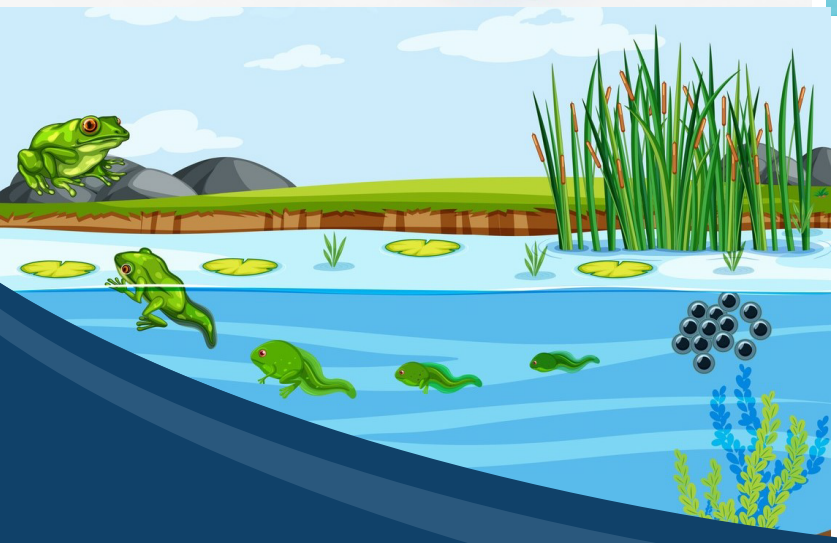
TIMSS 2019

Canadian Results from the Trends in International Mathematics and Science Study



cmec

TIMSS 2019

Canadian Results from the Trends in International Mathematics and Science Study

Authors

Kathryn O'Grady, Council of Ministers of Education, Canada
Ashley Rostamian, Council of Ministers of Education, Canada
Jeremy Monk, Council of Ministers of Education, Canada
Yitian Tao, Council of Ministers of Education, Canada
Tanya Scerbina, Council of Ministers of Education, Canada
Vanja Elez, Council of Ministers of Education, Canada

The Council of Ministers of Education, Canada (CMEC) was formed in 1967 by the jurisdictional ministers responsible for education to provide a forum in which they could discuss matters of common interest, undertake educational initiatives cooperatively, and represent the interests of the provinces and territories with national educational organizations, the federal government, foreign governments, and international organizations. CMEC is the national voice for education in Canada and, through CMEC, the provinces and territories work collectively on common objectives in a broad range of activities at the elementary, secondary, and postsecondary levels.

Through the CMEC Secretariat, the Council serves as the organization in which ministries and departments of education undertake cooperatively the activities, projects, and initiatives of particular interest to all jurisdictions. One of the activities on which they cooperate is the development and implementation of pan-Canadian testing based on contemporary research and best practices in the assessment of student achievement in core subjects.

Note of appreciation

The Council of Ministers of Education, Canada, thanks the students, teachers, and administrators whose participation in the Trends in International Mathematics and Science Study ensured its success. The quality of your commitment has made this study possible. We are truly grateful for your contribution to a pan-Canadian understanding of educational policy and practices in mathematics and science.

Council of Ministers of Education, Canada
95 St. Clair West, Suite 1106
Toronto, Ontario M4V 1N6

Telephone: (416) 962-8100
Fax: (416) 962-2800
E-mail: cmec@cmec.ca

ISBN 978-0-88987-522-7

Ce rapport est également disponible en français.

Table of Contents

List of Figures

List of Tables

INTRODUCTION

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 equivalent of the Grade 4 and Grade 8/ Secondary II[1] levels. Participating countries can choose to administer the assessment at either one or both grade 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 was founded in 1959, with a secretariat based in Amsterdam (the Netherlands), to conduct large-scale comparative studies in order to gain a deeper understanding of the effects of educational policies and practices around the world. IEA's membership has now grown to over 60 countries, including Canada.

TIMSS is one of the regular studies of cross-national achievement conducted by IEA. The assessment is coordinated by the IEA's TIMSS & PIRLS[2] International Study Center, located at Boston College, in Massachusetts. The IEA Secretariat, the IEA Data Processing and Research Center, Statistics Canada, and the Educational Testing Services (ETS) are all members of the TIMSS 2019 International Consortium. The international coordination for TIMSS is supported by the cooperative expertise provided by the National Research Coordinators of the participating countries. The Canadian participation in TIMSS 2019 is coordinated by the Council of Ministers of Education, Canada (CMEC), on behalf of participating provinces. In 2019, Canada, as a country, participated in TIMSS at the Grade 4 level only.

In order to improve students' knowledge and skills in mathematics and science, it is crucial to have a strong understanding of the contexts in which students learn. In addition to obtaining data on student achievement in the two subject areas, TIMSS also collects a range of contextual information on a large number of factors influencing students' learning, such as home, school, and classroom supports; learning environments; and student attitudes. These data are collected through the administration of background questionnaires to students, teachers, school principals, parents/guardians (Grade 4 only), and curriculum experts. The information obtained is valued by policy-makers, administrators, schools, teachers, and researchers.

TIMSS has been carried out every four years since 1995. Canada participated in TIMSS in 1995 (nine provinces and two territories) and 1999 (nine provinces, Grade 8 only). In 2003, only Ontario and Quebec participated, as benchmarking participants[3]. In 2007, they were joined by Alberta (at the Grade 4 level only) and British Columbia. In 2011, Alberta, Ontario, and Quebec participated as benchmarking participants at both the Grade 4 and Grade 8/Secondary II levels. In 2015, Canada was represented by Alberta, Manitoba, Ontario, Quebec, and Newfoundland and Labrador at the Grade 4 level, and by the same provinces, except for Alberta, at the Grade 8 level. Ontario and Quebec participated as benchmarking participants at both grade levels. 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. This included students from several provinces of Canada. With the results of the 2019 assessment, the countries and provinces that participated in the first assessment cycle in 1995 will now be able to monitor students' performance over time by comparing their

[1] The TIMSS Grade 8 assessment was administered to students in Secondary II in Quebec and in Grade 8 in Ontario.
[2] Progress in International Reading Literacy Study
[3] See page 6 for more information on benchmarking.

results over the past 24 years. In TIMSS 2019, five Canadian provinces participated: Alberta, Manitoba, and Newfoundland and Labrador in Grade 4 (as oversampling participants), and Ontario and Quebec in Grade 4 and Grade 8/Secondary II (as benchmarking participants).

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.

TIMSS assessment results are used for research and policy purposes. In Canada, results are reported only at the pan-Canadian and provincial levels.[4] They are not included in students' academic records, and no results for individual students, schools, or school boards/districts are reported by CMEC.

Participation levels in Canada

IEA has established practices for participation in TIMSS since 1995. In total, 64 countries participated in TIMSS 2019 (58 countries at the Grade 4 level and 39 at the Grade 8 level). Aside from the participating countries, some jurisdictions, states, and geographical or cultural regions of a country may opt to participate in IEA assessments as benchmarking participants. In TIMSS 2019, eight entities participated at the benchmarking level (six entities at the Grade 4 level and seven at the Grade 8 level), including two Canadian provinces.

In Canada, five provinces (Alberta, Manitoba, Ontario, Quebec, and Newfoundland and Labrador) participated in TIMSS Grade 4, and two provinces (Ontario and Quebec) participated in TIMSS Grade 8. At the time of the 2019 assessment, the student mean age in Canada was 9.9 years for the Grade 4 assessment. Overall, there were two levels of participation in Canada:

- **Benchmarking level**: Benchmarking participants are treated as separate countries for data and reporting purposes. They are considered entities with their own education systems and participate with representative samples of students. They follow the same procedures and adhere to the same standards as all other participating countries. Their results are reported separately in the TIMSS International Report in a separate section under the figures and tables. Provinces participating at this level have the opportunity to evaluate their programs within an international context, and their students' performance can be compared with that of students in other participating countries or benchmarking participants. Ontario and Quebec participated at the benchmarking level in both Grades 4 and 8.
- **Oversampling level:** At this level, a greater number of respondents in a subgroup are selected than the relative size of the population would normally require. This allows provinces to compare themselves to each other as well to international participants. The results for provinces participating as this level are not included in the TIMSS 2019 international report but are presented in the following pages in this report.

Although two Canadian provinces participated in TIMSS at both the Grade 4 and Grade 8 levels in 2019, only the sample size at the Grade 4 level was large enough to obtain overall results for Canada. Therefore, this report will focus on reporting results at the Grade 4 level only.

[4] No data were collected in the three territories or in 5 provinces (Prince Edward Island, Nova Scotia, New Brunswick, Saskatchewan, and British Columbia). Information on sampling procedures and response rates for Canada can be found in Appendix A.

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 (Mullis & Martin, 2017).

CMEC's *Learn Canada 2020* declaration[5] emphasizes the importance of measuring the success of pan-Canadian numeracy initiatives in elementary to high school systems. *Learn Canada 2020* is a framework developed by Canada's provincial and territorial ministers of education with the goal of enhancing Canada's education systems, learning opportunities, and overall education outcomes. The declaration states that, "All children in our elementary to high school systems deserve teaching and learning opportunities that are inclusive and that provide them with world-class skills in literacy, numeracy, and science." Moreover, the framework acknowledges the direct link between "a well-educated population and (1) a vibrant knowledge-based economy in the 21st century, (2) a socially progressive, sustainable society, and (3) enhanced personal growth opportunities for all Canadians." TIMSS represents a very valuable data source on education quality as it publishes internationally comparable indicators on early mathematics and science skills for Canada's primary/elementary and middle school students at regular intervals.

Canadian jurisdictions invest significant amounts of money and other resources in primary/elementary and secondary education systems. Therefore, it is essential to evaluate student learning outcomes, identify areas in which students perform well and areas where they encounter challenges, and understand the factors that have an impact on student achievement. TIMSS provides education policy-makers, administrators, schools, teachers, and researchers with powerful insights into how education systems are functioning, as well as critical intelligence about the possibilities for education improvement. It provides a tool for Canadian educators and policy-makers to assess and monitor students' achievement, within a pan-Canadian as well as an international context, and to help them make informed decisions about how to improve learning outcomes.

TIMSS is the only international study that assesses students' achievement in mathematics and science at both the primary/elementary and middle school levels. TIMSS is administered every four years; therefore, it allows participating countries and provinces to monitor their performance over time. Because Ontario and Quebec have been participating since the first TIMSS cycle in 1995, they are now able to track changes and compare their achievement in mathematics and science over the past 24 years. The other participating provinces will be able to use the data obtained from the 2015 and 2019 assessments for comparisons in achievement results over time.

[5] The document *Learn Canada 2020: Joint declaration, provincial and territorial ministers of education, 2008*, is available at www.cmec.ca/Publications/Lists/Publications/Attachments/187/CMEC-2020-DECLARATION.en.pdf

Sampling features of TIMSS 2019

Target population

TIMSS is designed to assess students' achievement in mathematics and science in their fourth and eighth years of formal schooling. The number of years of formal schooling must be the same across all participating countries and is the basis for comparison. The exact definition of the TIMSS 2019 target grade for the assessment at the Grade 4 level appears in the TIMSS 2019 Assessment Frameworks (Mullis & Martin, 2017) as follows:

> At the fourth grade, the TIMSS target grade should be the grade that represents four years of schooling, counting from the first year of ISCED Level 1. (p. 82)

ISCED[6] is the International Standard Classification of Education, which was developed by the UNESCO Institute for Statistics. It describes the different levels of schooling across countries, starting from Level 0 (early childhood education) to Level 8 (doctoral or equivalent level). Level 1 of ISCED refers to primary education, which is the first stage of basic education. Based on the definitions above, in Canada and in most other countries, the target grade of four years of schooling would be Grade 4.

However, school-entry age varies across different countries. Therefore, in order to avoid testing very young students, age is also taken into consideration when selecting the target grade. If the sampled students' average age at the time of testing would be less than 9.5 years for TIMSS Grade 4, the TIMSS policy recommends that countries sample the next higher grade (i.e., Grade 5).

In Canada, the compulsory starting age of schooling is typically age six, although there is some variation across provinces and territories.[7] Therefore, a student's average age after four years of schooling in each province is at least 9.5 years. As a result, in Canada, Grade 4 was sampled for TIMSS 2019.

General sampling approach

It is highly important that the international sampling requirements and the target for comprehensive participation of eligible students are met in order to provide reliable and comparable results on students' achievement. The goal is to select a representative sample of students from the entire target population. In TIMSS, this included all students enrolled in the target grade, which represented all students in Grade 4 in participating provinces. Provinces provided a list of all schools in which eligible students were enrolled. TIMSS used a two-stage sampling approach. The first stage consisted of randomly selecting a stratified[8] sample of schools; the second stage consisted of randomly selecting intact classes within the selected schools. Replacement schools were identified for each originally sampled school in case the original school was unable to participate in the assessment. It should be noted that schools that are not under the authority of the provincial ministry/department of education (e.g., on-reserve schools) were not included in the target population for TIMSS.

At the pan-Canadian level, two types of exclusions were allowed based on the following criteria:

- **School-level exclusions**
  - inaccessibility due to a geographically remote location

[6] ISCED, the International Standard Classification of Education developed by the UNESCO Institute for Statistics, provides an international standard for describing levels of schooling across the world (UNESCO, 2012).

[7] Refer to the TIMSS 2019 Encyclopedia (Kelly, Centurino, Martin, & Mullis, 2020, available at https://timssandpirls.bc.edu/timss2019/encyclopedia/index.html.) to obtain more information on education systems in all participating countries, including Canada.

[8] For stratification variables in each participating country, refer to Appendices 3A and 3B in Martin, von Davier, & Mullis, 2020.

- extremely small size (e.g., four or fewer students in the target grade)
- schools offering a grade structure, or curriculum, radically different from the mainstream educational system
- schools providing instruction solely to students in the student-level exclusion categories listed below (i.e., catering only to students with special education needs)

- **Student-level exclusions**[9]
  - students with functional disabilities
  - students with intellectual disabilities
  - non-native language speakers

The national samples represent the national target population. Therefore, the sample must be accurate, and exclusions must be kept to a minimum. In order to achieve this, IEA established the following two rules:

- the overall number of excluded students at the school and student levels must not exceed five percent of the national target population in a country.
- the overall number of students excluded because they attend very small schools must not exceed two percent of the national target population in a country.

Detailed information regarding the school and student exclusion and participation rates in Canada can be found in Tables A.1 to A.4 in Appendix A.

General design of the assessment

Assessment framework

The TIMSS 2019 assessment is based on comprehensive frameworks developed collaboratively with participating countries (Mullis & Martin, 2017). The frameworks have two dimensions:

1. a *content* dimension specifying the domains or subject matter to be assessed within mathematics and science; and
2. a *cognitive* dimension specifying the thinking processes expected of students as they engage with the mathematics and science content.

Overall, the 2019 frameworks are similar to the 2015 frameworks; however, some changes were introduced. The 2019 frameworks were updated to ensure they are relevant to the current mathematics and science curricula, frameworks, and standards of all the participating countries. In light of the transition to a digital assessment, the frameworks were also updated to ensure they are suitable for both paper and digital assessment modes (Mullis & Martin, 2017).

While the focus of this report is on the TIMSS assessment at the Grade 4 level, the following section presents information on the content and cognitive domains for both Grade 4 and Grade 8. Information on both grades is included in order to demonstrate the continuity and consistency that exists between the assessments at the Grade 4 and Grade 8 levels. The content domains of the assessment are different for Grade 4 and Grade 8 in order to represent the different subject matter taught at each grade. However, the cognitive domains are the same for both grades, encompassing a range of cognitive processes required to solve problems throughout primary/elementary and middle school years.

[9] For more detailed information, please see Appendix A.

Table 1 presents the content domains, related topics, and target percentages of testing time dedicated to each content domain in mathematics for Grade 4 and Grade 8.

TABLE 1 Elements of the TIMSS 2019 mathematics framework — content domains

	Content domains	Topic areas	%
Grade 4	Number	• Whole numbers • Expressions, simple equations, and relationships • Fractions and decimals	50
	Measurement and geometry	• Measurement • Geometry	30
	Data	• Reading, interpreting, and representing data • Using data to solve problems	20
Grade 8	Number	• Integers • Fractions and decimals • Ratio, proportion, and percent	30
	Algebra	• Expressions, operations, and equations • Relationships and functions	30
	Geometry	• Geometric shapes and measurements	20
	Data and probability	• Data • Probability	20

Table 2 presents the cognitive domains, cognitive skills, and target percentages of testing time dedicated to each cognitive domain in mathematics for both Grades 4 and 8.

TABLE 2 Elements of the TIMSS 2019 mathematics framework — cognitive domains

Cognitive domains	Thinking processes	% (Grade 4)	% (Grade 8)
Knowing	• Recall • Recognize • Classify/order • Compute • Retrieve • Measure	40	35
Applying	• Determine • Represent/model • Implement	40	40
Reasoning	• Analyze • Integrate/synthesize • Evaluate • Draw conclusions • Generalize • Justify	20	25

The content domains, topic areas, and target percentages of testing time dedicated to each content domain in science for Grade 4 and Grade 8 are presented in Table 3.

TABLE 3 **Elements of the TIMSS 2019 science framework — content domains**

	Content domains	Topic areas	%
Grade 4	Life science	• Characteristics and life processes of organisms • Life cycles, reproduction, and heredity • Organisms, environment, and their interactions • Ecosystems • Human health	45
	Physical science	• Classification and properties of matter and changes in matter • Forms of energy and energy transfer • Forces and motion	35
	Earth science	• Earth's physical characteristics, resources, and history • Earth's weather and climates • Earth in the solar system	20
Grade 8	Biology	• Characteristics and life processes of organisms • Cells and their functions • Life cycles, reproduction, and heredity • Diversity, adaptation, and natural selection • Ecosystems • Human health	35
	Chemistry	• Composition of matter • Properties of matter • Chemical change	20
	Physics	• Physical states and changes in matter • Energy transformation and transfer • Light and sound • Electricity and magnetism • Motion and forces	25
	Earth science	• Earth's structure and physical features • Earth's processes, cycles, and history • Earth's resources, their use and conservation • Earth in the solar system and the universe	20

The cognitive domains, thinking processes, and the target percentages dedicated to each cognitive domain in science (Grade 4 and Grade 8) are listed in Table 4.

