

# TIMSS 2019

Canadian Results from the Trends in  
International Mathematics and Science Study

## Highlights

## What is TIMSS?

The Trends in International Mathematics and Science Study (TIMSS) is an international assessment that measures trends in mathematics and science achievement at the Grade 4 and Grade 8 (Secondary II in Quebec) levels. It is conducted under the auspices of the International Association for the Evaluation of Educational Achievement (IEA), an independent cooperative of research institutions and governmental agencies. IEA's membership has now grown to over 60 countries, including Canada.

TIMSS 2019 marks the seventh TIMSS assessment cycle. Over 330,000 students from around the world took part in the Grade 4 assessment, and approximately 250,000 students took part in the Grade 8 assessment. In Canada, over 13,000 Grade 4 students took part in the study in either English or French across five provinces: Newfoundland and Labrador, Quebec, Ontario, Manitoba, and Alberta. Canada-level results were not obtained at the Grade 8 level.

TIMSS 2019 focused on three Grade 4 content domains in mathematics (number, measurement and geometry, and data) and science (life science, physical science, and Earth science), and three cognitive domains (knowing, applying, and reasoning). In addition to the cognitive assessment, information about the home, school, and classroom contexts was collected in TIMSS by means of background questionnaires that were completed by the students being assessed, their parents or caregivers, their school principals, and their teachers.

The 2019 cycle also marked the beginning of the transition from a paper-based to a digital assessment. The assessment was offered in both a new digital format (eTIMSS) and a paper-and-pencil format (paperTIMSS) as in past cycles. More than half of the participating countries, including Canada, administered the digital version of the assessment, while the remainder administered the paper-based version.

## Why did Canada participate in TIMSS?

Mathematics and science are two key learning domains universal to all school children across the world. Developing strong skills in mathematics and science can enhance the lives of individuals, helping them apply problem-solving skills effectively, manage daily tasks, and better understand the environment around them. Mathematics and science knowledge is not only important at the individual level; it is also becoming increasingly important in today's workforce and is fundamental to our collective well-being as a society. The contributions of the science, technology, engineering, and mathematics (STEM) workforce are essential to finding solutions to address global issues, such as poverty and habitat loss, while also sustaining global economic growth and stability, and promoting further technological advancement.<sup>1</sup>

TIMSS assessment results are used for research and policy purposes. In Canada, results are reported only at the pan-Canadian and provincial levels. They are not included in students' academic records, and no results for individual students, schools, or school boards/districts are reported by CMEC.

<sup>1</sup> Mullis, I. V. S., & Martin, M. O. (Eds.). (2017). *TIMSS 2019 Assessment Frameworks*. (Boston College: TIMSS & PIRLS International Study Center), p. 3.

