given that generally the same teachers taught the students both mathematics and science. At the eighth grade, there were separate versions of the questionnaire for the students' mathematics teachers and the students' science teachers. The questionnaires asked about the teachers' education, professional development, and career satisfaction as well as about students' readiness for instruction, the frequency they do various instructional activities, difficulties in providing instruction, curriculum topics covered, assessment practices, and availability of computers for instruction. Countries administered the Teacher Questionnaire either online or via paper-and-pencil.

Student Questionnaire

Administered to all students at the fourth and eighth grades, the Student Questionnaire asked students about their educational experiences at home and school related to learning mathematics and science. It also included several scales about their attitudes toward learning mathematics and science. At the eighth grade, there were two versions of the questions about science—one for countries that taught science as an integrated subject and one for countries where science was taught as separate subjects (e.g., biology, earth science, chemistry, and physics). The separate science questionnaire asked some of the questions for each content area individually. Regardless of whether they were participating in eTIMSS or paperTIMSS, students were administered a paper-and-pencil questionnaire at the end of their testing session.

For countries that participated in eTIMSS, students also answered several questions on their digital devices at the end of the assessment about their experience taking the eTIMSS assessment and their familiarity with digital devices.

Curriculum Questionnaire

The Curriculum Questionnaire was administered at the fourth and eighth grades to the National Research Coordinators (NRCs) of the participating countries. This questionnaire collected information about national curriculum policies and practices related to the countries' educational systems and the organization and content of the mathematics and science curricula in their country. The Curriculum Questionnaire was administered online.

Maintaining Continuity with Previous Assessments

Much of the information in the TIMSS 2019 context questionnaires was collected in the form of context questionnaire scales (typically including 8–12 items) that measure particular factors or constructs that have been found to be related to mathematics and science achievement as assessed by TIMSS. Many of the scales included in the TIMSS 2019 questionnaires were brought forward from 2015 because they

addressed home and school factors that have been of interest for several assessment cycles. These scales either were brought forward in their entirety or modified for the 2019 cycle.

The following existing scales were included in the Home Questionnaire:

- Home Resources for Learning
- Home Early Literacy and Numeracy Activities Before Primary School
- Could Do Early Literacy and Numeracy Tasks When Beginning Primary School
- Parents' Perceptions of Their Child's School

Existing scales included in the School Questionnaire covered:

- Instruction Affected by Resource Shortages
- School Emphasis on Academic Success (also included in the Teacher Questionnaire)
- School Discipline
- Schools Where Students Entered Primary Grades with Literacy and Numeracy Skills

Existing scales included in the Teacher Questionnaire covered:

- School Emphasis on Academic Success (also in the School Questionnaire)
- Safe and Orderly School
- Teachers' Job Satisfaction
- Classroom Teaching Limited by Students Not Ready for Instruction

The following existing scales were included in the Student Questionnaire:

- Student Bullying
- Sense of School Belonging

TIMSS 2019 also continued the long-standing practice of asking students about their attitudes toward mathematics and science, primarily via the following scales:

- Students Like Learning Mathematics
- Students Like Learning Science
- Students Confident in Mathematics
- Students Confident in Science
- Students Value Mathematics
- Students Value Science

Other topics also were brought forward to TIMSS 2019 from previous assessments. Collecting information about the curriculum has been central to TIMSS from the beginning, and TIMSS 2019 continued this by asking countries to describe their mathematics and science curricula in the curriculum questionnaire and in their chapters for the *TIMSS 2019 Encyclopedia*. The chapters detailed each country's nationally specified (or formal) curricula in mathematics and science (sometimes called the intended curriculum by TIMSS). To collect information about students' opportunity to learn the country's curriculum, the teachers of the TIMSS students were asked which TIMSS topics had been covered during the current or previous school years.

Teacher education policies and practices also have been of continued interest across assessment cycles. TIMSS 2019 asked countries to describe the education and credentialing procedures for becoming a teacher in the Curriculum Questionnaire and professional development requirements and programs were described in the *Encyclopedia* chapters. The Teacher Questionnaire asked teachers themselves about their education degrees, areas of concentrated study while earning their degrees, and participation in professional development after becoming a teacher.

Updates to the TIMSS 2019 Context Questionnaires and Encyclopedia Chapters

Although a number of scales and questions were brought forward from TIMSS 2015, the TIMSS 2019 Home, School, Teacher, and Student Questionnaires as well as the Curriculum Questionnaire and the outline for the countries' *Encyclopedia* chapters were updated to address important areas of current research, such as using digital devices in mathematics and science instruction. Considering recommendations from the participating countries about the most useful information to collect, TIMSS 2019 had three main goals for improving the context questionnaires: 1) enhancing the measures of teacher instructional quality, 2) addressing areas relevant to using technology in instruction and assessment, and 3) reducing the response burden for teachers.