TABLE 4 Elements of the TIMSS 2019 science framework — cognitive domains

Cognitive domains	Thinking processes	% (Grade 4)	% (Grade 8)
Knowing	• Recall/recognize • Describe • Provide examples	40	35
Applying	• Compare/contrast/classify • Relate • Use models • Interpret information • Explain	40	35
Reasoning	• Analyze • Synthesize • Formulate questions/hypothesize/ predict • Design investigations • Evaluate • Draw conclusions • Generalize • Justify	20	30

Transition to eTIMSS

For the first time, this cycle of TIMSS was administered digitally in approximately half of the participating countries, including Canada. In order to support the two different assessment modes, all the items were developed in both paper and digital formats for the 2019 cycle, with the exception of problem solving and inquiry (PSI) items, further discussed below.

To control for mode effects and allow data linking across modes, a bridge study was also administered in a number of countries, including Canada. As part of the bridge study, countries that opted to administer the digital version of the assessment in 2019 and that had administered the paper-based version in 2015 were required to also administer a trend paper-based version of the assessment, which contained only 2019 trend items, to a smaller additional sample of students. Trend items are common assessment items that are used across cycles in order to monitor changes in student achievement over time in mathematics and science. In Canada, the paper-based version of the trend items was administered to approximately 1,600 students at the Grade 4 level.

For the eTIMSS assessment, an additional series of problem solving and inquiry tasks was developed. The PSI items were administered only to students in countries that participated in eTIMSS; these items did not appear in the paper-based version of the assessment. The PSI items were developed with the goal of increasing framework coverage by measuring higher-order skills and areas of the framework that traditionally have been more difficult to measure, using the new digital assessment mode. The PSI items are innovative, visually stimulating, and interactive items which simulate laboratory and real-world settings through the use of scenarios, such as planning a school event, building an object, or conducting an experiment on plant growth. These items require students to engage with mathematics problems and scientific experiments by applying and using both process skills and content knowledge (Martin & Mullis, 2020). While the PSI items were included

in the eTIMSS assessment, the results for these items will not be included in this report or in the TIMSS international report. These results will be reported at a later time.

Student assessment design

The TIMSS 2019 mathematics and science assessment includes a large pool of items in order to maximize coverage of the framework.[10] In 2019, approximately 350 items (175 items per domain) were administered to students at the Grade 4 level, with questionnaires used to gather contextual information. As it would be impossible to administer every item to each student and in order to minimize the individual assessment burden, a designated sample of items was presented to each student. In this approach, which is known as matrix sampling, the assessment items are divided and distributed into student achievement booklets or block combinations.

There are a total of 14 unique student achievement booklets for paperTIMSS and 16 unique block combinations[11] for eTIMSS. The main difference between the paperTIMSS and eTIMSS assessment designs is that the latter includes two additional booklets that contain PSI items.

While each of these booklets varies in content, all include items in mathematics and in science presented in a pre-established order. Students complete one booklet each and the order of the distribution of the booklets within each school is pre-determined by the sampling software to ensure equal distribution.

To facilitate distribution, the assessment items are grouped into a series of item blocks. The item blocks contain 10 to 14 items each. As mentioned in the previous section, TIMSS also monitors changes in student achievement by measuring trends over time in mathematics and science by administering some items to students that are common across assessment cycles. Therefore, a number of the item blocks in mathematics and science include trend items that also appeared in the 2015 TIMSS assessment. The remaining item blocks contain items that were newly developed for the 2019 assessment. The new items were extensively field tested in the year before the main study. Table 5 includes information on the number and type (trend or new) of item blocks per domain and by assessment mode.

TABLE 5 Item blocks, paperTIMSS and eTIMSS

Type of item blocks	Number of item blocks	
	paperTIMSS	eTIMSS
Mathematics (trend)	8	8
Mathematics (new)	6	6
Mathematics PSI (new)	-	2
Science (trend)	8	8
Science (new)	6	6
Science PSI (new)	-	2
Total	**28**	**32**

To enable linking among the booklets, each item block appears in 2 of the 14 booklets in paperTIMSS or 16 booklets in eTIMSS. The location of a block and the combination of blocks differ by student booklet.

[10] See the TIMSS 2019 Assessment Frameworks (Mullis & Martin, 2017).
[11] Referred to hereinafter as booklets.

Each student booklet includes a total of four different item blocks, two blocks of items for mathematics and two blocks of items for science. In half of the booklets, the first two blocks are mathematics items, followed by the science items. The other half begins with two blocks of items in science followed by the items in mathematics.

The assessment takes 72 minutes to complete at the Grade 4 level (18 minutes per item block). It is administered in two parts, with a short break in between. Following the assessment, students also complete the Student Questionnaire, which takes about an additional 30 minutes and collects information on students' characteristics and attitudes towards learning.

Question types and coding procedures

The following two formats were used for items in the TIMSS 2019 assessment:

- ***Selected-response:*** This format included two types of items: single-selection items and multiple-selection items. For single-selection items, students were presented with four possible response options and asked to select one. For multiple-selection items, students were presented with a number of response options and asked to select more than one. Selected-response items are written clearly and concisely to minimize the reading load, requiring a relatively short time to answer. Most selected-response items were worth 1 point, with some multiple-selection items worth 2 points.
- ***Constructed-response:*** This format was used mostly to assess students' knowledge and skills, and required students to construct a written response. For instance, students were required to refer to their background knowledge or experience to be able to explain phenomena or interpret data. Each constructed-response item was worth 1 or 2 points depending on how complex the item was. Students' responses were not coded based on their ability to write. However, it was important that responses be clear and understandable for coders. Trained teachers coded all constructed-response questions.

Background questionnaires

TIMSS 2019 administered a series of questionnaires to gain a better understanding of the contextual factors that are related to students' learning and to identify procedures and practices that could improve their achievement in mathematics and science. The following questionnaires were administered:

- ***Student Questionnaire:*** This questionnaire was administered to each participating student following the achievement test. It asked about aspects of students' home and school lives, including demographic information, their home environment, the school climate for learning, and self-perception and attitudes towards mathematics and science. Students who participated in the digital version of the assessment were also asked a few questions about their familiarity with digital devices and their experience completing the digital version of the assessment. This questionnaire required approximately 30 minutes for students to complete and it was administered in paper format in all countries, regardless of the country assessment mode.
- ***Early Learning Survey (Home Questionnaire):*** Parents/guardians of each participating student in Grade 4 were asked to complete the Home Questionnaire. It asked about home resources and early childhood activities related to literacy and numeracy. It also identified the student's reading and numeracy readiness when beginning school, parents'/guardians' attitudes towards reading and mathematics, and parental/guardian education and occupation. In Canada, parents/guardians were asked to complete the questionnaire online, which took between 15 to 30 minutes.

- ***Teacher Questionnaire:*** This questionnaire was administered to teachers of mathematics and science in the selected classes. It asked about teachers' backgrounds; their views on the school environment, opportunities for collaboration with other teachers, and school leadership; their job satisfaction; and their education and training and their professional development. It also asked about characteristics of the participating classes; instructional time; classroom resources; activities for teaching mathematics and science, and promoting students' interest in mathematics and science; use and availability of digital devices; curriculum coverage and topic areas; assessment practices; and homework. In Canada, the Teacher Questionnaire was administered online and took approximately 35 minutes to complete.
- ***School Questionnaire:*** This questionnaire was completed by the principal of each participating school or his or her designate. It asked about school enrolment and characteristics, instructional time, teaching and staff resources and technology, parental/guardian involvement, school climate for learning and emphasis on academic success, discipline, safety, principal education and experience, and students' school readiness. In Canada, the School Questionnaire was administered online and took approximately 30 minutes to complete.
- ***Curriculum Questionnaire:*** This questionnaire was completed by the TIMSS 2019 National Research Coordinator of each participating country. It asked about the structure of the education system in the country, the curriculum in mathematics and science and the content related to these subjects. Questions on grade structure, promotion and retention policies, teacher and principal requirements, jurisdictional or national examination systems, as well as goals and standards for mathematics and science instruction, including policies on digital device use, were also part of this questionnaire. In Canada, ministries/departments of education from most provinces/territories completed this questionnaire. The responses were then collected and aggregated at the Canadian level. Commonalities and differences among provincial education systems were taken into consideration. Each country prepared a chapter that included the information obtained from this questionnaire; these can be found in the TIMSS 2019 Encyclopedia (https://timssandpirls.bc.edu/timss2019/encyclopedia/index.html).

Participating countries were allowed to make minor adaptations to these questionnaires to take their national context into account (e.g., the provincial/territorial jurisdiction for education in Canada). The international version of these questionnaires is available at http://timssandpirls.bc.edu/timss2015/questionnaires/index.html.

Objectives and organization of the report

This report presents the results of Canadian students in the TIMSS assessment in Grade 4. It provides information on the students' performance in mathematics and science and on factors related to their performance. The results are reported at the Canadian level as well as at the international level, and comparisons are drawn across participating countries and Canadian provinces.

Chapter 1 provides information on the overall performance of Grade 4 students in mathematics and science. The chapter provides results both overall and by content and cognitive domain subscales. Student achievement is first reported using a four-point "international benchmarks" scale, which shows the percentages of students reaching each of the four international levels of achievement (advanced, high, intermediate, and low). Student achievement is then reported as overall average scores at the provincial, pan-Canadian, and international levels. Results by language of the school system and by gender are included in this chapter. In addition, the chapter presents the changes in student performance in mathematics and science over time.

Chapter 2 presents data from the Student Questionnaire and the Early Learning Survey (Home Questionnaire). It presents an analysis of the relationship between student performance in mathematics and science and school and home factors. Overall, the data are organized across four main topic areas: parental/guardian involvement, student characteristics, preschool, and student confidence and sense of belonging.

Chapter 3 presents data from the Student Questionnaire, the Teacher Questionnaire, and the School Questionnaire. It reports statistics for variables of interest including school contexts, teacher and teaching characteristics, and classroom activities and, where pertinent, provides an analysis of the relationship between different variables and student performance in mathematics and science.

The conclusion summarizes the major findings of the Canadian results of the TIMSS 2019 assessment. Finally, the appendices provide additional details on exclusion and response rates, as well as a number of data tables.

CHAPTER 1
Canadian Students' Performance in Mathematics and Science

This chapter presents results of the TIMSS 2019 assessment at the Grade 4 level. Student performance is presented in this report in two ways: as the percentage of students attaining proficiency levels, and as overall average scores. Results are presented for Canada overall and by province, both for mathematics and science overall, and by content and cognitive domain subscales. The performance of students enrolled in anglophone and francophone school systems is also presented for those provinces in which the two groups were sampled separately. This chapter also compares Canadian students' performance in mathematics and science by gender. Given that TIMSS 2019 marks the second time that Canada participated with a large enough sample size to obtain overall results for Canada, changes in mathematics and science performance over time are discussed.

UN Sustainable Development Goal for education

As stated in the UN Sustainable Development Goal (SDG) for education, by 2030, all learners should acquire the knowledge and skills needed to promote sustainable development, including through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship, and appreciation of cultural diversity and of culture's contribution to sustainable development (UNESCO, 2016a).

Education is a central theme throughout *Agenda 2030*, the UN document that outlines more specific direction for the SDGs. It includes a more specific stand-alone education goal, as shown in Table 1.1. UNESCO reiterates that "increased educational attainment helps transform lives by reducing poverty, improving health outcomes, advancing technology and increasing social cohesion" (UNESCO, 2016b, p. 10). The SDGs, targets, and means of implementation are considered to be universal, indivisible, and interlinked (UNESCO, 2016b).

The monitoring of the sustainable development goals will provide challenges and the Global Education Monitoring (GEM) report "has a mandate to help the international community understand whether and how the world is making progress in education (UNESCO, 2016b). TIMSS Grade 4 mathematics has been proposed as an indicator for mathematics at the end of primary school with the TIMSS low international benchmark of 400 TIMSS points as the global minimum proficiency level (UNESCO-UIS, 2020).

TABLE 1.1 ***Education 2030*** **sustainable development goal 4**

Sustainable development goal (SDG) 4	By 2030, ensure inclusive and equitable quality education, and promote lifelong learning opportunities for all.
SDG target 4.1	By 2030, ensure that all girls and boys complete free, equitable, and quality primary and secondary education leading to relevant and effective learning outcomes.
SDG indicator 4.1.1	Proportion of children and young people: (a) in grades 2/3; (b) at the end of primary; and (c) at the end of lower secondary achieving at least a minimum proficiency level in (i) reading and (ii) mathematics, by sex.

Source: UNESCO, 2016

Results in mathematics

Results in mathematics by proficiency level

In TIMSS 2019, as in previous cycles, four international benchmarks are used to show the range of students' performance: advanced (625 points), high (550 points), intermediate (475 points), and low (400 points). It should be noted that those students not reaching a score of 400 are not deemed to possess "no mathematical ability"; however, questions from this TIMSS assessment cannot measure their performance accurately. Table 1.2 describes the criteria for the four international benchmarks for TIMSS 2019 mathematics. The low benchmark represents a basic level of achievement, while the advanced benchmark represents successful completion of the most complex and challenging tasks in the TIMSS assessment.

TABLE 1.2 TIMSS 2019 mathematics international benchmarks — summary description

Advanced International Benchmark (625 points)
At the advanced benchmark, students can apply their understanding and knowledge in a variety of relatively complex situations and explain their reasoning. They can: • solve a variety of multistep word problems involving whole numbers and show an understanding of fractions and decimals • apply knowledge of two- and three-dimension shapes in a variety of situations • interpret and represent data to solve multistep problems
High International Benchmark (550 points)
At the high benchmark, students can apply conceptual understanding to solve problems. They can: • apply conceptual understanding of whole numbers to solve two-step word problems • show understanding of the number line, multiples, factors, and rounding numbers, and operations with fractions and decimals • solve simple measurement problems • demonstrate understanding of geometric properties of shapes and angles • interpret and use data in tables and a variety of graphs to solve problems
Intermediate International Benchmark (475 points)
At the intermediate benchmark, students can apply basic mathematical knowledge in simple situations. Students can: • compute with three- and four-digit whole numbers in a variety of situations • demonstrate some understanding of decimals and fractions • identify and draw shapes with simple properties • read, label, and interpret information in graphs and tables
Low International Benchmark (400 points)
At the low benchmark, students have some basic mathematical knowledge. They can: • add, subtract, multiply, and divide one- and two-digit whole numbers • solve simple word problems • apply some knowledge of simple fractions and common geometric shapes • read and complete simple bar graphs and tables

Adapted from Mullis et al., 2020, Exhibit 1.7. Available at https://timss2019.org/reports/achievement/#math-4.

Figure 1.1 presents results showing percentages of students reaching each international benchmark in Canada overall and in each of the five provinces participating in TIMSS 2019 at the benchmarking or oversampling level. In Canada, 6 percent of the students reached the highest level, the advanced international benchmark, which is slightly lower than the international median (7 percent) and substantially below that of the highest achieving country (Singapore, at 54 percent). Most countries had fewer than 10 percent of their Grade 4 students achieving at the advanced level (Mullis, Martin, Foy, Kelly, & Fishbein, 2020). Within Canada, the

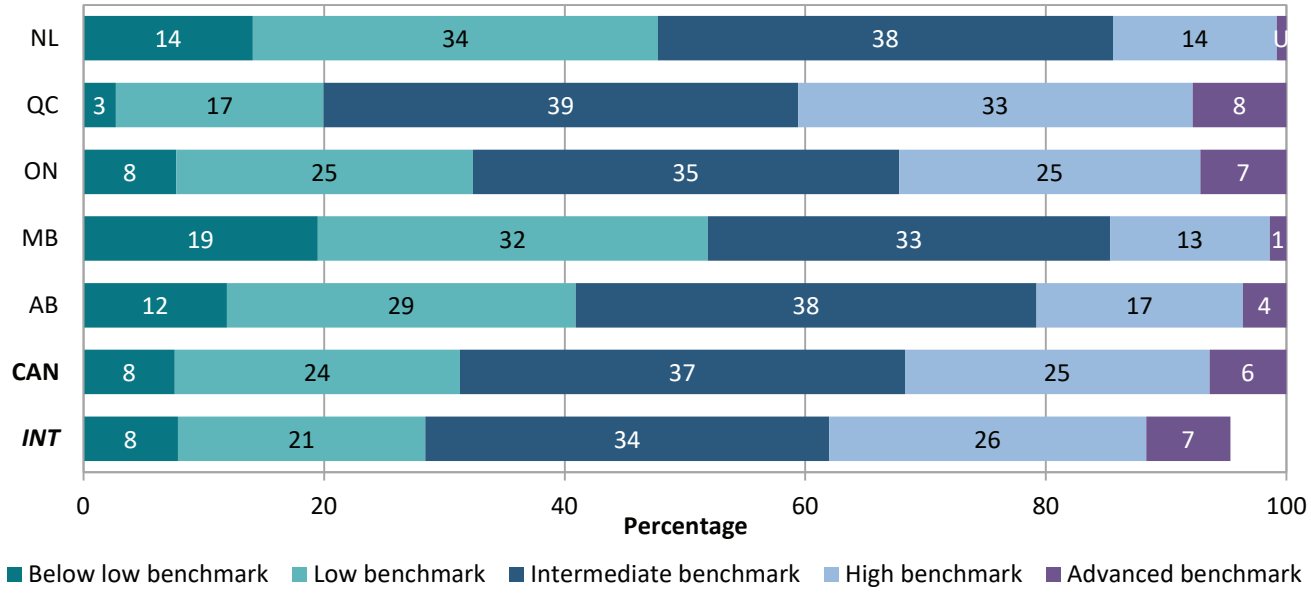
percentage of students reaching this benchmark ranged from one percent in Manitoba to 8 percent in Quebec (Appendix B.1.1a and B.1.1b).

Thirty-two percent of Canadian students reached the high international benchmark, a proportion that is similar to the international median of 34 percent. The percentages vary from 14 percent in Newfoundland and Labrador to 41 percent in Quebec.

In Canada, 69 percent of the Grade 4 students reached the intermediate international benchmark, which was slightly lower than the international median of 71 percent. Among all participating countries, six have at least 90 percent of students at the intermediate level or higher: Singapore, Hong Kong SAR, Korea, Chinese Taipei, Japan, and the Russian Federation. Across Canadian provinces, approximately half of students reached this level in Manitoba and Newfoundland and Labrador while four in five students reached this level in Quebec.

The low international benchmark, which can be considered a level of minimum proficiency internationally, was reached by 92 percent of Canadian students. This is the same as the international median. In six countries — Singapore, Hong Kong SAR, Korea, Chinese Taipei, Japan, and the Russian Federation — 99 to 100 percent of students reached this level. In the Canadian provinces, the percentages vary from 81 percent in Manitoba to 97 percent in Quebec (Figure 1.1; Appendix B.1.1a).