# Canadian Results of the TIMSS 2019 Study

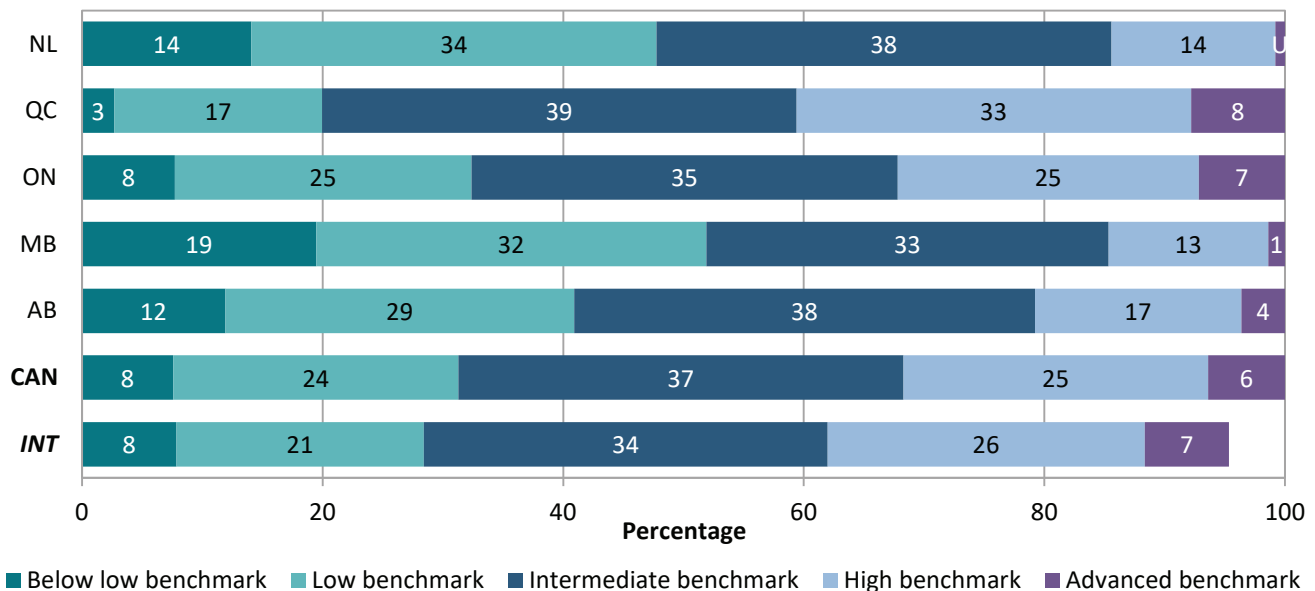
## Highlights

### In mathematics, 92 percent of Canadian students attained the basic proficiency level or higher

The UN Sustainable Development Goal 4 (SDG 4) of the 2030 Agenda aims to “ensure inclusive and equitable quality education and promote lifelong learning opportunities for all” by 2030.<sup>2</sup> TIMSS Grade 4 mathematics has been proposed as an indicator for mathematics at the end of primary school and the TIMSS low international benchmark of 400 points can be considered as the global minimum proficiency level (UNESCO, 2017).<sup>3</sup> In Canada, 92 percent of students reached this proficiency level in mathematics while 6 percent of students reached the highest level of proficiency (advanced international benchmark).

Across provinces, the percentages of students reaching the low international benchmark varied from 81 percent in Manitoba to 97 percent in Quebec. At the highest level of proficiency, Quebec and Ontario had the highest proportions of students achieving at the advanced benchmark (8 percent and 7 percent respectively), compared to 7 percent internationally (Figure 1).

**Figure 1** Percentage of students at each proficiency level in mathematics



Note: Percentages may not add as expected due to rounding. INT represents the international median and cannot add up to 100 percent. Provincial results are reported as means. U – too unreliable to be published.

Canadian Grade 4 students achieved a mean score of 512 in mathematics, which is above the international average of 500 but substantially below the highest performing country, Singapore, which had an average score of 625. Among all participating countries in TIMSS 2019, 26 countries obtained an average score significantly higher than the average score for Canadian students overall.

<sup>2</sup> UNESCO. (2016a). *Education 2030: Incheon Declaration and Framework for Action—Towards inclusive and equitable quality education and lifelong learning for all*. May 21, 2015. Retrieved from <https://unesdoc.unesco.org/ark:/48223/pf0000245656>

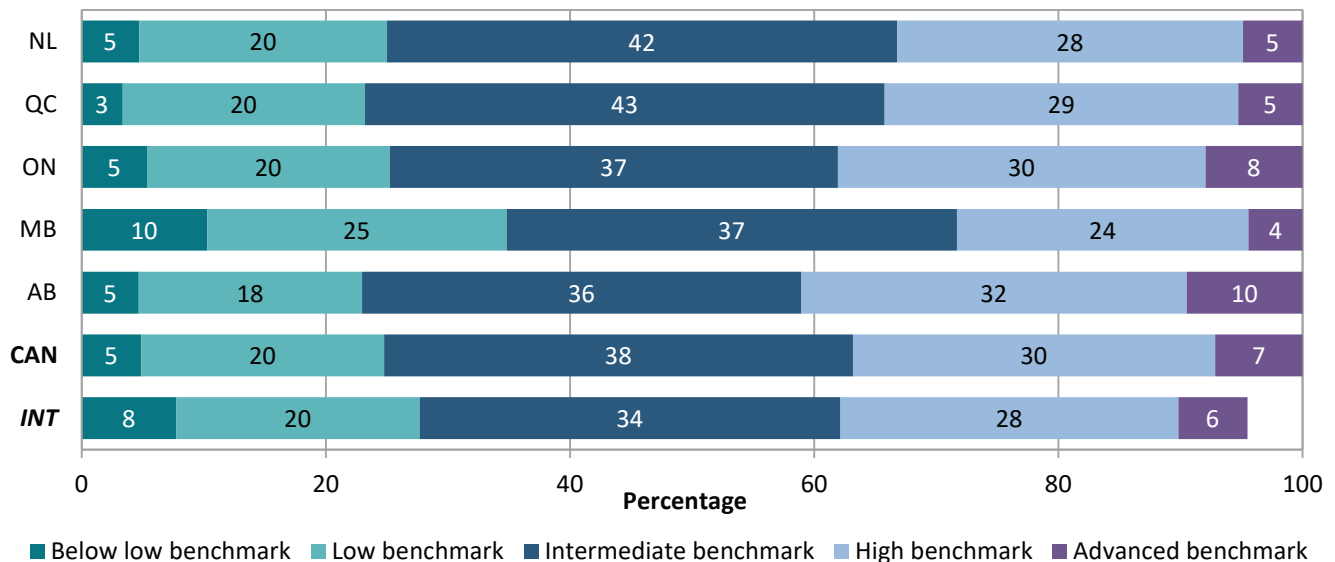
<sup>3</sup> UNESCO. (2017). *SDG 4 Reporting: Proposal of a protocol for reporting indicator 4.1.1*, (August 2017). Retrieved from <http://uis.unesco.org/sites/default/files/documents/gaml4-sdg4-reporting-proposal-protocol-reporting-indicator4.1.1.pdf>

