IEA TIMSS 2019

About TIMSS 2019

Overview

IEA's TIMSS 2019 is the seventh assessment cycle of TIMSS, the Trends in International Mathematics and Science Study. TIMSS 2019 was conducted at the fourth and eighth grades in 64 countries and 8 benchmarking systems. Inaugurated in 1995, TIMSS has been conducted every four years since, providing 24 years of trends in mathematics and science achievement.

The TIMSS assessments of student achievement are updated with each cycle in collaboration with the participating countries, who review the frameworks describing the mathematics and science content to be assessed and participate in item development. TIMSS also provides important policy relevant data about students' contexts for learning mathematics and science based on questionnaires completed by students and their parents or caregivers, teachers, and school principals. Taken together, TIMSS provides comparative data about countries' student achievement over time and in relation to key home, school, and classroom variables.

TIMSS 2019 continues the long history of international assessments in mathematics and science conducted by IEA—the International Association for the Evaluation of Educational Achievement. An independent international cooperative of national research institutions and government agencies, IEA pioneered international comparative assessments of educational achievement in the 1960s to gain a deeper understanding of the effects of policies across countries' different systems of education. IEA has been conducting international assessments of mathematics and science and collecting data about the factors associated with achievement in countries around the world for more than 50 years. TIMSS at the fourth grade is complemented by IEA's PIRLS—the Progress in International Reading Literacy Study—conducted every five years since 2001.

TIMSS and PIRLS are directed by IEA's TIMSS & PIRLS International Study Center at Boston College, in close cooperation with IEA Amsterdam, IEA Hamburg, and Statistics Canada. Each participating country has a National Research Coordinator who is responsible for implementing TIMSS in accordance with international procedures and to TIMSS' standards of technical excellence.

Transition to Computer-Based Assessment

In 2019, TIMSS began the transition to computer-based assessment by introducing a computerized version—eTIMSS. Half the participating countries in 2019 chose to administer the new eTIMSS version, while the other half continued to administer the paper-based version.

Every effort was made to have the eTIMSS and paperTIMSS assessments be as similar as possible, while capitalizing on new item types, such as drag-and-drop and drop-down menus, and automated scoring through keypad entry. The goal of item development was to ensure that eTIMSS and paperTIMSS measured the same mathematics and science constructs using the same assessment items, as much as possible.

To provide a bridge between eTIMSS and paperTIMSS, eTIMSS countries also administered the paperTIMSS trend items to a separate sample of students, typically in the same schools. The bridge data form an intermediate link (or bridge) between eTIMSS countries' computer-based data in 2019 and their paper-based data in 2015 as well as to the paperTIMSS countries in 2019.

Participating Countries

As shown below, 64 countries participated in TIMSS 2019, including some distinct education systems within countries that have always participated separately throughout IEA's long history (e.g., the Dutch-speaking part of Belgium and Hong Kong Special Administrative Region (SAR) of the People's Republic of China). In addition, TIMSS 2019 had 8 benchmarking participants, (e.g., regional entities, such as provinces and municipalities).

Countries and benchmarking participants could choose to participate in the fourth grade assessment, the eighth grade assessment, or both. In 2019, 58 countries and 6 benchmarking entities participated in the TIMSS fourth grade assessment, and 39 countries and 7 benchmarking participants participated in the eighth grade assessment.

Countries Participating in TIMSS 2019

Albania
Armenia
Australia
Austria *
Azerbaijan
Bahrain
Belgium (Flemish)
Bosnia and Herzegovina
Bulgaria
Canada *
Chile *
Chinese Taipei *
Croatia *
Cyprus
Czech Republic *
Denmark *
Egypt
England *
Finland *
France *
Georgia *
Germany *
Hong Kong SAR *
Hungary *
Iran, Islamic Rep. of
Ireland
Israel *
Italy *
Japan
Jordan
Kazakhstan
Korea, Rep. of *
Kosovo
Kuwait
Latvia
Lebanon
Lithuania *
Malaysia *
Malta *
Montenegro
Morocco
Netherlands *
New Zealand
North Macedonia
Northern Ireland
Norway *
Oman
Pakistan
Philippines
Poland
Portugal *
Qatar *
Romania
Russian Federation *
Saudi Arabia
Serbia
Singapore *
Slovak Republic *
South Africa
Spain *
Sweden *
Turkey *
United Arab Emirates *
United States *