FIGURE 1.1 Percentage of students at each proficiency level in mathematics



Note: U – data too unreliable to be published.

Results in mathematics by average score

Among all participating countries in TIMSS 2019, 26 obtained an average score significantly higher than that for Canadian students overall. In addition, nine countries performed as well as Canada. Quebec performed above the Canadian average, while Ontario performed at the Canadian average. The average score for Alberta, Manitoba, and Newfoundland and Labrador is significantly below students in Canada overall (Table 1.3, Figure 1.2; Appendix B.1.2).

Overall, Canadian Grade 4 students achieved a mean score of 512 in mathematics, above the international centrepoint of 500. Figure 1.2 provides the average scores in mathematics for Grade 4 students for Canada overall and each province participating in TIMSS 2019.

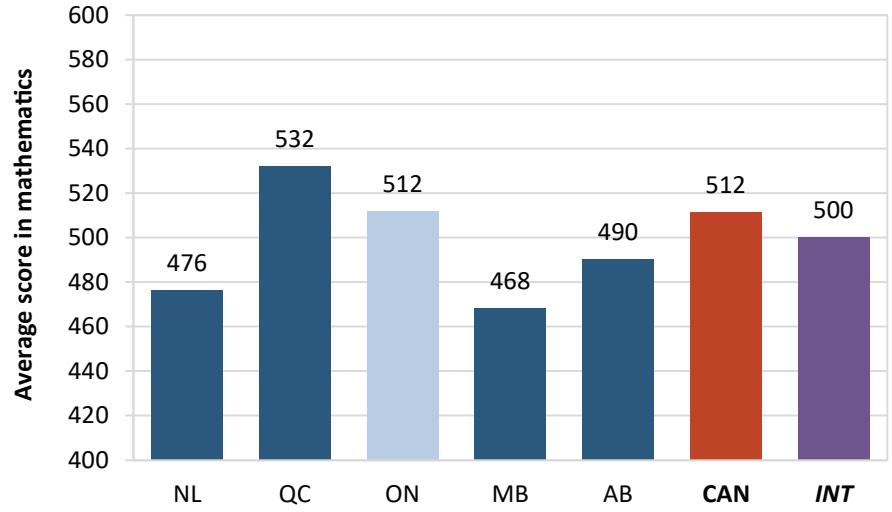
TABLE 1.3 Comparison of country and provincial results to the Canadian average in mathematics

Country or province	Average score	Standard error	Countries or provinces whose mean score is not significantly different from the comparison country or province
Singapore	625	(3.9)	
Hong Kong SAR	602	(3.3)	Republic of Korea, Chinese Taipei
Republic of Korea	600	(2.2)	Hong Kong SAR, Chinese Taipei
Chinese Taipei	599	(1.9)	Hong Kong SAR, Republic of Korea
Japan	593	(1.8)	
Russian Federation	567	(3.3)	Northern Ireland
Northern Ireland	566	(2.7)	Russian Federation
England	556	(3.0)	Ireland
Ireland	548	(2.5)	England, Latvia, Norway (5), Lithuania
Latvia	546	(2.6)	Ireland, Norway (5), Lithuania
Norway (5)	543	(2.2)	Ireland, Latvia, Lithuania, Austria, Netherlands
Lithuania	542	(2.8)	Ireland, Latvia, Norway (5), Austria, Netherlands
Austria	539	(2.0)	Norway (5), Lithuania, Netherlands, United States, Czech Republic
Netherlands	538	(2.2)	Norway (5), Lithuania, Austria, United States, Czech Republic, Belgium (Flemish), Quebec, Cyprus, Finland
United States	535	(2.5)	Austria, Netherlands, Czech Republic, Belgium (Flemish), Quebec, Cyprus, Finland
Czech Republic	533	(2.5)	Austria, Netherlands, United States, Belgium (Flemish), Quebec, Cyprus, Finland
Belgium (Flemish)	532	(1.9)	Netherlands, United States, Czech Republic, Quebec, Cyprus, Finland
Quebec	**532**	**(2.3)**	Netherlands, United States, Czech Republic, Belgium (Flemish), Cyprus, Finland, Turkey (5)
Cyprus	532	(2.9)	Netherlands, United States, Czech Republic, Belgium (Flemish), Quebec, Finland, Portugal, Turkey (5)
Finland	532	(2.3)	Netherlands, United States, Czech Republic, Belgium (Flemish), Quebec, Cyprus, Turkey (5)
Portugal	525	(2.6)	Cyprus, Denmark, Hungary, Turkey (5), Sweden, Germany, Poland
Denmark	525	(1.9)	Portugal, Hungary, Turkey (5), Sweden, Germany, Poland
Hungary	523	(2.6)	Portugal, Denmark, Turkey (5), Sweden, Germany, Poland, Bulgaria
Turkey (5)	523	(4.4)	Quebec, Cyprus, Finland, Portugal, Denmark, Hungary, Sweden, Germany, Poland, Australia, Azerbaijan, Bulgaria, Italy
Sweden	521	(2.8)	Portugal, Denmark, Hungary, Turkey (5), Germany, Poland, Australia, Azerbaijan, Bulgaria, Italy
Germany	521	(2.3)	Portugal, Denmark, Hungary, Turkey (5), Sweden, Poland, Australia, Azerbaijan, Bulgaria, Italy
Poland	520	(2.7)	Portugal, Denmark, Hungary, Turkey (5), Sweden, Germany, Australia, Azerbaijan, Bulgaria, Italy
Australia	516	(2.8)	Turkey (5), Sweden, Germany, Poland, Azerbaijan, Bulgaria, Italy, Kazakhstan, Ontario, Canada, Slovak Republic, Croatia, Serbia
Azerbaijan	515	(2.7)	Turkey (5), Sweden, Germany, Poland, Australia, Bulgaria, Italy, Kazakhstan, Ontario, Canada, Slovak Republic, Croatia, Serbia
Bulgaria	515	(4.3)	Hungary, Turkey (5), Sweden, Germany, Poland, Australia, Azerbaijan, Italy, Kazakhstan, Ontario, Canada, Slovak Republic, Croatia, Malta, Serbia
Italy	515	(2.4)	Turkey (5), Sweden, Germany, Poland, Australia, Azerbaijan, Bulgaria, Kazakhstan, Ontario, Canada, Slovak Republic, Croatia, Serbia
Kazakhstan	512	(2.5)	Australia, Azerbaijan, Bulgaria, Italy, Ontario, Canada, Slovak Republic, Croatia, Malta, Serbia

Country or province	Average score	Standard error	Countries or provinces whose mean score is not significantly different from the comparison country or province
Ontario	**512**	**(3.3)**	Australia, Azerbaijan, Bulgaria, Italy, Kazakhstan, Canada, Slovak Republic, Croatia, Malta, Serbia
CANADA	**512**	**(1.9)**	Australia, Azerbaijan, Bulgaria, Italy, Kazakhstan, Ontario, Slovak Republic, Croatia, Malta, Serbia
Slovak Republic	510	(3.5)	Australia, Azerbaijan, Bulgaria, Italy, Kazakhstan, Ontario, Canada, Croatia, Malta, Serbia, Spain
Croatia	509	(2.2)	Australia, Azerbaijan, Bulgaria, Italy, Kazakhstan, Ontario, Canada, Slovak Republic, Malta, Serbia
Malta	509	(1.4)	Bulgaria, Kazakhstan, Ontario, Canada, Slovak Republic, Croatia, Serbia
Serbia	508	(3.2)	Australia, Azerbaijan, Bulgaria, Italy, Kazakhstan, Ontario, Canada, Slovak Republic, Croatia, Malta, Spain
Spain	502	(2.1)	Slovak Republic, Serbia, Armenia
International Centrepoint	**500**	--	
Armenia	498	(2.5)	Spain, Albania, Alberta
Albania	494	(3.4)	Armenia, Alberta, New Zealand
Alberta	**490**	**(4.1)**	Armenia, Albania, New Zealand, France, Georgia
New Zealand	487	(2.6)	Albania, Alberta, France, Georgia, United Arab Emirates
France	485	(3.0)	Alberta, New Zealand, Georgia, United Arab Emirates, Bahrain, Newfoundland and Labrador
Georgia	482	(3.7)	Alberta, New Zealand, France, United Arab Emirates, Bahrain, Newfoundland and Labrador, North Macedonia
United Arab Emirates	481	(1.7)	New Zealand, France, Georgia, Bahrain, Newfoundland and Labrador, North Macedonia
Bahrain	480	(2.6)	France, Georgia, United Arab Emirates, Newfoundland and Labrador, North Macedonia
Newfoundland and Labrador	**476**	**(4.0)**	France, Georgia, United Arab Emirates, Bahrain, North Macedonia, Manitoba
North Macedonia	472	(5.3)	Georgia, United Arab Emirates, Bahrain, Newfoundland and Labrador, Manitoba
Manitoba	**468**	**(3.6)**	Newfoundland and Labrador, North Macedonia
Montenegro	453	(2.0)	Bosnia and Herzegovina, Qatar
Bosnia and Herzegovina	452	(2.4)	Montenegro, Qatar, Kosovo, Islamic Republic of Iran
Qatar	449	(3.4)	Montenegro, Bosnia and Herzegovina, Kosovo, Islamic Republic of Iran, Chile
Kosovo	444	(3.0)	Bosnia and Herzegovina, Qatar, Islamic Republic of Iran, Chile
Islamic Republic of Iran	443	(3.9)	Bosnia and Herzegovina, Qatar, Kosovo, Chile
Chile	441	(2.7)	Qatar, Kosovo, Islamic Republic of Iran
Oman	431	(3.7)	
Saudi Arabia	398	(3.6)	
Morocco	383	(4.3)	Kuwait, South Africa (5)
Kuwait	383	(4.7)	Morocco, South Africa (5)
South Africa (5)	374	(3.6)	Morocco, Kuwait
Pakistan	328	(12.0)	
Philippines	297	(6.4)	

Note: The participating grade is identified in parentheses after the country name if it is not Grade 4.

FIGURE 1.2 Achievement scores in mathematics



Note: Darker shade denotes significant difference compared to Canada

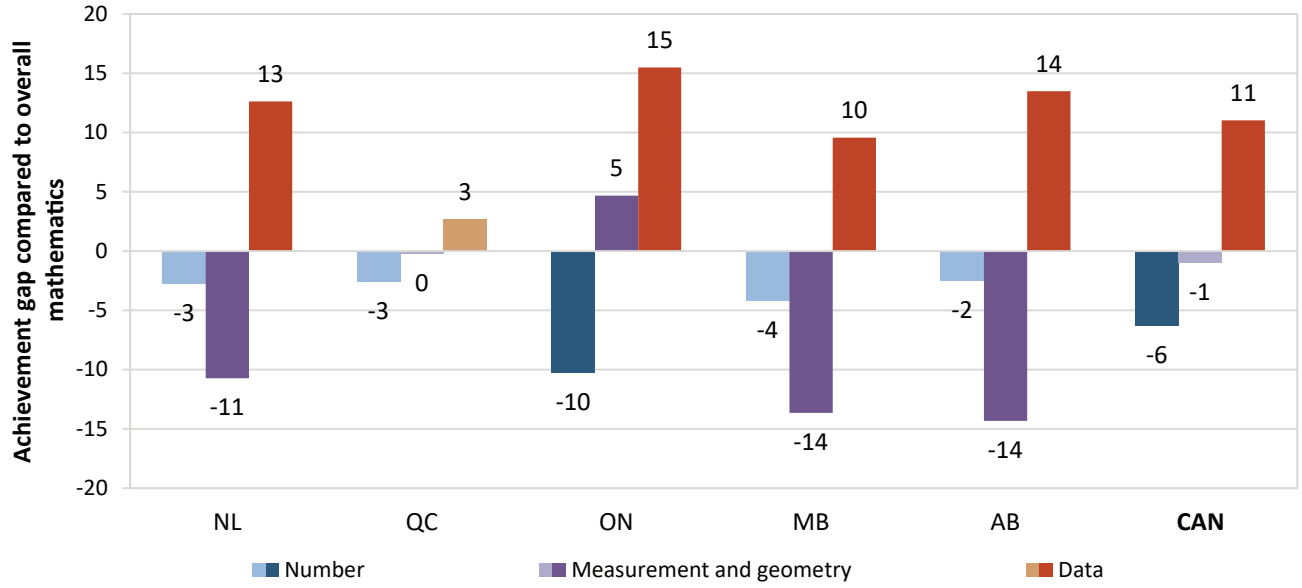
Results in mathematics by content and cognitive domains

TIMSS is organized around a content dimension that was concerned with subject matter and a cognitive domain that assessed thinking process. The relative proportion of each content and cognitive domain in the overall mathematics assessment, as well as the topics included in each domain, can be found in the introduction (Tables 1 and 2).

At the Grade 4 level, there are three content domains in mathematics (*number, measurement and geometry,* and *data*). Figure 1.3 shows the difference between each content domain and the overall mathematics score for each participating province and for Canada. Canadian students showed the strongest results in *data*, scoring 11 points higher in this domain than Canada's overall mathematics score. Weaker results were shown in *number* in which students scored six points below the average score for mathematics in Canada. There was no significant difference in the results for *measurement and geometry* and overall mathematics at the Canada level.

At the provincial level, in *number*, Ontario students showed the greatest negative difference, scoring 10 points lower than Ontario's overall mathematics results while there was no significant difference found for the other provinces. For *measurement and geometry*, Ontario students scored above the overall average for mathematics while Newfoundland and Labrador, Manitoba, and Alberta students scored below the overall average in this domain. For the *data* cognitive domain, all provinces had higher scores compared to their overall mathematics score, except in Quebec where no significant difference was found (Figure 1.3; Appendix B.1.3).

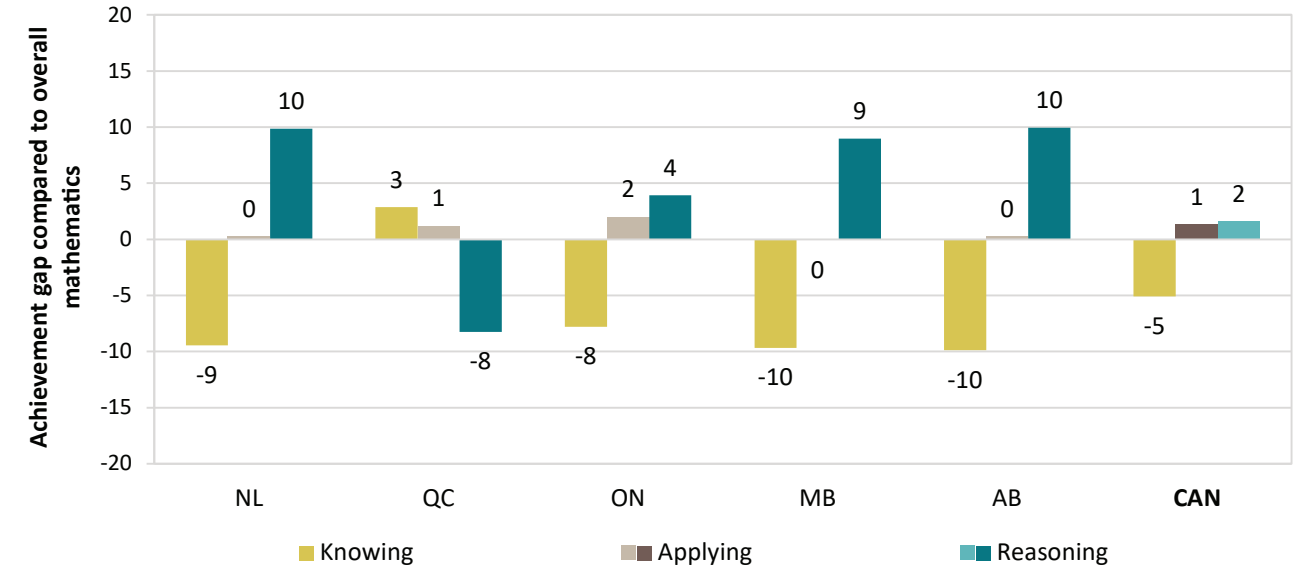
FIGURE 1.3 Comparison of achievement differences in content domains and the overall mathematics score



Note: Darker shade denotes significant difference

There are three cognitive domains in mathematics: *knowing*, *applying*, and *reasoning*. Figure 1.4 shows the difference between each cognitive domain and the overall mathematics score for each participating province and for Canada. Canadian students were stronger in *applying*, one point higher than the overall Canadian mathematics score, while the results were five points lower than the overall Canadian mathematics score for *knowing*. There was no significant difference in *reasoning*. Students in all provinces, except Quebec, had lower scores in *knowing* compared to their provincial overall mathematics scores. No provincial differences were found in *applying*. For the *reasoning* cognitive domain, students in Newfoundland and Labrador, Ontario, Manitoba, and Alberta had significantly higher scores while students in Quebec had significantly lower scores compared to the overall provincial mathematics results (Appendix B.1.4).