TIMSS 2019 focused on scales of teacher instructional quality based on students' reports. New items were written for the Student Questionnaire to enhance existing measures aligned with research about "instructional clarity." To address the topic of classroom management, a new scale was developed asking students about the extent disorderly behavior occurs in their mathematics lessons. New items in the Student Questionnaire also asked about how often teachers use instructional activities related to problem solving and inquiry, such as conducting science experiments.

With more than half the participating countries transitioning to eTIMSS, TIMSS 2019 renewed efforts to collect data about technology use for instruction and assessment. The School Questionnaire asked principals about the availability of technology resources, such as digital learning resources (e.g.,

digital books). Teachers were asked about using computers to support students in mathematics and science lessons, and whether students take mathematics and science tests on digital devices. To cover additional questionnaire topics relevant to digital assessment, students who took eTIMSS answered questions about their familiarity with using digital devices for schoolwork.

New items for the Home Questionnaire improved coverage for early numeracy activities and skills, such as drawing shapes and measuring quantities. The Student Questionnaire scale at the eighth grade about students' bullying experiences also was revamped to better reflect the current trends related to social media and cyberbullying. The new scale included a greater emphasis on bullying experienced through digital devices.

Based on feedback from NRCs and in response to high rates of teacher nonresponse in several TIMSS 2015 countries, several items and scales that were given a lower priority were retired from the Teacher Questionnaire, including those asking about school working conditions, collaborating with other teachers, and confidence in teaching the curriculum.

TIMSS 2019 also retired some content to reduce the burden for NRCs. Several topics were moved from the *Encyclopedia* chapters to the Curriculum Questionnaire, including the countries' language(s) of instruction, additional education requirements for mathematics and science teachers, and the first grade of schooling taught by subject specialist teachers. Several topics deemed to be outdated were deleted from the Curriculum Questionnaire, such as policies for student tracking and the process for approving instructional materials.

Overview of the Updating Process

With each new assessment cycle, the TIMSS & PIRLS International Study Center at Boston College follows a collaborative and iterative process to update the TIMSS data collection instruments for the contexts for learning mathematics and science. For TIMSS 2019, Executive Directors Ina Mullis and Michael Martin and TIMSS Questionnaire Coordinator Martin Hooper (through 2018) led the development process, which involved updating the questionnaires from 2015, conducting several iterations of review, and a full-scale field test. Based on the field test results, minor revisions were made to the questionnaires and final reviews were conducted prior to data collection.

The National Research Coordinators (NRCs) who were designated by the participating countries to be responsible for implementing TIMSS 2019 played a key role in reviewing the TIMSS 2019 context questionnaires. They provided feedback and proposed new topics at NRC meetings throughout the development process, including at the first TIMSS 2019 NRC meeting, as well as the NRC meetings before the field test and prior to TIMSS 2019 Data Collection.

The TIMSS 2019 Questionnaire Item Review Committee (QIRC) consisted of NRCs with experience and expertise in education policy analysis and survey development. Members of QIRC made major

contributions in updating the [TIMSS 2019 Context Questionnaire Framework](#) and in modifying and developing the context questionnaires. This included conducting an online review and attending two committee meetings—a first meeting prior to the field test and a second meeting prior to data collection. The members of the TIMSS 2019 QIRC are listed in Exhibit 2.1.

Exhibit 2.1: TIMSS 2019 Questionnaire Item Review Committee (QIRC)

Sue Thomson

Australian Council for Educational Research
(ACER)

Australia

Josef Basl

Czech School Inspectorate

Czech Republic

Heike Wendt

Institute for School Development Research (IFS)
TU Dortmund University

Germany

Laura Palmerio

Istituto Nazionale per la Valutazione del
Sistema Educativo di Istruzione e di Formazione
(INVALSI)

Italy

Kyongah Sang

Center for Global Education
Korea Institute for Curriculum & Evaluation

Korea, Republic of

Martina Meelissen

Department of Research Methodology,
Measurement, and Data Analysis
University of Twente

The Netherlands

Trude Nilsen

Department of Teacher Education and School
Research

ILS, University of Oslo

Norway

Vijay Reddy

Human Sciences Research Council (HSRC)

South Africa

Sean P. “Jack” Buckley

American Institutes for Research

United States

Reviewing the Field Test Results for the TIMSS 2019 Context Questionnaires

The field test is an important step for assessing the quality of the home, school, teacher, and student questionnaire instruments and measurement scales before data collection. Particularly for newly developed items, this step in the updating process also gives countries’ an opportunity to ensure the items are appropriately translated and adapted to their national contexts so that their data are internationally comparable (see [Chapter 5: Instrument Translation and Layout Verification for TIMSS 2019](#)).