Benchmarking Participants

Ontario, Canada *
Quebec, Canada *
Moscow, Russian Fed. *
Madrid, Spain *
Gauteng, RSA
Western Cape, RSA
Abu Dhabi, UAE *
Dubai, UAE *

* Transitioned to eTIMSS

TIMSS 2019 Assessment Frameworks

The TIMSS 2019 mathematics and science assessments are based on comprehensive frameworks developed collaboratively with the participating countries. The TIMSS 2019 Mathematics Framework and the TIMSS 2019 Science Framework are each organized around two dimensions: a content dimension specifying the content to be assessed and a cognitive dimension specifying the thinking processes to be assessed.

In mathematics, TIMSS 2019 at the fourth grade assessed three content domains: number, measurement and geometry, and data. The eighth grade assessment had four content domains: number, algebra, geometry, and data and probability. In science, the TIMSS 2019 fourth grade assessment included three content domains: life science, physical science, and Earth science. The eighth grade included four content domains: biology, chemistry, physics, and Earth science. The proportion of each assessment devoted to the content domains differed to reflect curricular emphases in each grade. In both grades and both subjects, TIMSS 2019 assessed three cognitive domains: knowing, applying, and reasoning.

The TIMSS assessments include a substantial number of items to cover the breadth of mathematics and science content addressed in the frameworks. The fourth grade mathematics and science assessments each include approximately 175 items and the eighth grade mathematics and science assessments each include approximately 220 items.

Achievement Data

The *TIMSS 2019 International Mathematics and Science Results* report presents TIMSS 2019 average mathematics and science scale scores and score distributions at the fourth and eighth grades for each participating country and benchmarking system. Scaling the TIMSS 2019 achievement data proceeded in two phases: calibrating the paperTIMSS and bridge data on the TIMSS 2019 achievement scales, and linking the eTIMSS data to these scales via the bridge data. This process enabled the eTIMSS and paperTIMSS achievement results to be reported on the same achievement scale in each grade and subject.

Trends are reported across the seven TIMSS assessment cycles for countries that have comparable data from previous TIMSS assessments. Average scale scores also are provided by gender and for each of the content and cognitive domains. To provide an interpretation for the average scale scores, TIMSS relates performance on the assessment items to four international benchmarks on the achievement scales: Low, Intermediate, High, and Advanced. Students' performance at each of the benchmarks is described in terms of the items that students reaching the benchmark answered correctly.

Contextual Data

The goal of TIMSS is to provide the best policy-relevant information to help improve mathematics and science teaching and learning. TIMSS 2019 included student, teacher, and school questionnaires

and the Early Learning Survey (also called the "home questionnaire") completed by students' parents or caregivers. Many of the questionnaire items were developed and analyzed as item response theory (IRT) scales to provide robust indicators of important aspects of schooling (e.g., school safety, students' attitudes toward learning mathematics and science, the impact of an early start). Together, the questionnaire results provide a wealth of information about the home, school, and classroom contexts in which students learn mathematics and science. The results from the questionnaires are reported in the Home & School Contexts and Classroom Contexts parts of this report.

The *TIMSS 2019 Encyclopedia: Education Policy and Curriculum in Mathematics and Science report* is a qualitative companion to the quantitative results summarized in this report. The *TIMSS 2019 Encyclopedia* comprises chapters written by each country and benchmarking participant that describe the structure of these countries' education systems and their mathematics and science curricula and initiatives. It also includes the results from the TIMSS 2019 Curriculum Questionnaire, completed by each TIMSS National Research Coordinator.