FIGURE 1.4 Comparison of achievement differences in cognitive domains and the overall mathematics score



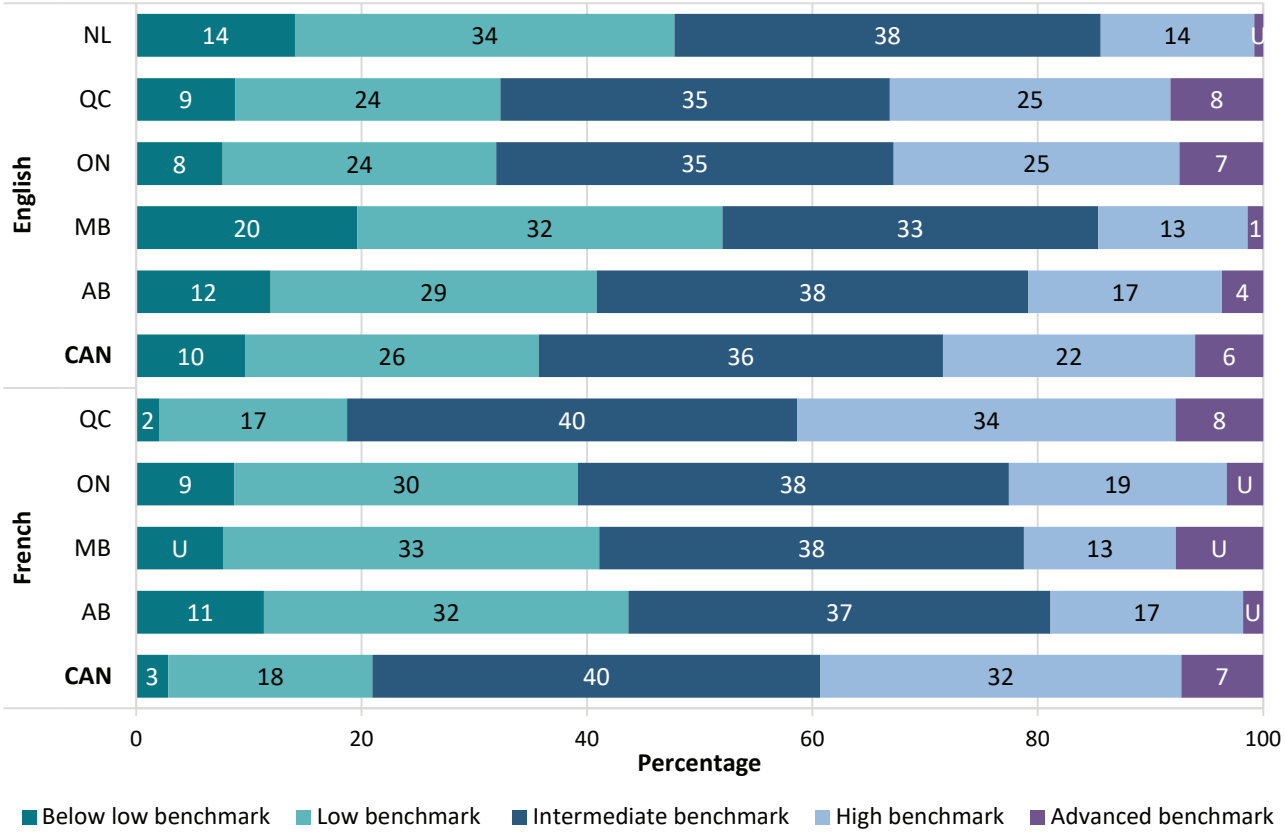
Note: Darker shade denotes significant difference

Results in mathematics by language of the school system

TIMSS samples are representative of both majority and minority official language groups in the four provinces that have sufficient numbers for valid statistical comparisons. Only Newfoundland and Labrador did not oversample by language separately in order to examine the difference between the performance of students in the English- and French-language systems.

Figure 1.5 shows proficiency levels in mathematics by the language of the school system in which students were enrolled. In Canada overall, a higher proportion of students in francophone schools achieved the low international benchmark than those in anglophone schools (97 percent vs. 90 percent, respectively). However similar proportions from both language groups achieved at the advanced international benchmark level (Appendix B.1.5a). At the provincial level, more than 90 percent of students achieved at least the low benchmark level in both anglophone and francophone schools in Quebec and Ontario while 80 percent or more of students achieved this level in other provinces. Close to 10 percent of students achieved the highest proficiency level (advanced) in English-language schools in Quebec and Ontario and French-language schools in Quebec (Appendix B.1.5b).

FIGURE 1.5 Percentage of students at each proficiency level in mathematics by language of the school system



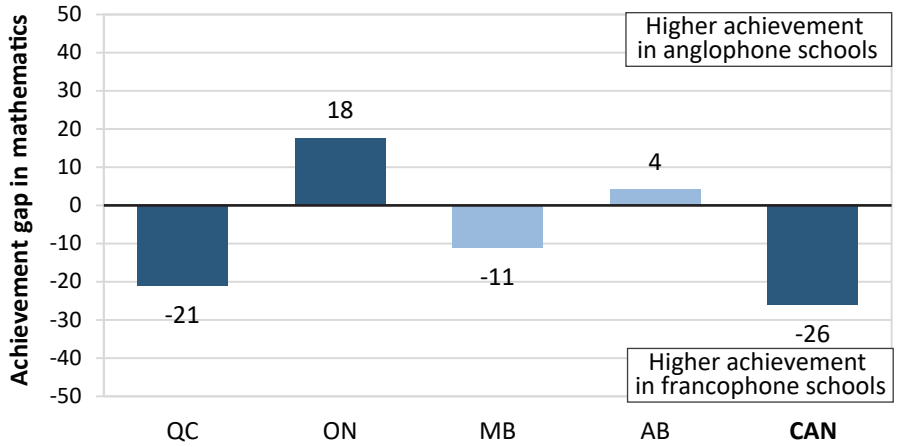
Note: U – data too unreliable to be published.

Figure 1.6 compares the achievement between anglophone and francophone schools; the bars represent the difference in the average scores of students in the francophone systems and the average scores of those in anglophone systems. The achievement gap favours francophone schools in Canada overall for mathematics. This is consistent with the trend found in TIMSS 2015 (Brochu et al., 2017) as well as in the PISA 2018 study with 15-years-olds (O'Grady, Deussing, Scerbina, Tao, Fung, Elez, & Monk, 2019) and the PCAP 2016 study with Grade 8/Secondary II students (O'Grady, Fung, Servage, & Ghan, 2018). At the provincial level,

the achievement gap favoured anglophone schools in Ontario and francophone schools in Quebec. There was no significant difference in mathematics scores found in in Alberta and Manitoba between the two language systems (Appendix B.1.6).

As shown in Table 1.4, francophone schools outperformed anglophone schools at the Canada level while equity was found between the two language systems in Manitoba and Alberta for all content and cognitive domains. The results for Quebec and Ontario were more variable (Appendix B.1.7, B.1.8).

FIGURE 1.6 Achievement gap in mathematics by language of the school system



Note: Numbers are achievement scores in anglophone systems minus those in francophone systems. Darker shade denotes significant difference within Canada or within a province.

TABLE 1.4 Summary of differences in achievement scores in mathematics subscales, by language of the school system

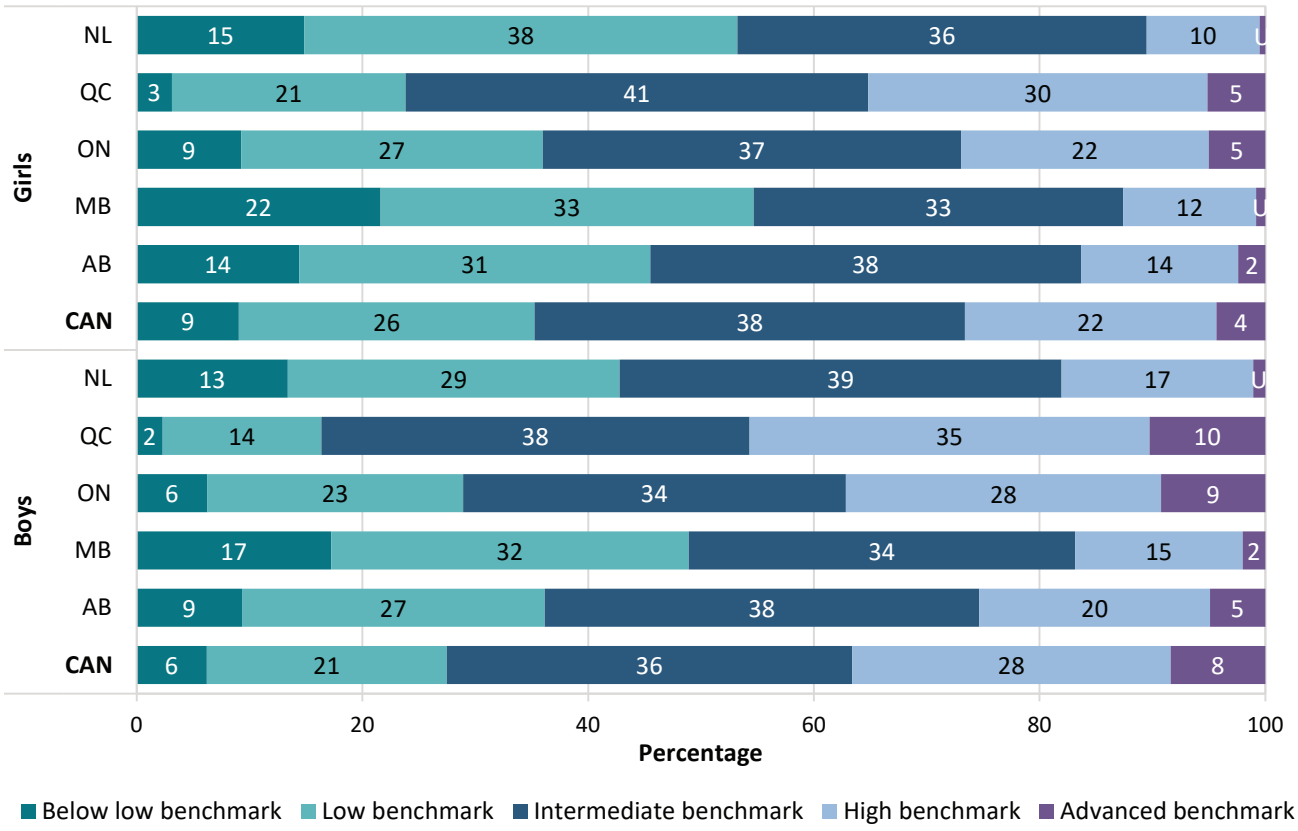
	Anglophone schools performed significantly better than francophone schools	Francophone schools performed significantly better than anglophone schools	No significant difference between school systems
Content domains			
Number		Canada, Quebec	Ontario, Manitoba, Alberta
Measurement and geometry		Canada, Quebec	Ontario, Manitoba, Alberta
Data	Ontario	Canada	Ontario, Manitoba, Alberta
Cognitive domains			
Knowing	Ontario	Canada, Quebec	Manitoba, Alberta
Applying	Ontario	Canada, Quebec	Manitoba, Alberta
Reasoning	Ontario	Canada	Quebec, Manitoba, Alberta

Results in mathematics by gender

The proportion of girls and boys participating in TIMSS in Canada was similar (49 percent vs. 51 percent, respectively) and this pattern was consistent in provinces (Appendix B.1.9).

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 more boys than girls attained the advanced international benchmark, the highest level of proficiency (8 percent vs. 4 percent). This trend is consistent across provinces as shown in Figure 1.7 (Appendix B.1.10).

FIGURE 1.7 Percentage of students at each proficiency level in mathematics by gender

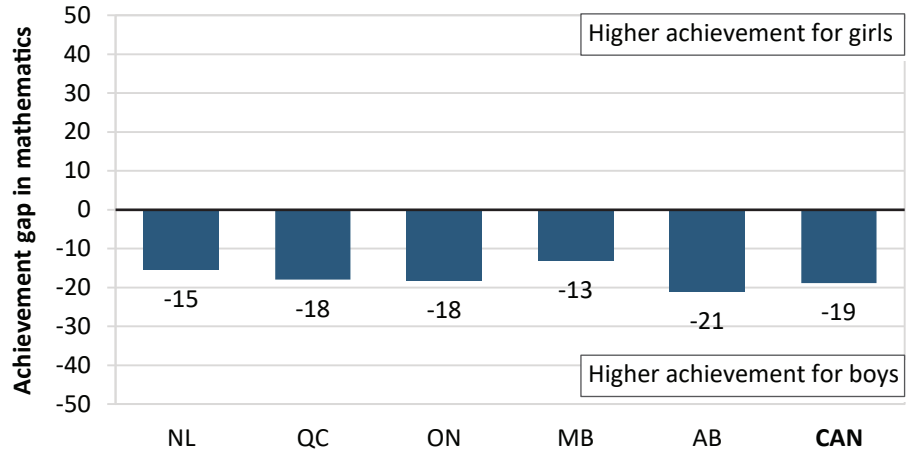


Note: U – data too unreliable to be published.

On average across countries participating in the TIMSS mathematics assessment at the Grade 4 level, boys outperformed girls by four points. Indeed, girls outperformed boys in only four countries: Philippines, Saudi Arabia, South Africa, and Oman. In Canada as a whole, and in 26 other countries, boys outperformed girls; however, Canada had the highest gender gap favouring boys (19 points) (Mullis et al., 2020, Exhibit 1.5). This trend is consistent at the provincial level as well (Figure 1.8; Appendix B.1.11). At the Canada level, this trend has been seen in TIMSS 2015 (Brochu et al., 2017), as well for 15-year-olds in PISA 2018 (O'Grady et al., 2019); however, no gender gap was shown at the Grade 8/Secondary II level in PCAP 2016 (O'Grady et al., 2018).

As shown in Table 1.5, Canadian boys outperformed girls in all the mathematics content and cognitive domains (Appendix B.1.12, B.1.13). Although this pattern is consistent with the international averages, the results were more variable across countries (Mullis et al., 2020, Exhibit 1.19).

FIGURE 1.8 **Achievement gap in mathematics by gender**



Note: Numbers are achievement scores of girls minus those of boys. Differences within Canada and all provinces are significant.

TABLE 1.5 **Summary of differences in achievement scores in mathematics subscales, by gender**

	Girls performed significantly better than boys	Boys performed significantly better than girls	No significant difference between girls and boys
Content domains			
Number		Canada, Newfoundland and Labrador, Quebec, Ontario, Manitoba, Alberta	
Measurement and geometry		Canada, Newfoundland and Labrador, Quebec, Ontario, Manitoba, Alberta	
Data		Canada, Newfoundland and Labrador, Quebec, Ontario, Manitoba, Alberta	
Cognitive domains			
Knowing		Canada, Newfoundland and Labrador, Quebec, Ontario, Manitoba, Alberta	
Applying		Canada, Newfoundland and Labrador, Quebec, Ontario, Manitoba, Alberta	
Reasoning		Canada, Newfoundland and Labrador, Quebec, Ontario, Manitoba, Alberta	

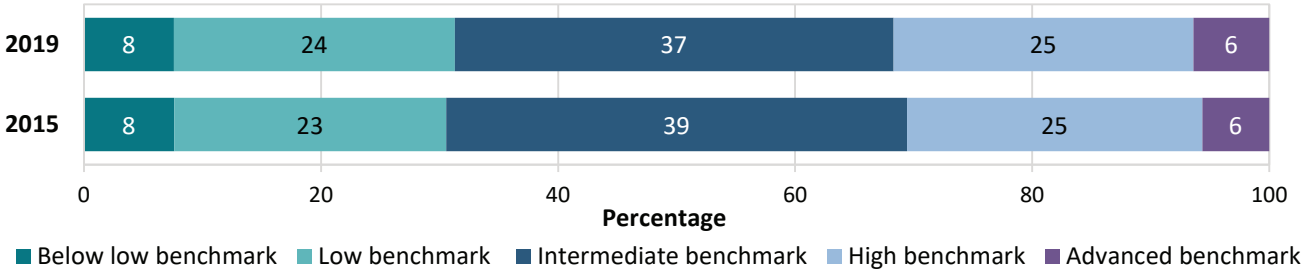
Changes in mathematics performance over time

Even though Canada participated in previous cycles of TIMSS in 1995 and 1999, no comparisons over time that include data for those years are made here for the country overall because of the large gap in data between 1999 and 2015. Alberta participated in TIMSS in 1995 (as part of the Canadian sample) and in 2007, 2011, and 2015. Ontario and Quebec participated in every TIMSS cycle over the same period, with the exception of 1999, when TIMSS was not administered at the Grade 4 level.

At the Canada level, Grade 4 mathematics results have been relatively stable. Similar proportions of students reached each of the international benchmarks (Figure 1.9; Mullis et al., 2020, Exhibit 1.9;

Appendix B.1.14a)[12]. As shown in Table 1.6, there has been no change in the overall average scores in mathematics between 2015 and 2019 (Appendix B.1.14b). In addition, there has been no change in the mathematics scores of students in anglophone and francophone schools (Appendix B.1.14c). The achievement of girls and boys has also remained unchanged between the two TIMSS administrations (Appendix B.1.14d).

FIGURE 1.9 Results in mathematics over time by proficiency level, 2015–2019



Note: Percentages may not add up to 100 due to rounding.

TABLE 1.6 Results in mathematics over time by average score, 2015–2019

	2015	2019	Change over time
Overall mathematics	**511**	**512**	**No change**
Anglophone schools	503	504	No change
Francophone schools	533	530	No change
Achievement gap (anglophone–francophone)	-31*	-26*	
Girls	506	502	No change
Boys	515	521	No change
Achievement gap (girls–boys)	-9*	-19*	

* Denotes significant difference.
Note: Numbers may differ from those expected due to rounding.

When the results over time are examined by the mathematics subscales, no significant change was found in Canada for the two content subscales, *number* and *data* or the two cognitive domains of *knowing* and *applying*; however, there was a significant decrease (six points) in results for the *measurement and geometry* content domain and the *reasoning* cognitive domain (eight points) between 2015 and 2019 (Table 1.7; Mullis et al., 2020; Exhibits 1.15 and 1.18).

TABLE 1.7 Results in mathematics subscales over time by average score, 2015–2019

	2015	2019	Change over time
Content domains			
Number	503	505	No change
Measurement and geometry	517	511	Decrease
Data	528	523	No change
Cognitive domains			
Knowing	505	506	No change
Applying	510	513	No change
Reasoning	521	513	Decrease

[12] Comparisons over time are valid at the Canadian level because the same provinces participated in both cycles. Although Newfoundland and Labrador and Manitoba did not oversample in 2015, their relative weights on the Canadian results were proportional to their population in both cycles.

At the international level, 43 countries had comparable data for the three content domains for TIMSS 2015 and 2019. In each of the three content areas, about half the countries show no change in average achievement between the two assessment cycles. For countries in which changes occurred, similar numbers showed increases and decreases in achievement scores.

Changes were found in 19 countries for *number* (11 improved, 8 declined), 23 countries for *geometry and measurement* (13 improved, 10 declined), and 18 countries for *data* (10 improved, 8 declined). Similarly, fewer than half of countries showed changes over time in their results for the three cognitive domains, with about equal numbers of countries improving and declining for each cognitive domain (Mullis et al., 2020).

Results in science

The criteria for the four international benchmarks for TIMSS 2019 science are presented in Table 1.8. It is assumed that students attaining a specific benchmark would also be successful at questions designated for all lower benchmarks.

TABLE 1.8 TIMSS 2019 science international benchmarks — summary description

Advanced International Benchmark (625 points)
At the advanced benchmark, students communicate their understanding of *life*, *physical*, and *Earth sciences* and demonstrate some knowledge of the process of scientific inquiry. They have: • knowledge of characteristics and life processes of a variety of organisms • understanding of relationships in ecosystems and interactions between organisms and their environment • understanding of properties and states of matter and physical and chemical changes • understanding of Earth's physical characteristics, processes, and history • knowledge of Earth's revolution and rotation
High International Benchmark (550 points)
At the high benchmark, students communicate and apply knowledge of *life*, *physical*, and *Earth sciences*. They have: • knowledge of characteristics of plants, animals and their life cycles • knowledge of states and properties of matter and of energy transfer in practical contexts • some understanding of forces and motion • knowledge of various facts about the Earth's physical characteristics • basic understanding of the Earth-Moon-Sun system
Intermediate International Benchmark (475 points)
At the intermediate benchmark, students show knowledge and understanding of some aspects of science. Students have: • basic knowledge of plants and animals • knowledge about some properties of matter • knowledge of some facts related to electricity and can apply elementary knowledge of forces and motion • some understanding of Earth's physical characteristics
Low International Benchmark (400 points)
At the low benchmark, students have some limited knowledge of science facts.