Subsequent to conducting the TIMSS 2019 Field Test, the TIMSS & PIRLS International Study Center analyzed the field test data, consisting of responses from: 1) 66,626 parents or caregivers to the Home Questionnaire, 2) 2,682 principals to the School Questionnaire, 3) 10,993 teachers to the Teacher

Questionnaire, and 4) 121,454 students to the Student Questionnaire. The staff at the TIMSS & PIRLS International Study Center produced data almanacs containing item statistics for each questionnaire item, including the percentage of students responding to each response option, with the corresponding average student achievement in mathematics or science, respectively. The staff also prepared context questionnaire scale summaries to evaluate the suitability of the items for scaling with one parameter item response theory (Rasch) model. The scales were evaluated for unidimensionality, reliability, and their relationship with achievement. More information about the TIMSS 2019 context questionnaire scales and their measurement properties can be found in [Chapter 16: Creating and Interpreting the TIMSS 2019 Context Questionnaire Scales](#).

The TIMSS & PIRLS International Study Center reviewed the field test results and updated the questionnaires as necessary for the final round of reviews by the TIMSS 2019 QIRC and NRCs. The next section contains the complete schedule of activities included in the updating process.

Schedule of Activities for Updating the TIMSS 2019 Instruments for Describing Contexts for Student Learning

Exhibit 2.2 presents the schedule for updating the TIMSS 2019 instruments used to collect information about students' home, school, and classroom contexts for learning mathematics and science. The iterative review process formally began in February 2017 at the 1st TIMSS 2019 NRC meeting and ended with finalizing the Curriculum Questionnaire in April 2019.

Exhibit 2.2: TIMSS 2019 Schedule of Activities for Updating Context Questionnaires

Date(s)		Group and Activity
February	2017	NRCs reviewed the TIMSS 2015 context questionnaires, providing ideas for new topics that should be addressed in TIMSS 2019 (1 st NRC meeting—Hamburg, Germany)
February–June	2017	TIMSS & PIRLS International Study Center drafted the TIMSS 2019 Context Questionnaire Framework incorporating NRC feedback
June–July	2017	The TIMSS 2019 Questionnaire Item Review Committee (QIRC) conducted an online review of the draft TIMSS 2019 Context Questionnaire Framework
July–August	2017	TIMSS & PIRLS International Study Center finalized the TIMSS 2019 Context Questionnaire Framework incorporating QIRC feedback and drafted the updated TIMSS 2019 Field Test Home, School, Teacher, and Student Questionnaires
August	2017	TIMSS & PIRLS International Study Center published <i>TIMSS 2019 Assessment Frameworks</i> , including the TIMSS 2019 Context Questionnaire Framework
September	2017	QIRC reviewed the draft TIMSS 2019 Field Test Home, School, Teacher, and Student Questionnaires (1 st QIRC meeting—Hengelo, the Netherlands)
September–November	2017	TIMSS & PIRLS International Study Center incorporated the QIRC suggestions into the draft TIMSS 2019 Field Test Home, School, Teacher, and Student Questionnaires

Exhibit 2.2: TIMSS 2019 Schedule of Activities for Updating Context Questionnaires (continued)

Date(s)		Group and Activity
November	2017	NRCs reviewed the draft field test home, school, teacher, and student questionnaires (3 rd NRC meeting—Melbourne, Australia)
November–December	2017	TIMSS & PIRLS International Study Center finalized the field test home, school, teacher, and student questionnaires, incorporating suggestions from the NRCs
December	2017	TIMSS & PIRLS International Study Center provided the TIMSS 2019 field test questionnaires to the NRCs for translation
March–May	2018	Countries conducted TIMSS 2019 Field Test
April–May	2018	Countries submitted field test data to IEA Hamburg for review
May–June	2018	TIMSS & PIRLS International Study Center analyzed the field test data and reviewed the results
July	2018	QIRC reviewed questionnaires together with the field test results and proposed revisions to the home, school, teacher, and student questionnaires. QIRC also reviewed the draft TIMSS 2019 Curriculum Questionnaire and <i>Encyclopedia</i> chapter outline (2 nd QIRC meeting—Oslo, Norway)
July–August	2018	TIMSS & PIRLS International Study Center incorporated the QIRC suggestions into the questionnaires
August	2018	NRCs reviewed the proposed TIMSS 2019 Home, School, Teacher, and Student Questionnaires (5 th NRC meeting—Stockholm, Sweden)
August	2018	TIMSS & PIRLS International Study Center distributed the TIMSS 2019 Home, School, Teacher, and Student Questionnaires to NRCs for translation and verification
October–December	2018	Southern Hemisphere countries conducted TIMSS 2019 Data Collection
January–March	2019	TIMSS & PIRLS International Study Center incorporated the QIRC suggestions into the TIMSS 2019 Curriculum Questionnaire and <i>Encyclopedia</i> chapter outline
March	2019	NRCs reviewed the proposed TIMSS 2019 Curriculum Questionnaire and <i>Encyclopedia</i> chapter outline (6 th NRC meeting—Limassol, Cyprus)
March–June	2019	Northern Hemisphere countries conducted TIMSS 2019 Data Collection
April–October	2019	NRCs responded to the online TIMSS 2019 Curriculum Questionnaire
October–February	2019	NRCs submitted their <i>TIMSS 2019 Encyclopedia</i> chapters to the TIMSS & PIRLS International Study Center