Students Assessed

TIMSS assesses students in participating countries in their fourth year of formal schooling, provided the mean age at the time of testing is at least 9.5 years, and in their eighth year of formal schooling, provided the mean age at the time of testing is 13.5 years. Because education systems vary in structure and in policies and practices with regard to age of starting school and promotion and retention, there are differences across countries in how the target grades are labeled and in the average age of students. Moreover, some countries choose to administer TIMSS to a different grade than the fourth or eighth years of formal schooling. Norway chose to assess fifth and ninth grade students to obtain better comparisons with Sweden and Finland. South Africa and its benchmarking systems assessed fifth and ninth grade students to better match their curricula and to maintain trend measurement. Turkey also chose to assess students in the fifth grade.

In each grade, nationally representative samples of approximately 4,000 students from 150 to 200 schools participated in TIMSS 2019. Including the mathematics and science assessments and context questionnaires, more than 330,000 students, 310,000 parents, 11,000 schools, and 22,000 teachers participated in the fourth grade assessment, and a further 250,000 students from 8,000 schools, and 30,000 teachers participated in the eighth grade assessment.

Appendix B of this report provides information about the grades assessed in each country, including the country's name of that grade or grades, as well as the mean age of students in each grade assessed in TIMSS 2019.

Quality Assurance

TIMSS 2019 made every effort to attend to the quality and comparability of the data through careful planning and documentation, cooperation among participating countries, standardized procedures,

and rigorous attention to quality control throughout. The assessments were administered to nationally representative and well-documented probability samples of students in each country. Staff from Statistics Canada and IEA Hamburg worked with National Research Coordinators on all phases of sampling activities to ensure compliance with sampling and participation requirements, with the few exceptions from compliance annotated in the data exhibits. IEA Amsterdam worked with the TIMSS & PIRLS International Study Center to manage an extensive series of verification checks to ensure the comparability of translations of the assessment items and questionnaires, and to conduct an international quality assurance program of school visits to monitor and report on the administration of the assessment. IEA Hamburg staff worked closely with National Research Coordinators during the project to organize data collection operations and to check all data for accuracy and consistency within and across countries.

Finally, full documentation of the many technical activities required to conduct TIMSS 2019 is provided in *Methods and Procedures: TIMSS 2019 Technical Report*. This volume includes detailed information about the processes used to develop and implement the TIMSS 2019 assessments, including sampling, translation verification, data collection, scaling, linking, and data analysis.

About this Report

The *TIMSS 2019 International Mathematics and Science Results* report presents results from TIMSS 2019 in 14 chapters. Report readers can view the TIMSS 2019 results using the navigation buttons across the top of the report website, or access each chapter using the side menu. Exhibits and report text can be downloaded and printed from the Download Center in the side menu and on pages throughout the website.

The report is organized in three parts:

- **Countries' Mathematics & Science Achievement** presents achievement results in four chapters, one for each grade and subject assessed in TIMSS: Mathematics Grade 4, Science Grade 4, Mathematics Grade 8, and Science Grade 8.
- **Home & School Contexts** presents results pertaining to the home and school contexts in which students learn, in four chapters: Home Environment Support; School Composition and Resources; School Climate; and School Discipline and Safety.
- **Classroom Contexts** presents results pertaining to students' classrooms contexts for learning mathematics and science: Teacher Preparation, Professional Development and Job Satisfaction; Challenges to Teaching and Learning; Students' Attitudes; Mathematics Curriculum and Instruction; Science Curriculum and Instruction; and Technology in Instruction.

Appendices A through H provide information about country participation in TIMSS 2019 and earlier TIMSS assessments; population coverage, sample sizes, and participation rates; additional achievement results, including the Test-Curriculum Matching Analysis (TCMA); and information about the organizations and individuals responsible for TIMSS 2019.