Adapted from Mullis et al., 2020. Exhibit 2.7. Available at https://timss2019.org/reports/achievement/#science-4.

Figure 1.10 presents results showing percentages of students reaching each international benchmark in Canada overall and in each of the five provinces participating in TIMSS 2019 at the benchmarking or oversampling level. In Canada, 7 percent of the students reached the highest level, the advanced international benchmark, which is just above the international median of 6 percent, but substantially below that of the highest achieving country (Singapore, at 38 percent). Within Canada, the percentage of students reaching this benchmark ranged from 4 percent in Manitoba to 10 percent in Alberta (Appendix B.1.15a and B.1.15b).

Thirty-seven percent of Canadian students reached the high international benchmark, a proportion that is above the international median of 32 percent. The percentages vary from 28 percent in Manitoba to 41 percent in Alberta.

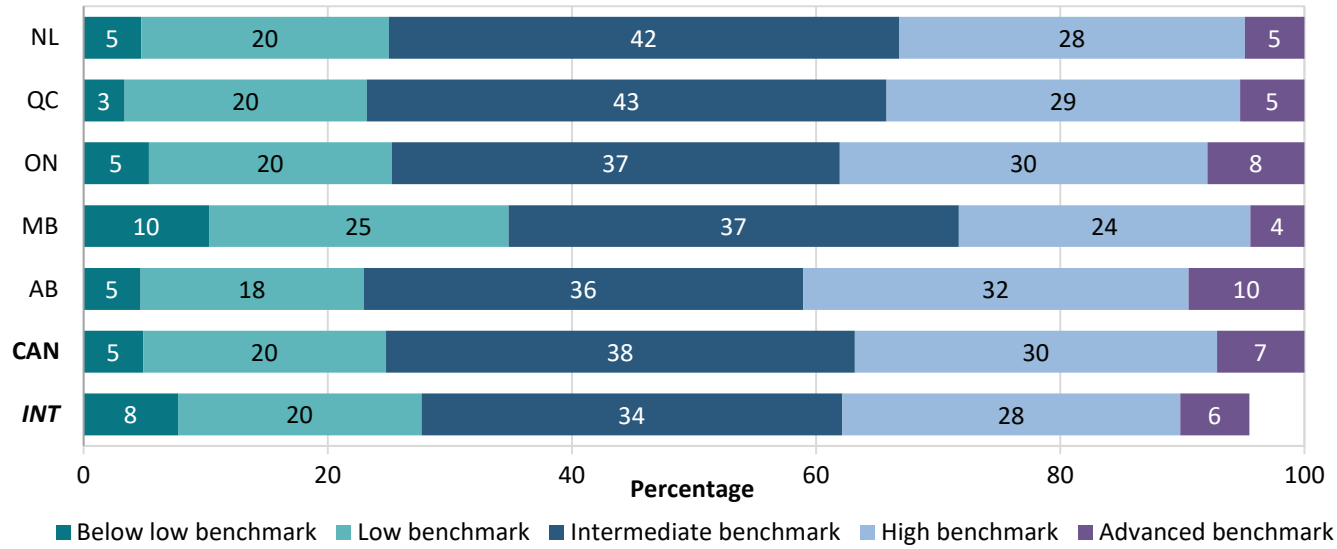
In Canada, 75 percent of the Grade 4 students reached the intermediate international benchmark, which was higher than the international median of 71 percent. Among all participating countries, three have more than 90 percent of students at the intermediate level: Singapore, Korea, and the Russian Federation. Across Canadian provinces, the lowest percentage of students at this level is 65 percent in Manitoba, and the highest is 77 percent in both Quebec and Alberta.

The low international benchmark was reached by 95 percent of Canadian students, which is higher than the international median of 92 percent. In three countries — Korea, the Russian Federation, and Chinese Taipei — 99 percent of students reached this level. In the Canadian provinces, the percentages vary from 90 percent in Manitoba to 97 percent in Quebec (Figure 1.10; Appendix B.1.15b).

Results in science by proficiency level

The ranges for the four international benchmarks in science are defined in the same way as was done for mathematics in the previous section.

FIGURE 1.10 Percentage of students at each proficiency level in science



Note: Percentages may not add up due to rounding.

Results in science by average score

Thirty-two countries, including Canada and four Canadian provinces (Newfoundland and Labrador, Quebec, Ontario, and Alberta) had higher achievement than the TIMSS centrepoint of 500, which is the point of reference that remains constant from one TIMSS assessment to the next. There is considerable variability in achievement with 346 points separating the highest achieving and lowest achieving countries. Students in Singapore (595 points) and Korea (588 points) had the highest achievement in TIMSS Grade 4 science. Seventeen countries performed better than Canada while the results for Canada were not significantly different from 11 other countries (Table 1.9; Appendix B.1.16, Mullis et al., 2020, Exhibit 2.2).

Figure 1.11 presents science achievement by average score. All provinces achieved at or above the international average and achievement results were similar to the Canadian average in all provinces, except Manitoba where the results were below the Canadian average.

TABLE 1.9 Comparison of country and provincial results to the Canadian average in science

Country or province	Average score	Standard error	Countries or provinces whose mean score is not significantly different from the comparison country or province
Singapore	595	(3.4)	Republic of Korea
Republic of Korea	588	(2.1)	Singapore
Russian Federation	567	(3.0)	Japan
Japan	562	(1.8)	Russian Federation, Chinese Taipei
Chinese Taipei	558	(1.8)	Japan, Finland
Finland	555	(2.6)	Chinese Taipei
Latvia	542	(2.4)	Norway (5), United States, Lithuania, Sweden, England
Norway (5)	539	(2.2)	Latvia, United States, Lithuania, Sweden, England, Czech Republic
United States	539	(2.7)	Latvia, Norway (5), Lithuania, Sweden, England, Czech Republic, Australia, Hong Kong SAR, Alberta
Lithuania	538	(2.5)	Latvia, Norway (5), United States, Sweden, England, Czech Republic, Australia, Hong Kong SAR, Alberta
Sweden	537	(3.3)	Latvia, Norway (5), United States, Lithuania, England, Czech Republic, Australia, Hong Kong SAR, Poland, Alberta, Hungary
England	537	(2.7)	Latvia, Norway (5), United States, Lithuania, Sweden, Czech Republic, Australia, Hong Kong SAR, Poland, Alberta
Czech Republic	534	(2.6)	Norway (5), United States, Lithuania, Sweden, England, Australia, Hong Kong SAR, Poland, Alberta, Hungary, Ireland, Turkey (5)
Australia	533	(2.4)	United States, Lithuania, Sweden, England, Czech Republic, Hong Kong SAR, Poland, Alberta, Hungary, Ireland, Turkey (5)
Hong Kong SAR	531	(3.3)	United States, Lithuania, Sweden, England, Czech Republic, Australia, Poland, Alberta, Hungary, Ireland, Turkey (5), Ontario, Croatia, Bulgaria
Poland	531	(2.6)	Sweden, England, Czech Republic, Australia, Hong Kong SAR, Alberta, Hungary, Ireland, Turkey (5), Ontario, Bulgaria
Alberta	**530**	**(3.9)**	United States, Lithuania, Sweden, England, Czech Republic, Australia, Hong Kong SAR, Poland, Hungary, Ireland, Turkey (5), Ontario, Croatia, Canada, Denmark, Austria, Quebec, Bulgaria, Slovak Republic
Hungary	529	(2.7)	Sweden, Czech Republic, Australia, Hong Kong SAR, Poland, Alberta, Ireland, Turkey (5), Ontario, Croatia, Bulgaria, Slovak Republic
Ireland	528	(3.2)	Czech Republic, Australia, Hong Kong SAR, Poland, Alberta, Hungary, Turkey (5), Ontario, Croatia, Canada, Denmark, Austria, Quebec, Bulgaria, Slovak Republic, Newfoundland and Labrador
Turkey (5)	526	(4.2)	Czech Republic, Australia, Hong Kong SAR, Poland, Alberta, Hungary, Ireland, Ontario, Croatia, Canada, Denmark, Austria, Quebec, Bulgaria, Slovak Republic, Newfoundland and Labrador, Northern Ireland, Netherlands, Germany, Serbia
Ontario	**524**	**(3.2)**	Hong Kong SAR, Poland, Alberta, Hungary, Ireland, Turkey (5), Croatia, Canada, Denmark, Austria, Quebec, Bulgaria, Slovak Republic, Newfoundland and Labrador, Northern Ireland, Netherlands, Germany, Serbia
Croatia	524	(2.2)	Hong Kong SAR, Alberta, Hungary, Ireland, Turkey (5), Ontario, Canada, Denmark, Austria, Quebec, Bulgaria, Slovak Republic, Newfoundland and Labrador, Northern Ireland, Netherlands, Germany, Serbia
CANADA	**523**	**(1.9)**	Alberta, Ireland, Turkey (5), Ontario, Croatia, Denmark, Austria, Quebec, Bulgaria, Slovak Republic, Newfoundland and Labrador, Northern Ireland, Netherlands, Germany, Serbia
Denmark	522	(2.4)	Alberta, Ireland, Turkey (5), Ontario, Croatia, Canada, Austria, Quebec, Bulgaria, Slovak Republic, Newfoundland and Labrador, Northern Ireland, Netherlands, Germany, Serbia
Austria	522	(2.6)	Alberta, Ireland, Turkey (5), Ontario, Croatia, Canada, Denmark, Quebec, Bulgaria, Slovak Republic, Newfoundland and Labrador, Northern Ireland, Netherlands, Germany, Serbia
Quebec	**522**	**(2.5)**	Alberta, Ireland, Turkey (5), Ontario, Croatia, Canada, Denmark, Austria, Bulgaria, Slovak Republic, Newfoundland and Labrador, Northern Ireland, Netherlands, Germany, Serbia
Bulgaria	521	(4.9)	Hong Kong SAR, Poland, Alberta, Hungary, Ireland, Turkey (5), Ontario, Croatia, Canada, Denmark, Austria, Quebec, Slovak Republic, Newfoundland and Labrador, Northern Ireland, Netherlands, Germany, Serbia, Cyprus, Spain
Slovak Republic	521	(3.7)	Alberta, Hungary, Ireland, Turkey (5), Ontario, Croatia, Canada, Denmark, Austria, Quebec, Bulgaria, Newfoundland and Labrador, Northern Ireland, Netherlands, Germany, Serbia, Cyprus

Country or province	Average score	Standard error	Countries or provinces whose mean score is not significantly different from the comparison country or province
Newfoundland and Labrador	**519**	**(3.5)**	Ireland, Turkey (5), Ontario, Croatia, Canada, Denmark, Austria, Quebec, Bulgaria, Slovak Republic, Northern Ireland, Netherlands, Germany, Serbia, Cyprus, Spain
Northern Ireland	518	(2.3)	Turkey (5), Ontario, Croatia, Canada, Denmark, Austria, Quebec, Bulgaria, Slovak Republic, Newfoundland and Labrador, Netherlands, Germany, Serbia, Cyprus
Netherlands	518	(2.9)	Turkey (5), Ontario, Croatia, Canada, Denmark, Austria, Quebec, Bulgaria, Slovak Republic, Newfoundland and Labrador, Northern Ireland, Germany, Serbia, Cyprus
Germany	518	(2.2)	Turkey (5), Ontario, Croatia, Canada, Denmark, Austria, Quebec, Bulgaria, Slovak Republic, Newfoundland and Labrador, Northern Ireland, Netherlands, Serbia, Cyprus
Serbia	517	(3.5)	Turkey (5), Ontario, Croatia, Canada, Denmark, Austria, Quebec, Bulgaria, Slovak Republic, Newfoundland and Labrador, Northern Ireland, Netherlands, Germany, Cyprus, Spain, Italy
Cyprus	511	(3.0)	Bulgaria, Slovak Republic, Newfoundland and Labrador, Northern Ireland, Netherlands, Germany, Serbia, Spain, Italy, Portugal
Spain	511	(2.0)	Bulgaria, Newfoundland and Labrador, Serbia, Cyprus, Italy
Italy	510	(3.0)	Serbia, Cyprus, Spain, Portugal, New Zealand, Manitoba
Portugal	504	(2.6)	Cyprus, Italy, New Zealand, Manitoba, Belgium (Flemish)
New Zealand	503	(2.3)	Italy, Portugal, Manitoba, Belgium (Flemish)
Manitoba	**502**	**(3.5)**	Italy, Portugal, New Zealand, Belgium (Flemish), Malta, Kazakhstan, Bahrain
Belgium (Flemish)	501	(2.1)	Portugal, New Zealand, Manitoba, Kazakhstan
International Centrepoint	**500**	--	
Malta	496	(1.3)	Manitoba, Kazakhstan, Bahrain, Albania
Kazakhstan	494	(3.1)	Manitoba, Belgium (Flemish), Malta, Bahrain, Albania, France
Bahrain	493	(3.4)	Manitoba, Malta, Kazakhstan, Albania, France
Albania	489	(3.5)	Malta, Kazakhstan, Bahrain, France
France	488	(3.0)	Kazakhstan, Bahrain, Albania
United Arab Emirates	473	(2.1)	Chile, Armenia
Chile	469	(2.6)	United Arab Emirates, Armenia
Armenia	466	(3.4)	United Arab Emirates, Chile, Bosnia and Herzegovina
Bosnia and Herzegovina	459	(2.9)	Armenia, Georgia, Montenegro, Qatar
Georgia	454	(3.9)	Bosnia and Herzegovina, Montenegro, Qatar
Montenegro	453	(2.5)	Bosnia and Herzegovina, Georgia, Qatar
Qatar	449	(3.9)	Bosnia and Herzegovina, Georgia, Montenegro, Islamic Republic of Iran
Islamic Republic of Iran	441	(4.1)	Qatar, Oman
Oman	435	(4.1)	Islamic Republic of Iran, Azerbaijan, North Macedonia
Azerbaijan	427	(3.3)	Oman, North Macedonia
North Macedonia	426	(6.2)	Oman, Azerbaijan, Kosovo
Kosovo	413	(3.7)	North Macedonia
Saudi Arabia	402	(4.1)	Kuwait
Kuwait	392	(6.1)	Saudi Arabia
Morocco	374	(5.8)	
South Africa (5)	324	(4.9)	
Pakistan	290	(13.4)	
Philippines	249	(7.5)	

Note: The participating grade is identified in parentheses after the country name if it is not Grade 4.

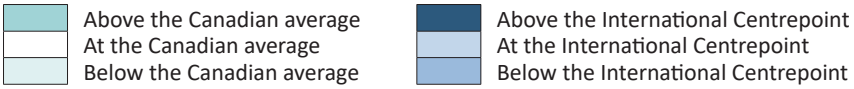
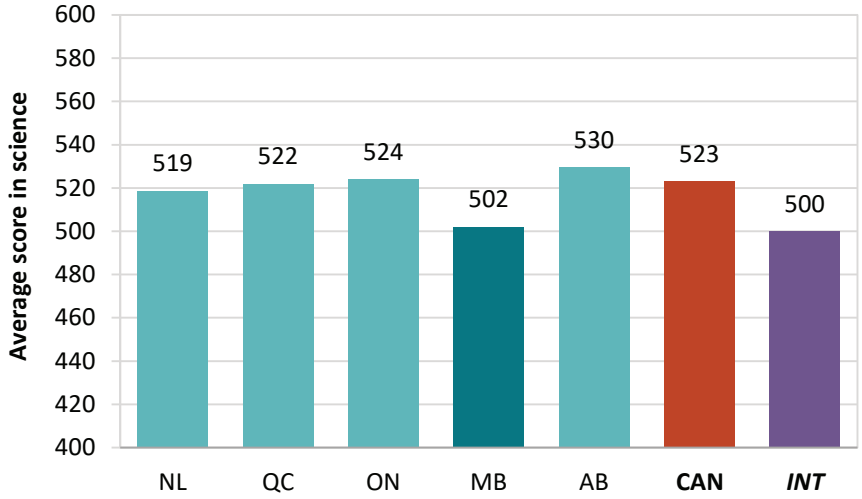


FIGURE 1.11 **Achievement scores in science**



* Darker shade denotes significant difference compared to Canada

Results in science by content and cognitive domains

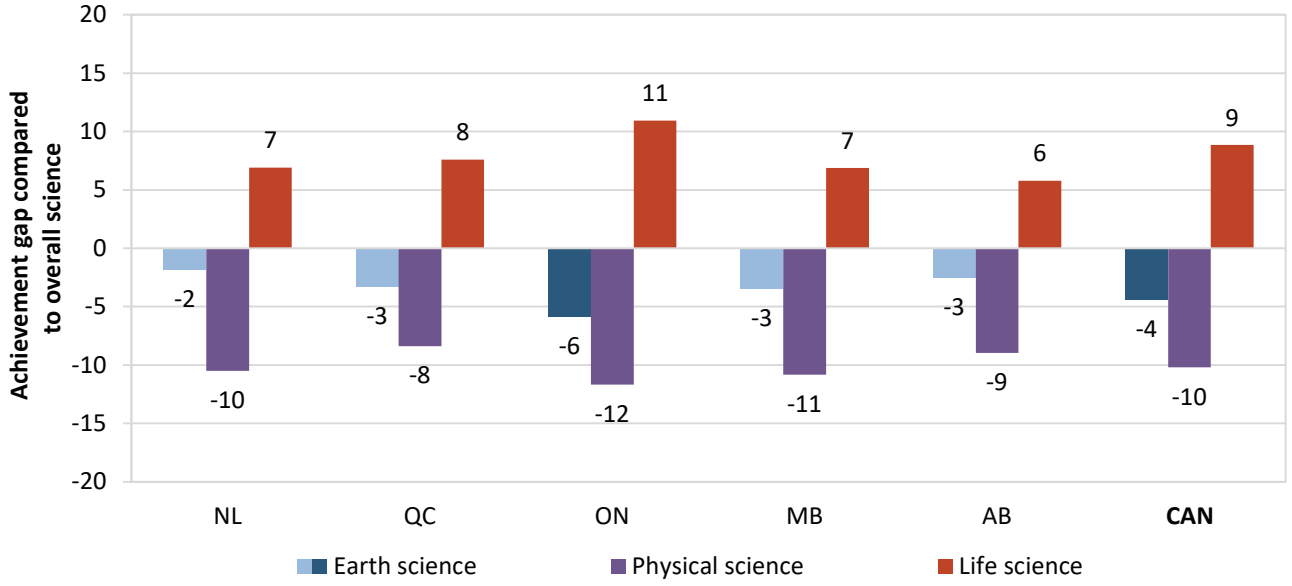
The relative proportion of each content and cognitive domain in the overall science assessment, as well as the topics included in each domain, can be found in the introduction (Tables 3 and 4).