Quebec students performed above the Canadian average, Ontario students performed at the Canadian average, and students in Newfoundland and Labrador, Manitoba, and Alberta scored significantly below students in Canada overall.

## In science, 95 percent of Canadian students attained the basic proficiency level or above

In science, the low international benchmark was reached by 95 percent of students in Canada overall, which is higher than the international median of 92 percent. These percentages vary from 90 percent in Manitoba to 97 percent in Quebec. For all students in Canada, 7 percent reached the advanced international benchmark (Figure 2).

**Figure 2 Percentage of students at each proficiency level in science**



Note: Percentages may not add as expected due to rounding. INT represents the international median and cannot add up to 100 percent. Provincial results are reported as means.

Sixteen countries scored significantly higher than the average score in Canada of 523 points. Students in Newfoundland and Labrador, Quebec, Ontario, and Alberta scored at the Canadian average in science while students in Manitoba scored lower than the Canadian average.

## Across Canada, mathematics and science results showed significant differences by language of the school system

For mathematics, a higher proportion of students in francophone schools achieved the low international benchmark than those in anglophone schools (97 percent vs. 90 percent, respectively) while similar proportions from both language groups achieved at the advanced international benchmark level. For science, 95 percent or more students reached the low benchmark level of achievement in Canada overall in both language systems. At the highest level of achievement, more anglophone students (8 percent) than francophone students (5 percent) reached the advanced benchmark.

Looking at average scores, the achievement gap between anglophone and francophone school systems favoured francophone students in mathematics by 26 points and anglophone students in science by 7 points in Canada overall. At the provincial level, higher average scores in mathematics were achieved by francophone students in Quebec and anglophone students in Ontario, while there was no difference between the language groups in Manitoba and Alberta. In science, anglophone students achieved higher scores than their counterparts in

francophone schools in Ontario and Alberta, while equity was found between the two language systems in Quebec and Manitoba.

## **Boys performed better than girls in mathematics and science**

In Canada overall, in mathematics, more boys than girls reached the low international benchmark, the basic level of achievement (94 percent vs. 91 percent), and attained the advanced international benchmark, the highest level of proficiency (8 percent vs. 4 percent). In science, the same proportion of girls and boys (95 percent) reached the low international benchmark; however, a higher proportion of boys than girls attained the highest level of proficiency (8 percent vs. 6 percent, respectively).

Considering average scores, in Canada and in 27 other countries, boys outperformed girls in mathematics. Of note, Canada had one of the highest gender gaps favouring boys (19 points). On average across countries participating in the TIMSS science assessment at the Grade 4 level, boys outperformed girls by 4 points. However, while in seven countries, including Canada, boys outperformed girls in science, girls outperformed boys in 16 countries.

At the provincial level, boys outperformed girls in mathematics in all provinces. In science, boys achieved higher scores than girls in Quebec and Alberta while there was no gender gap in Newfoundland and Labrador, Ontario, and Manitoba.