At the Grade 4 level, there are three content domains in science (*life science, physical science,* and *Earth science*). Figure 1.12 shows the difference between each content domain and the overall science score for each participating province and for Canada. The weakest results were in *physical science* and *Earth science* with Canadian students scoring lower in these domains (10 points and 4 points, respectively) than the overall science score while scores in the *life science* domain were nine points higher than the overall science score.

Compared to the overall science score, students in all provinces showed significantly stronger results in *life science* and weaker results in *physical science*. For *Earth science*, there was no significant difference in the results compared to the overall science score, except for students in Ontario who achieved lower results than the provincial overall science score in this content area (Figure 1.12; Appendix B.1.17).

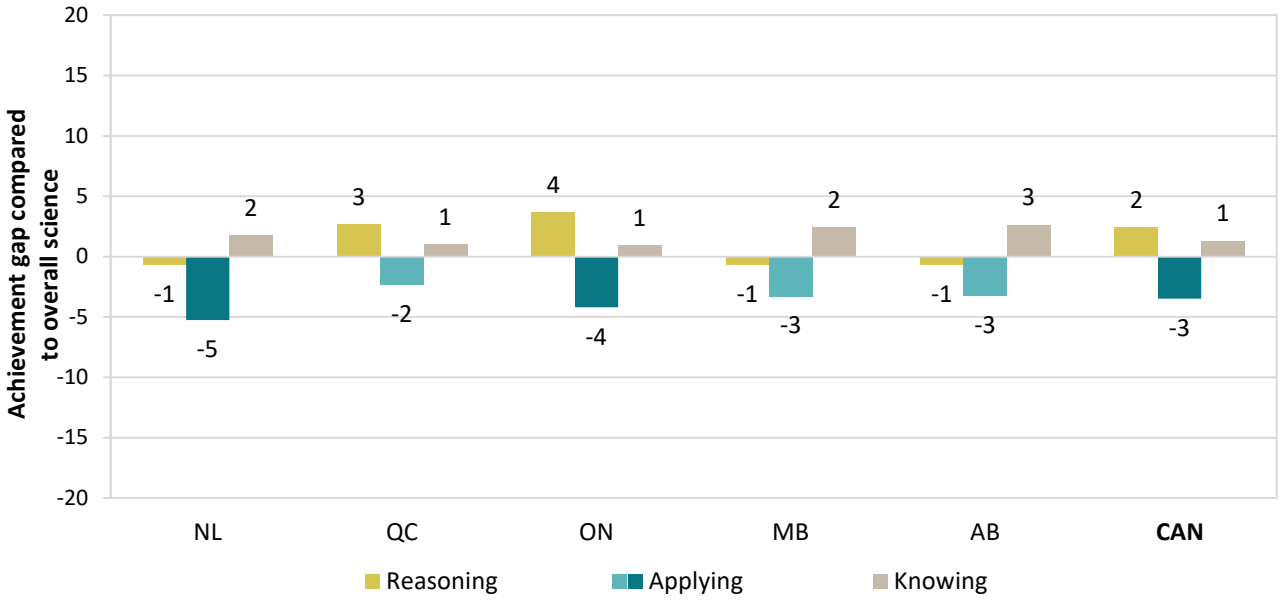
The results were less variable for the cognitive domains in science which assess thinking processes. At the Canada level, *applying* was the only cognitive domain that showed a significant difference compared to the overall Canadian science score. At the provincial level, only Newfoundland and Labrador and Ontario students showed significant differences: results were weaker in *applying* compared to the overall respective provincial science results (Figure 1.13; Appendix B.1.18).

FIGURE 1.12 **Comparison of achievement in content domains and the overall science score**



* Darker shade denotes significant difference

FIGURE 1.13 **Comparison of achievement in cognitive domains and the overall science score**



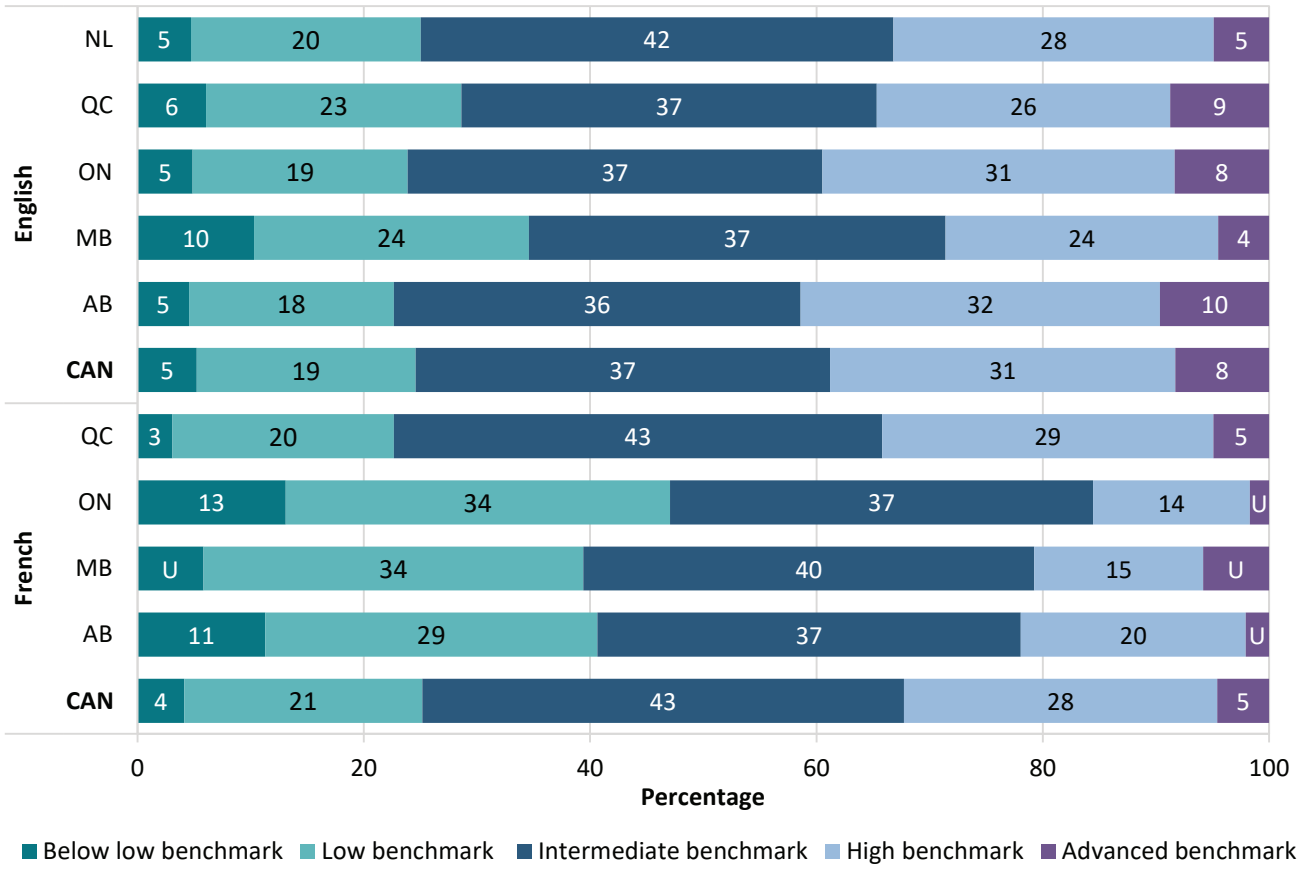
* Darker shade denotes significant difference

Results in science by language of the school system

Ninety-five percent or more students reached the basic (low benchmark) level of achievement in science in Canada overall in both language systems. The highest proportions reaching this level were found in francophone schools in Quebec (97 percent) and in anglophone schools in Newfoundland and Labrador, Ontario, and Alberta (95 percent). At the highest level of achievement, more anglophone students (8 percent) than francophone students (5 percent) reached the advanced benchmark. When considering this benchmark across provinces, Alberta had the highest proportion of students achieving at the advanced level in anglophone

schools (10 percent) while Quebec had the highest proportion in regards to students achieving at the advanced level in francophone schools (5 percent) (Figure 1.14; Appendix B.1.19a and B.1.19b).

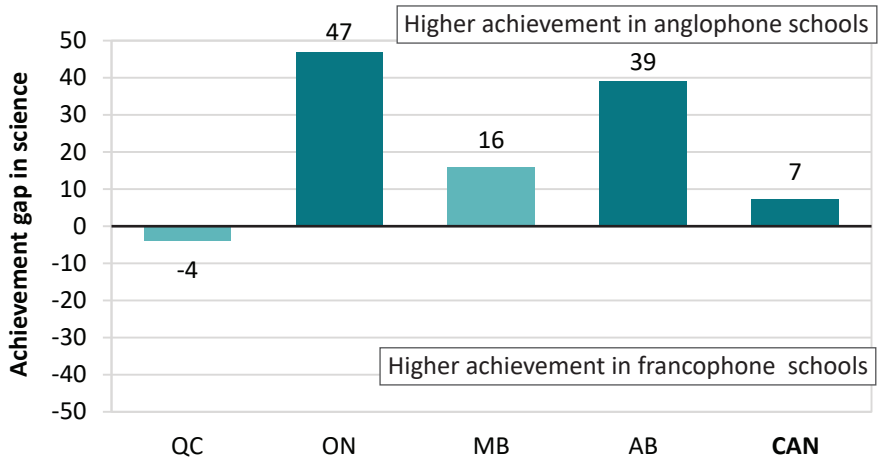
FIGURE 1.14 Percentage of students at each proficiency level in science by language of the school system



Note: U – data too unreliable to be published.

When the results in science are compared by average score, anglophone students achieved higher scores than their counterparts in francophone schools in Canada overall and in Ontario and Alberta, while equity was found between the two language systems in Quebec and Manitoba (Figure 1.15; Appendix B.1.20). A similar trend is found at the subscale level in science. As shown in Table 1.10, when a significant difference was found, anglophone students outperformed francophone students in two of the three content domains (*life science* and *earth science*) and in one of the cognitive domains of science (*knowing*) (Appendix B.1.21, B.1.22.)

FIGURE 1.15 Achievement gap in science by language of the school system



Note: Numbers are achievement scores in anglophone systems minus those in francophone systems. Darker shade denotes significant difference within Canada or a province.

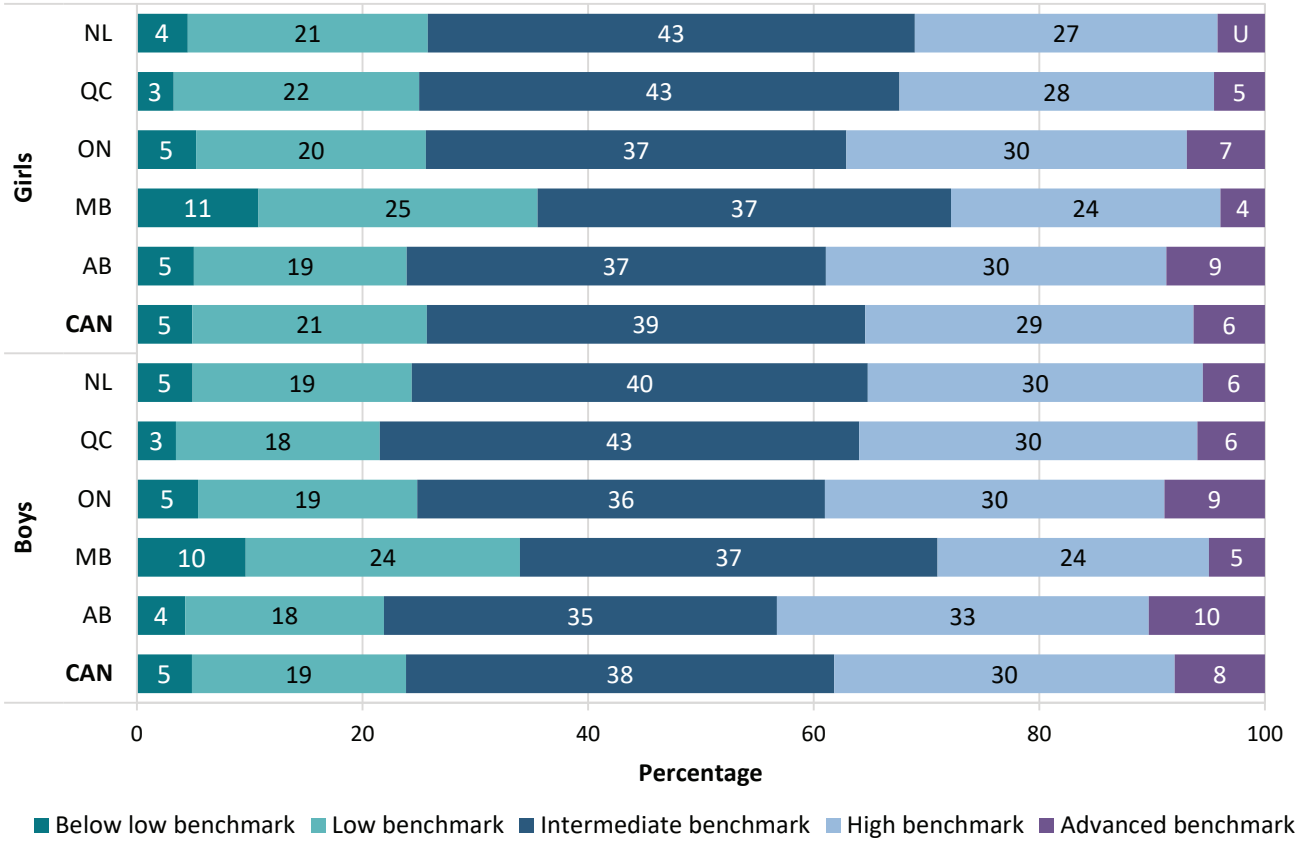
TABLE 1.10 Summary of differences in achievement scores in science subscales, by language of the school system

	Anglophone schools performed significantly better than francophone schools	Francophone schools performed significantly better than anglophone schools	No significant difference between school systems
Content domains			
Life science	Canada, Ontario, Alberta		Quebec, Manitoba
Physical science	Ontario, Alberta		Canada, Quebec, Manitoba
Earth science	Canada, Ontario, Manitoba, Alberta		Quebec
Cognitive domains			
Knowing	Canada, Ontario, Alberta		Quebec, Manitoba
Applying	Ontario, Alberta		Canada, Quebec, Manitoba
Reasoning	Ontario, Alberta		Canada, Quebec, Manitoba

Results in science by gender

In Canada overall, the same proportion of girls and boys (95 percent) reached the basic level of achievement (low international benchmark) in science; however, a higher proportion of boys than girls attained the highest level of proficiency (8 percent vs. six percent, respectively). This trend is consistent across provinces as shown in Figure 1.16 (Appendix B.1.23a).

FIGURE 1.16 **Percentage of students at each proficiency level in science by gender**

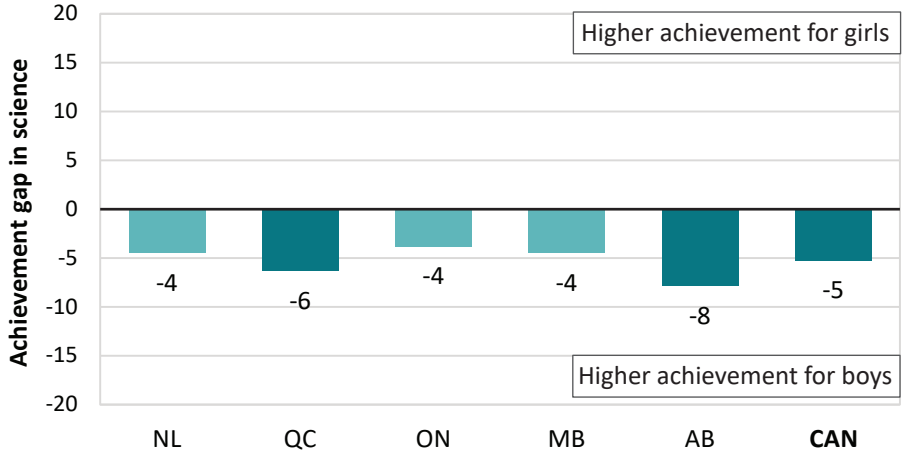


On average across countries participating in the TIMSS science assessment at the Grade 4 level, boys outperformed girls by four points. However, girls outperformed boys in 18 countries while boys outperformed girls in seven countries, including Canada (Mullis et al., 2020, Exhibit 2.5). At the provincial level, boys achieved higher scores than girls in Quebec and Alberta while there was no gender gap for science in Newfoundland and Labrador, Ontario, and Manitoba (Figure 1.17; Appendix B.1.24). These results differ from results found in other studies. Girls outperformed boys in Grade 8/Secondary II in PCAP 2016 (O'Grady et al., 2018) while no gender gap was found at the Canada level in TIMSS 2015 (Brochu et al.,2017) or at age 15 in PISA 2018 (O'Grady et al., 2019).

At the Canada level, boys also outperformed girls in two content subdomains (*physical science* and *Earth sciences*) and the cognitive domains of *knowing* and *applying*. No gender differences were found for the *life sciences* content domain or the *reasoning* cognitive domains (Table 1.11; Appendix B.1.25 and B.1.26).

As was the case in Canada, the performance between boys and girls was very different between content domains at the international level. Generally, girls had higher achievement than boys in *life science* in many countries while boys had higher achievement than girls in *physical* and *Earth sciences*. In the *life science* content domain, girls had higher achievement than boys in 26 countries; there was no gender-based difference in performance for the remaining countries in this content domain. For *physical science*, girls outperformed boys in four countries while the opposite occurred in 13 countries (including Canada). In *Earth science*, boys outperformed girls in 16 countries, while the opposite pattern occurred in only four countries. For the cognitive domains, boys had higher achievement than girls in more countries in the *knowing* domain while girls had higher achievement than boys in more countries in the *applying* and *reasoning* cognitive domains (Mullis, et al., 2020).