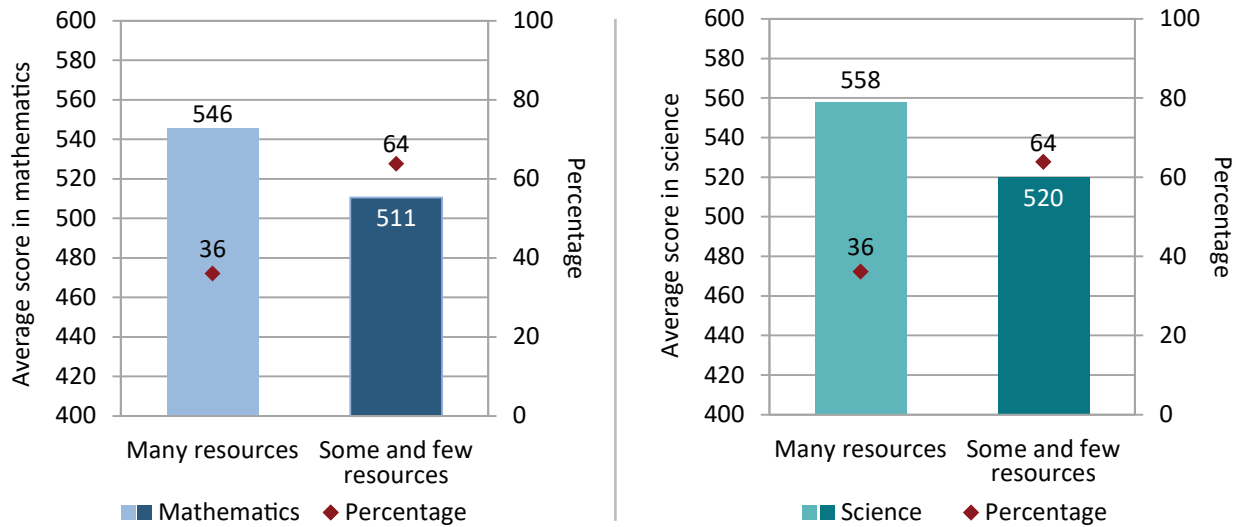
## **Over the past four years Canadian scores in mathematics and science remained stable**

At the Canada level, Grade 4 results have been relatively stable in both mathematics and science by both performance level and average scores. The achievement gap between anglophone and francophone school systems decreased for mathematics between 2015 and 2019, while the gap became wider for science. Boys continue to outperform girls in mathematics and the achievement gap increased between 2015 and 2019. In science, no gender difference was found in 2015, while boys outperformed girls in science in 2019.

## **The home environment provided a solid foundation for student learning**

The TIMSS 2019 Home Resources for Learning index combines data reported by Grade 4 students and their parents and serves as a proxy for students' socioeconomic status. In Canada, 36 percent of students had many resources available at home, while 64 percent of students had some or few resources at home. These proportions were less stark than the international averages of 17 and 83 percent, respectively. Canadian students who reported having many resources for learning at home had higher achievement in both mathematics (35 points) and science (38 points) than those with some or few resources (Figure 3). This relationship between resources at home and achievement was found in all provinces and for both subjects.

**Figure 3 Relationship between home resources for learning and achievement**



Note: Darker shade denotes significant difference compared to the many resources category.

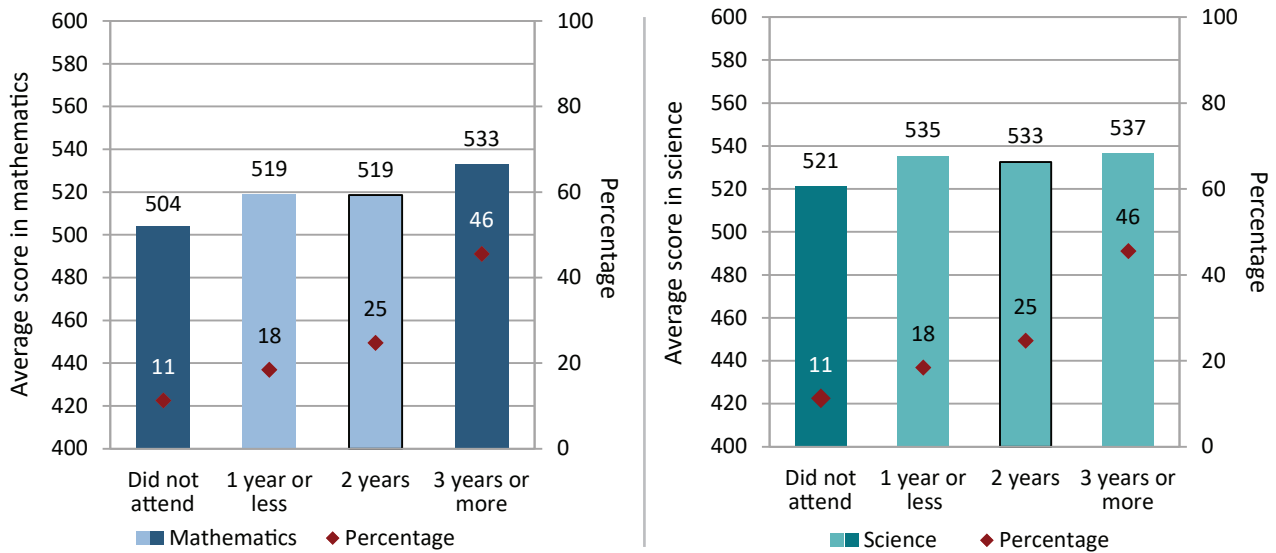
### One in four students did not speak the language of the test at home — no relationship with mathematics achievement