FIGURE 1.17 Achievement gap in science by gender



Note: Numbers are achievement scores of girls minus those of boys. Darker shade denotes significant difference within Canada or within a province.

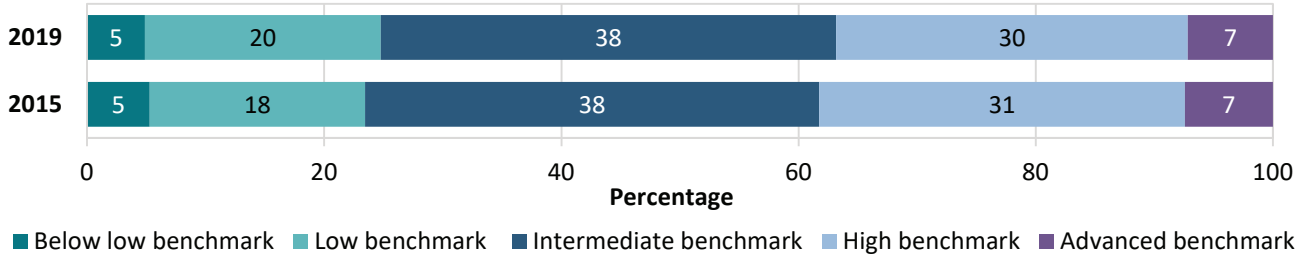
TABLE 1.11 Summary of differences in achievement scores in science subscales, by gender

	Girls performed significantly better than boys	Boys performed significantly better than girls	No significant difference between girls and boys
Content domains			
Life science			Canada, Newfoundland and Labrador, Quebec, Ontario, Manitoba, Alberta
Physical science		Canada, Quebec, Ontario, Manitoba, Alberta	Newfoundland and Labrador
Earth science		Canada, Newfoundland and Labrador, Quebec, Ontario, Alberta	Manitoba
Cognitive domains			
Knowing		Canada, Quebec, Manitoba, Alberta	Newfoundland and Labrador, Ontario
Applying		Canada, Quebec	Newfoundland and Labrador, Ontario, Manitoba, Alberta
Reasoning			Canada, Newfoundland and Labrador, Quebec, Ontario, Manitoba, Alberta

Changes in science performance over time

At the Canada level, Grade 4 science results have been relatively stable. Similar proportions of students reached each of the international benchmarks (Figure 1.18; Mullis et al., 2020, Exhibit 2.9; Appendix B.1.27a) in TIMSS 2015 and 2019[13]. For the 44 countries that participated in both TIMSS 2015 and 2019, 10 had increases in average achievement, 10 had declines, but the majority, including Canada, had no significant change in performance between the two assessment years in which Canada participated with a sufficient sample size for Canada-level results (Appendix B.1.27b). Between these two years, the results for both anglophone and francophone students remained stable in science; however, the achievement gap between the two language systems was significant in 2019 whereas there was no achievement gap in 2015 as reported in the TIMSS 2015 Canadian report (Brochu et al., 2017) (Appendix B.1.27c). The results for both girls and boys remained stable over time. Further, there was no gender gap shown in 2015, while boys outperformed girls in science in 2019 by five points (Table 1.12; Appendix B.1.27d).

FIGURE 1.18 Results in science over time by proficiency level, 2015–2019



Note: Percentages may not add up to 100 due to rounding.

TABLE 1.12 Results in science over time by average score, 2015–2019

	2015	2019	Change over time
Overall science	**525**	**523**	**No change**
Anglophone schools	526	525	No change
Francophone schools	520	518	No change
Achievement gap (anglophone–francophone)	6	7*	
Girls	526	520	No change
Boys	524	526	No change
Achievement gap (girls–boys)	2	-5*	

* Denotes significant difference.
Note: Numbers may differ from those expected due to rounding.

When the results over time are examined by the science subscales, no significant change was found for the three content subscales or the two cognitive domains of *knowing* and *reasoning*; however, there was a significant decrease (eight points) in results for the *applying* cognitive domain between 2015 and 2019 (Table 1.13, Mullis et al., 2020, Exhibits 2.15 and 2.17; Appendix B.1.27e and B.1.27f).

[13] Comparisons over time are valid at the Canadian level because the same provinces participated in both cycles. Although Newfoundland and Labrador and Manitoba did not oversample in 2015, their relative weights on the Canadian results were proportional to their population in both cycles.

TABLE 1.13 Results in science subscales over time by average score, 2015–2019

	2015	2019	Change over time
Content domains			
Life science	536	532	No change
Physical science	518	513	No change
Earth science	513	519	No change
Cognitive domains			
Knowing	523	524	No change
Applying	528	520	Decrease
Reasoning	524	525	No change

At the international level, 42 countries had comparable data for the three content domains with about half the countries showing no change in average achievement. Changes were found in 18 countries for *life science* (6 improved, 12 declined), 21 countries for *physical science* (12 improved, 9 declined), and 15 countries for *Earth science* (9 improved, 6 declined). Similarly, few countries showed changes over time in their results for the three cognitive domains (Mullis et al., 2020).

Sample questions to illustrate the benchmarks

As noted in the introduction, a number of items from the TIMSS 2019 assessment have been released to the public. Examples of questions at each benchmark, sample responses, and student results by country, are available in the TIMSS international report (Mullis et al., 2020) and in a forthcoming issue of *Assessment Matters!*, which is available on the CMEC website.[14]

Summary

Overall results

TIMSS Grade 4 mathematics has been proposed as an indicator for mathematics at the end of primary school with the TIMSS low international benchmark of 400 TIMSS points as the global minimum proficiency level (UNESCO-UIS, 2020). 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). Canadian Grade 4 students achieved a mean score of 512 in mathematics, above the international centrepoint 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.

In science, the low international benchmark was reached by 95 percent of Canadian students, while 7 percent of students reached the advanced international benchmark. Thirty-two countries, including Canada and all Canadian provinces, had higher achievement than the TIMSS centrepoint of 500, which is the point of reference that remains constant from one TIMSS assessment to the next.

Results by language of the school system

For mathematics, a higher proportion of Canadian students in francophone schools achieved the low international benchmark than those in anglophone schools (97 percent vs. 90 percent, respectively) while

[14] https://cmec.ca/459/Overview.html

similar proportions from both language groups achieved at the advanced international benchmark level. For science, 95 percent or more students reached the basic (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.

The achievement gap between anglophone and francophone school systems favoured francophone students in mathematics by 26 points and anglophone students in science by seven points.

Results by gender

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

In Canada as a whole, and in 27 other countries, boys outperformed girls in mathematics. Of note, Canada had the highest gender gap favouring boys (19 points). On average across countries participating in the TIMSS science assessment at the Grade 4 level, boys outperformed girls by four points. However, while in seven countries, including Canada, boys outperformed girls in science, girls outperformed boys in 16 countries.

Results over time

For IEA studies, such as TIMSS, the sample of students participating in the study must represent 75 percent of the Canadian population – in this case, Grade 4 students. TIMSS 2019 marks the second time that Canada has participated with a sample size that was large enough to obtain country-level results.

In Canada, results at the Grade 4 level between 2015 and 2019 have been relatively stable in both mathematics and science for overall results by both performance level and average score, as well as by the content and cognitive subscales for these two subjects.

The achievement gap for the two language groups decreased by five points for mathematics between 2015 and 2019. For science, although there was no significant achievement gap between students in anglophone and francophone schools in 2015, the gap became significant in 2019.

The achievement gap favouring boys in mathematics became even greater in 2019. In science, no gender difference was found in 2015 while boys outperformed girls in science in 2019.

CHAPTER 2
Student and Home Contexts

As a part of the TIMSS 2019 assessment, questionnaires were administered to participating students in Canada, their parents, their subject teacher, along with the school principal. The responses to these questionnaires provide context to the variation in student performance. In Chapter 1, student achievement data from the assessment was reported at the international, pan-Canadian, and provincial levels. This chapter builds upon the achievement data by highlighting responses from the student and parent (home) questionnaires.

Responses from the two questionnaires are organized below into four broad topics: parent involvement, student characteristics, preschool factors, and student confidence and sense of belonging. The first two topics generally relate to out-of-school factors, while the second two topics relate more closely to students' achievement due to in-school factors.

Out-of-school factors

Parent involvement

Parental involvement in a child's development outside of the school plays a role in a student's performance within it. Parents' involvement in their child's schooling may be seen in the heightened expectation of their child's level of education or the provision of supplementary math and science lessons, which may have an impact on student achievement and attainment. Indeed, Reardon (2011) notes that families who are socioeconomically more advantaged are tending increasingly to provide their children with developmental opportunities. Because of this, the parent questionnaire aimed to capture these two measures of parent involvement.

Level of education expected of child

In Canada, a sizeable proportion of parents indicated that they expected their Grade 4 child to complete at least a bachelor's degree (71 percent) (Figure 2.1; Appendix B.2.1). Another relatively high number of parents expressed an expectation that their child complete graduate studies (31 percent). In Ontario, this rate was notably higher than in other provinces, with 40 percent of parents expecting their child to undertake graduate studies. Students with parents who expected them to attain a higher level of education attained higher average achievement scores. Canadian students whose parents expected them to complete a bachelor's degree achieved an average score of 531 in mathematics and 541 in science (Figure 2.2).

FIGURE 2.1 **Parents' education expectation for students**

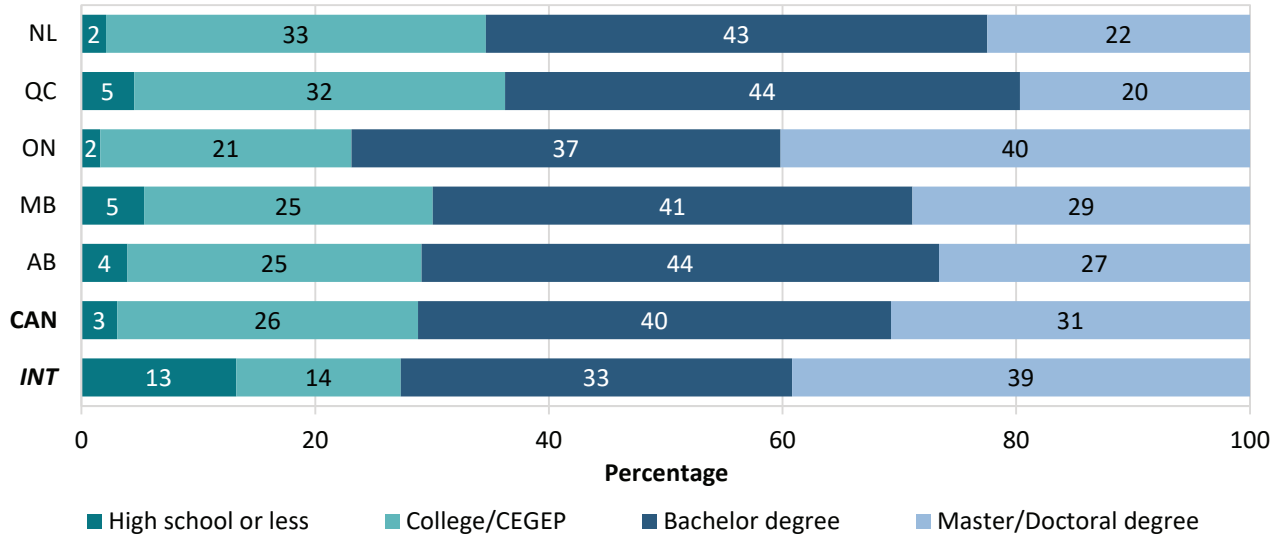
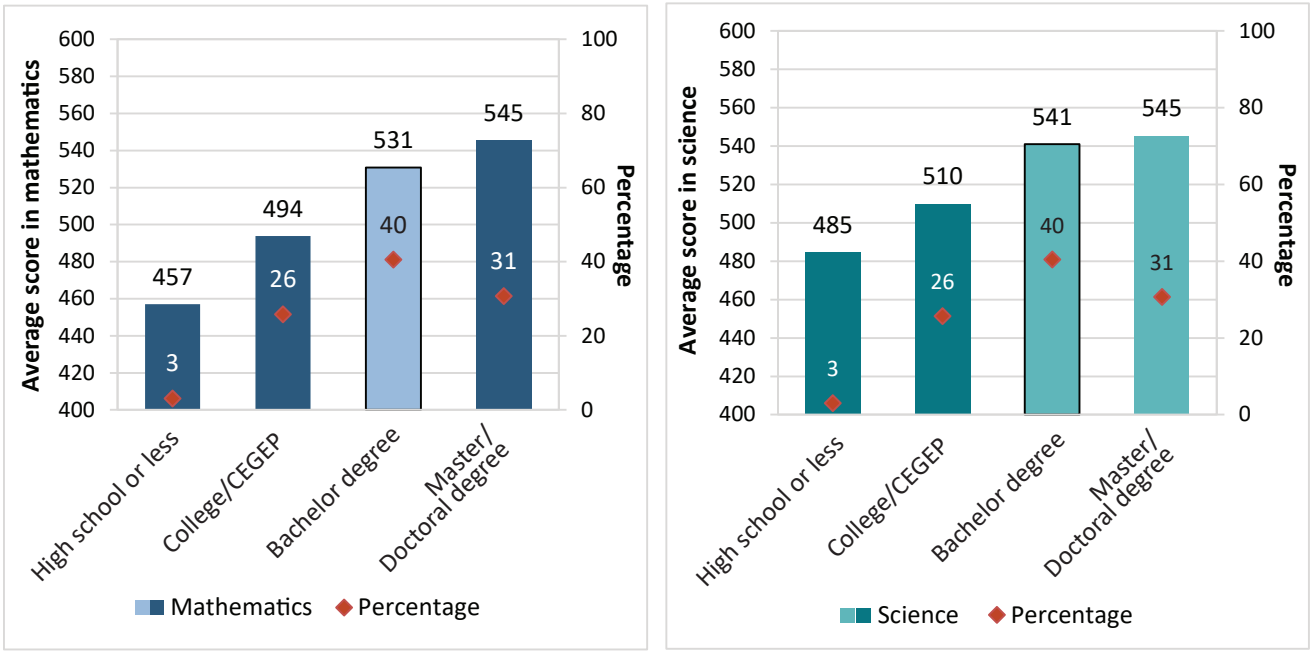


FIGURE 2.2 **Relationship between parents' education expectations and student achievement**



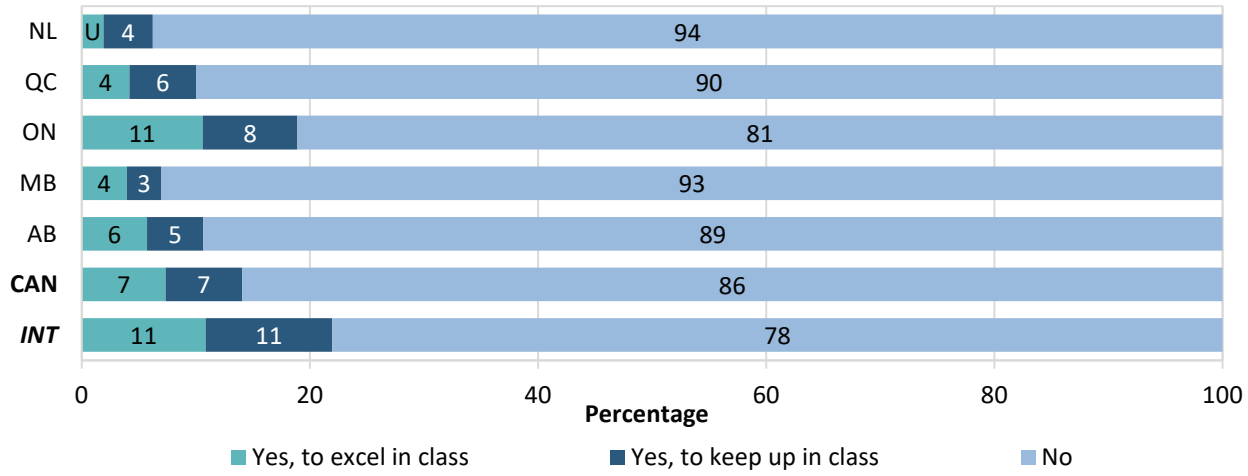
Note: Darker shade denotes significant difference compared to the bachelor degree category

Extra lessons in mathematics

Beyond compulsory school, parents may provide their students with additional opportunities to learn. Parents were asked whether they provided their children with extra lessons in mathematics. In Canada, 14 percent of students have parents who provided additional lessons in mathematics — approximately equal proportions of parents provide opportunities for enrichment or remediation. While 7 percent of parents expressed that they provide their children with extra lessons so that their child can excel in class, another 7 percent of parents reported providing their children with additional lessons so that their children can keep up in class (Figure 2.3; Appendix B.2.2). In Canada, students whose parents provided extra mathematics lessons for enrichment achieved an average mathematics score of 548 while those who attended supplementary

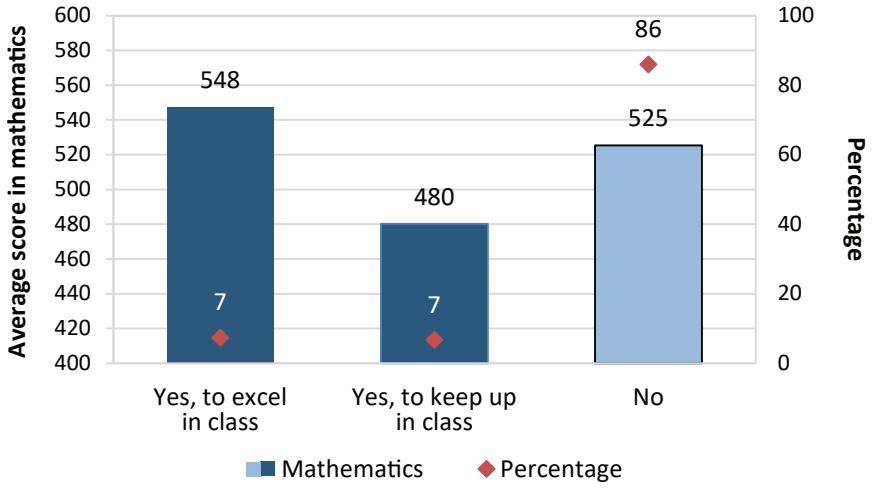
mathematics lessons for remedial reasons achieved an average mathematics score of 480 (Figure 2.4). By comparison, students who did not attend extra mathematics lessons achieved a mathematics score of 525.

FIGURE 2.3 Percentage of students in extra mathematics lessons



Note: U – data too unreliable to be published.