Canada is a multilingual and multicultural country with various immigrant and Indigenous populations. In Canada, approximately one in four students do not speak the language of the test at home. Quebec has the highest rate of students who do not speak the language of the test at home (26 percent), while Newfoundland and Labrador has the lowest rate (8 percent). Students who sometimes or never speak the language of the test at home scored slightly lower in science than those who always or almost always speak it, while there was no difference in mathematics achievement between the two groups.

### Students who attended preschool for three or more years showed the highest achievement in mathematics at Grade 4

In Canada, formal primary/elementary schooling begins in Grade 1, typically when the student is six years old; however, many families enrol their children into kindergarten. In Canada, 46 percent of students reported attending preschool for three or more years. The mathematics scores for Grade 4 students who attended preschool for three or more years were 14 points higher than those for students who attended preschool for two years, and 29 points higher than the scores of students who did not attend preschool at all. A similar trend was found for science (Figure 4).

**Figure 4 Relationship between preschool attendance and achievement**

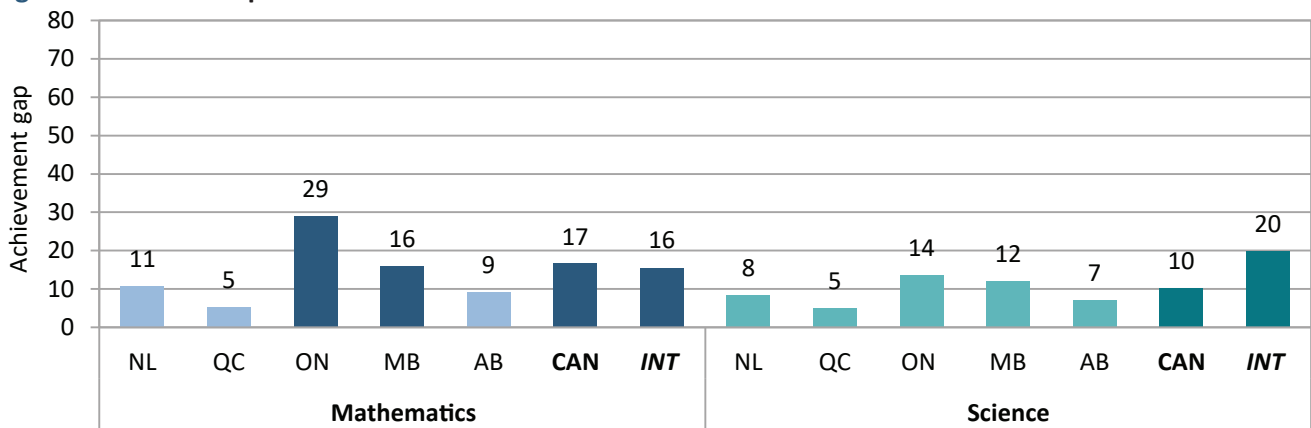


Note: Darker shade denotes significant difference compared to the 2 years category.

### A shortage of resources to teach mathematics and science was reported in Canada overall and for mathematics in some provinces

For Canada overall, more students attended schools where principals reported that science instruction is affected by a shortage of resources than was the case for mathematics instruction (67 percent vs. 57 percent, respectively). These proportions are lower than the international averages for both domains. A significant achievement gap was found in both subjects at the Canada level for students in schools where the principal felt that instruction was somewhat or a lot affected by a shortage of resources compared to those where resources did not affect instruction. At the provincial level, an achievement gap was found only for Ontario and Manitoba for mathematics (Figure 5).

**Figure 5 Relationship between limited school resources and student achievement**



Note: Darker shade denotes significant difference between the not affected and somewhat or a lot affected categories.

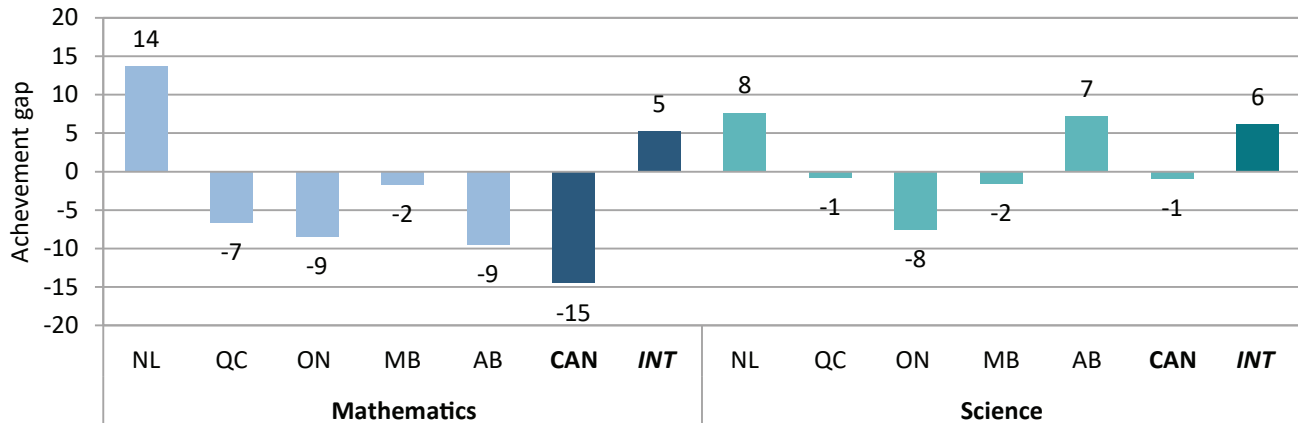
### Students reported high instructional clarity in mathematics and science lessons

The instructional clarity scale was developed from student responses to questions about the clarity (high, moderate, and low) of their mathematics and science lessons. Approximately three-quarters of students in Canada, across provinces, and internationally felt that mathematics and science lessons were taught with a high degree of clarity. A positive relationship was found between the clarity of lessons and achievement in mathematics and science.

## Higher achievement in mathematics and science was not related to greater access to computers for lessons

According to teachers, about half of Grade 4 students had access to computers for mathematics lessons, while nearly two-thirds had access to digital devices during science classes. Access to computers for lessons had no relationship with achievement at the provincial level for mathematics and science, while a negative relationship was found for mathematics at the Canada level (Figure 6).

**Figure 6 Relationship between access to computers for lessons and student achievement**



Note: Darker shade denotes significant difference between students with access to computers for subject lessons compared to students without access.

## Looking Forward

The results of TIMSS 2019 reveal that more than 9 in 10 students in Canada reached the level of minimum proficiency expected in both mathematics and science at the Grade 4 level. Canadian students continue to perform above the international average, although results indicate that Canada is substantially below the highest performing countries. In addition, the achievement gap between girls and boys was significant in both mathematics and science. Canada had one of the highest gender gaps favouring boys in mathematics and was one of only seven countries where boys scored significantly higher than girls in science. Further, the performance of Canadian students has remained relatively unchanged in mathematics and science since the last cycle of TIMSS in 2015.

While Grade 4 students in Canada continue to perform well, some students still do not reach the minimum proficiency level. As stated in the UN Sustainable Development Goal for education, by 2030 all girls and boys should complete free, equitable, and quality primary and secondary education leading to relevant and effective learning outcomes. The indicator for this goal is described as the proportion of children in target age groups attaining at least a minimum proficiency level in reading and mathematics by sex.<sup>4</sup> TIMSS Grade 4 mathematics can provide data to support Canada's commitment to meet this target at the primary/elementary level.

Further international results are available in *TIMSS 2019 International Results in Mathematics and Science*, available at: <http://timssandpirls.bc.edu/timss2019/international-results/>

Further Canadian results are available in the report *TIMSS 2019 Canadian Results from the Trends in International Mathematics and Science Study*. This report will be available electronically in spring 2021 at [www.cmec.ca](http://www.cmec.ca).

<sup>4</sup> UNESCO, *Education 2030: Incheon Declaration and Framework for Action for the implementation of Sustainable Development Goal 4*, (May 21, 2016), p. 21.