FIGURE 2.4 Relationship between extra mathematics lessons and achievement



Note: Darker shade denotes significant difference compared to the no category

Student characteristics

Studies have highlighted the association of student and family factors in relation to mathematics achievement for elementary students (Goforth, Noltemeyer, Patton, Bush, & Bergen, 2014). Because of this, the parent and student questionnaires aimed to capture measures of student and home characteristics to understand more fully their relation to student achievement in science and mathematics. In this section, student characteristics, such as gender, socioeconomic status (SES), immigration status, language spoken at home, and students' feelings of tiredness or hunger are all considered in relation to mathematics and science achievement.

Gender

Inclusive education is valued in Canadian provinces and territories and has led to the development of policies and resources to support inclusion. One aspect of inclusive education relates to gender identity. In the

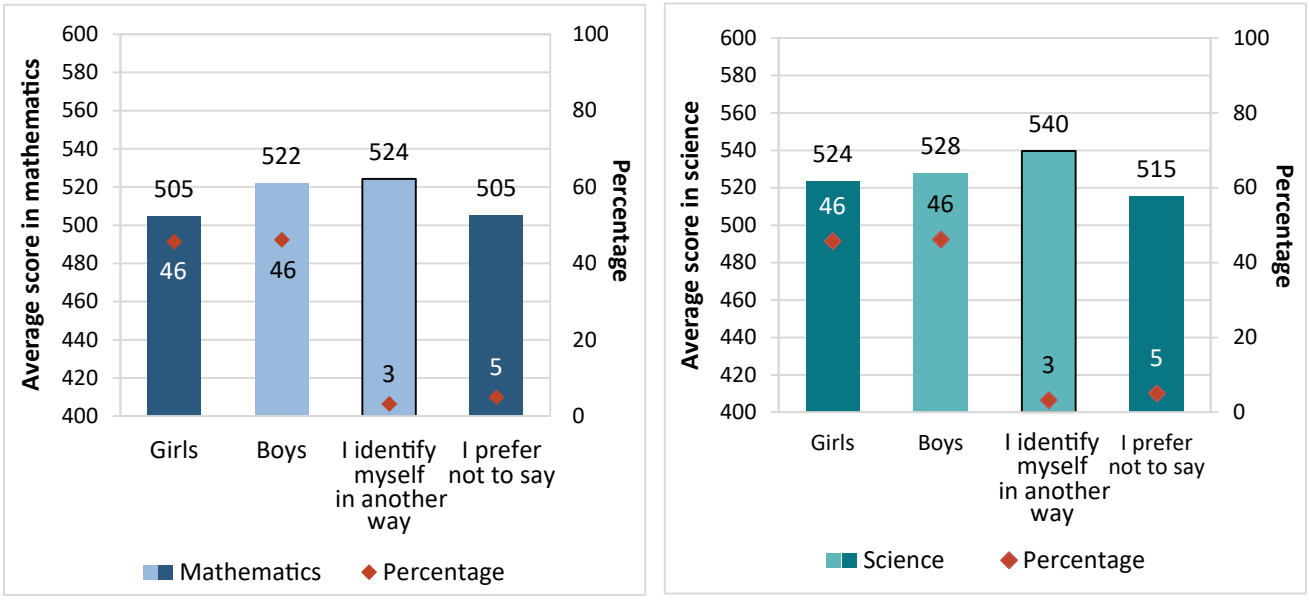
Canadian version of the TIMSS 2019 questionnaires for students, teachers, and principals, the question about gender was expanded from the female/male choices of previous assessments to allow two additional choices, as shown in the box below.

How do you identify yourself?
(Please select one response.)
Female Male I identify myself in another way. I prefer not to say.

In Canada, equal proportions of students self-identified as females and males (46 percent), 3 percent identified themselves in another way and 5 percent preferred to not say.

Students who identified in another way achieved the highest scores in science (540 points), significantly higher than girls but not significantly different than boys (524 and 528, respectively) (Figure 2.5; Appendix B.2.3). Students who identified as boys and those who identified in another way outperformed their peers who identified as girls, in mathematics.

FIGURE 2.5 Relationship between gender and achievement



Note: Darker shade denotes significant difference compared to the I identify myself in another way category.

Home resources for learning

Students' SES is also associated with differing levels of student achievement. The Home Resources for Learning index combines data reported by Grade 4 students and their parents and serves as a proxy for students' SES. The index consists of five items from the parent questionnaire shown in Table 2.1. Students provided information about the number of books in their home and the number of home study supports while parents were asked about the number of children's books as well as information about their education and occupation. The scale comprises three categories: many resources, some resources, and few resources. The "many resource" category corresponded to students reporting more than 100 books, both an internet connection and own room at home study supports, and parents reporting more than 25 children's books at home and at least one parent had completed university and one parent had a professional occupation.

Students categorized as owning few resources reported having 25 or fewer books with no study support at home, and parents in this category reported that there were 10 or fewer children's books in the home, and that neither parent had continued education beyond secondary school, was a small business owner, or worked in a clerical or professional occupation. All other students were categorized as possessing some resources.

TABLE 2.1 Home resources for learning scale

Student questionnaire	
Number of books in the home (students)	1) 0-11 2) 11-25 3) 26-100 4) 101-200 5) More than 200
Number of home study supports (students)	1) None 2) Internet connection or own room 3) Both internet connection and own room
Parent questionnaire	
Number of children's books in the home (parents)	1) 0-10 2) 11-25 3) 26-50 4) 51-100 5) More than 100
Highest level of education of either parent (parents)	1) Finished some primary or lower secondary or did not go to school 2) Finished lower secondary 3) Finished upper secondary 4) Finished post-secondary education 5) Finished university or higher
Highest level of occupation of either parent (parents)	1) Has never worked outside home for pay, general labourer, or semi-professional 2) Clerical 3) Small business owner 4) Professional

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 ratio seen in the international averages of 17 and 83 percent, respectively (Figure 2.6; Appendix B.2.4). Although the international report includes data for each of the three categories in this scale, the some resources and few resources categories were combined for Canada because of the limited number of observations for the few resources category. As shown in Figure 2.7, Canadian students who reported having many resources for learning at home scored 35 more points in mathematics and 38 more points in science than those with some or few resources.

FIGURE 2.6 **Percentage of students with home resources for learning for mathematics and science**

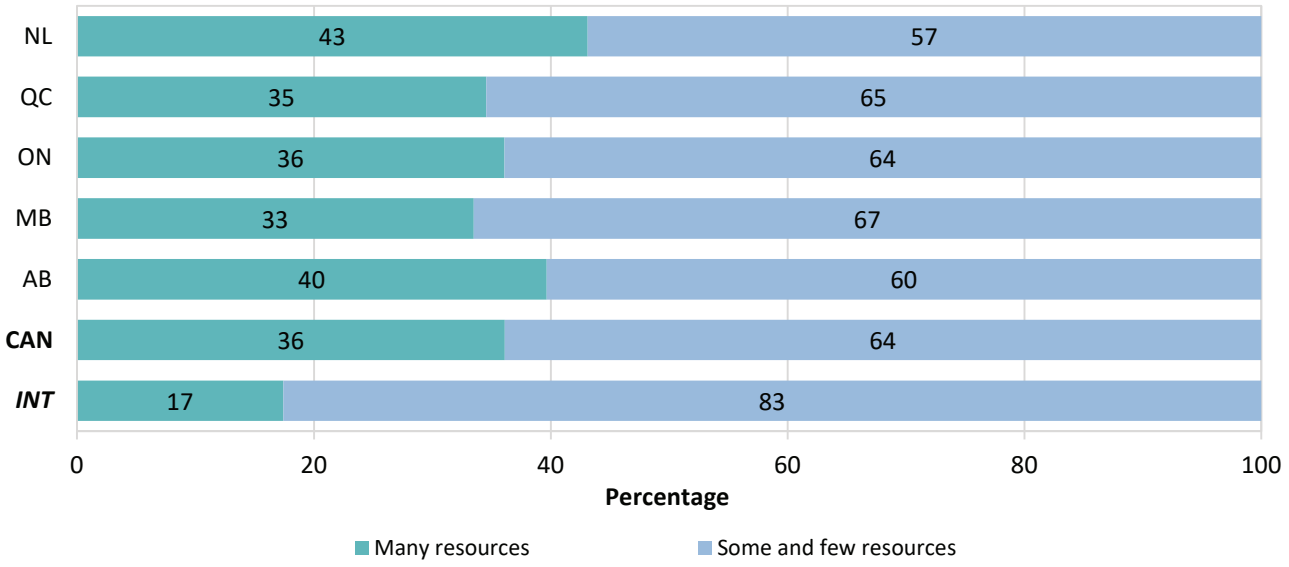
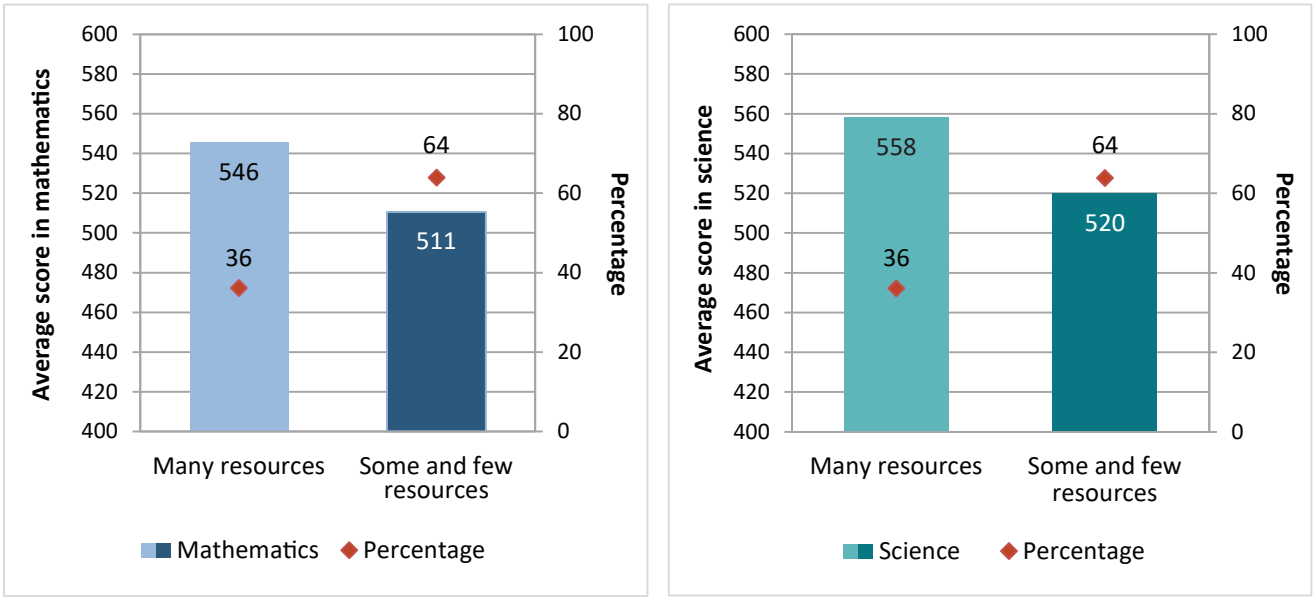


FIGURE 2.7 **Relationship between home resources for learning and achievement**



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

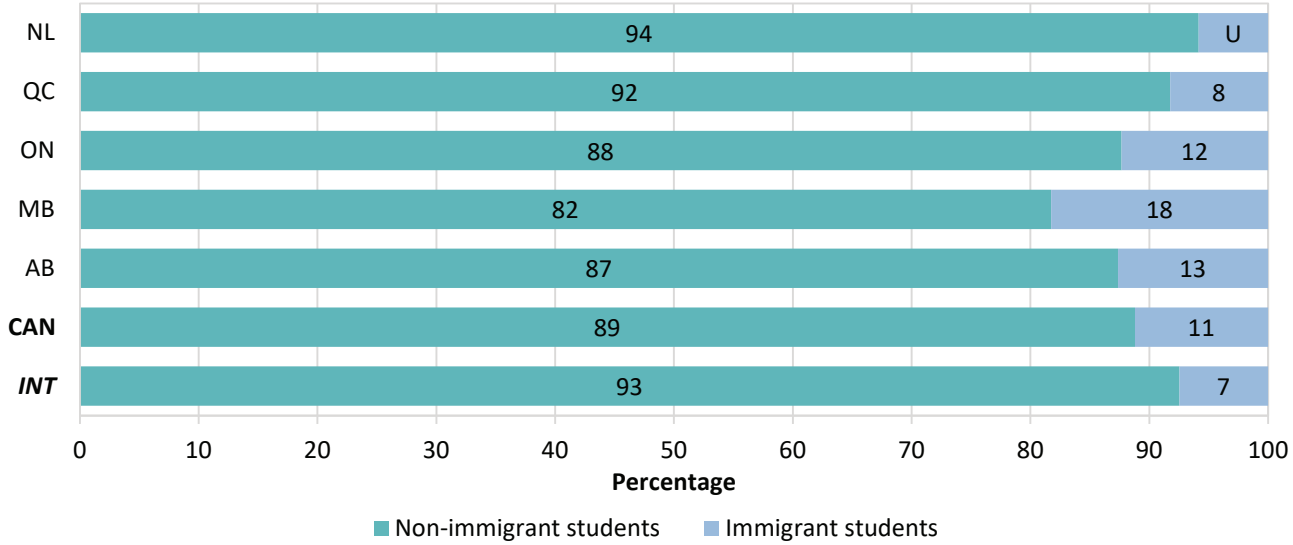
Immigration status

Canada has the second-largest foreign-born population in the world in proportion to its overall population, behind only Australia (CMEC, 2015; Duff & Becker-Zayas, 2017; Parkin, 2015). Research has found that children in immigrant families are more likely to be educationally disadvantaged (Andon, Thompson, & Becker, 2014; Bruckauf, 2016; OECD, 2010). Using data from earlier cycles of the Programme for International Student Assessment (PISA), Progress in International Reading Literacy Study (PIRLS), and the Trends in International Mathematics and Science Study (TIMSS), Andon et al. (2014) have concluded that an achievement gap exists between immigrant and non-immigrant students in the three domains of reading, mathematics, and science across OECD countries.

In Canada, immigrants are more likely than non-immigrants to fall into low-income categories (Collin & Jensen, 2009; CMEC, 2015). Despite this disadvantage, Canada is among the OECD countries that are more successful in closing the "immigrant achievement gap" (Parkin, 2015; Wech & Weinkam, 2016).

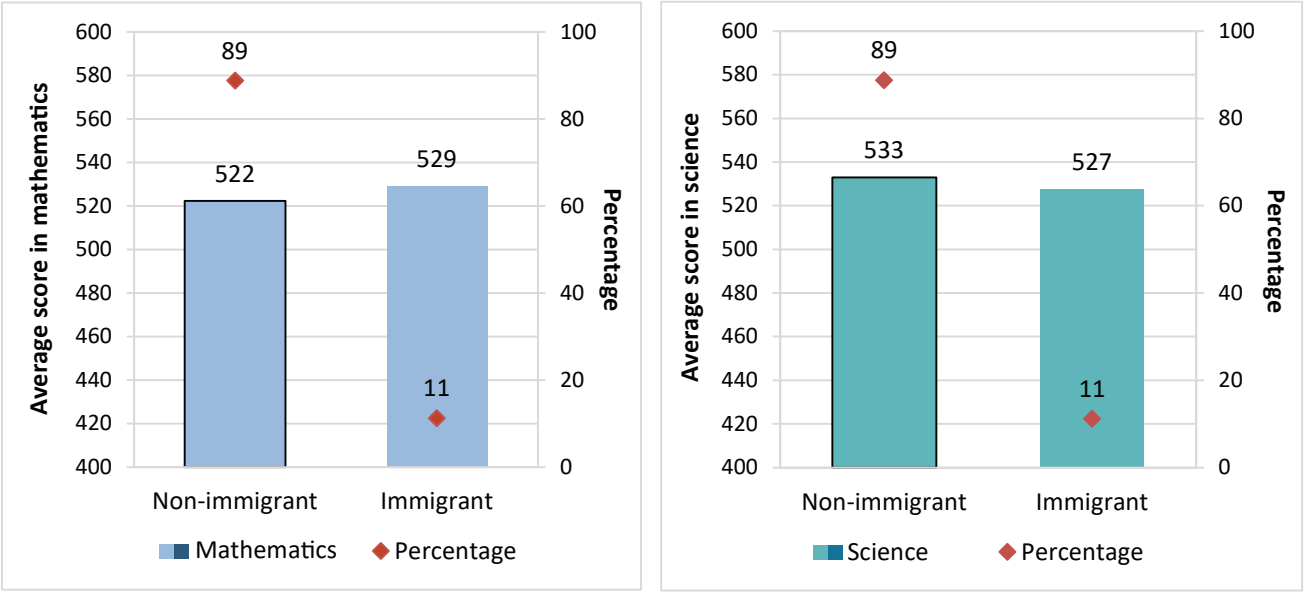
Based on the TIMSS 2019 data, approximately 89 percent of participating students were born in Canada. This was similar to the international average of 93 percent being born in the country of the assessment. Newfoundland and Labrador had the highest rate of students born in Canada (94 percent), while Manitoba had the lowest rate of students born in Canada (82 percent) (Figure 2.8; Appendix B.2.5). As shown in Figure 2.9, there was no significant difference in achievement between immigrant and non-immigrant students in Canada in either mathematics or science. This is consistent with the finding for 15-year-olds in PISA 2018 (O'Grady, Deussing, Scerbina, Tao, Fung, Elez, & Monk, 2019).

FIGURE 2.8 Percentage of immigrant students



Note: U – data too unreliable to be published.

FIGURE 2.9 Relationship between immigration status and achievement



Note: Darker shade denotes significant difference compared to the non-immigrant category.

Speaking the language of the test at home

Canada is a multilingual and multicultural country with various immigrant and Indigenous populations. In the 2016 census, over 200 languages were reported as a mother tongue (Statistics Canada, 2017). "Mother tongue," as used in Statistics Canada data reports, may be considered synonymous with "first language spoken." Canada's language groups may be classified into three distinct categories: official languages, non-official or heritage languages, and Indigenous languages (Duff & Becker-Zayas, 2017).

In Canada, approximately one in four students sometimes or never 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 (eight percent) (Figure 2.10; Appendix B.2.6). Students who sometimes or never spoke the language of the test at home scored slightly lower in science than those who always or almost always spoke it, while the difference is not statistically significant in mathematics (Figure 2.11).

FIGURE 2.10 Percentage of students who speak the language of the test at home

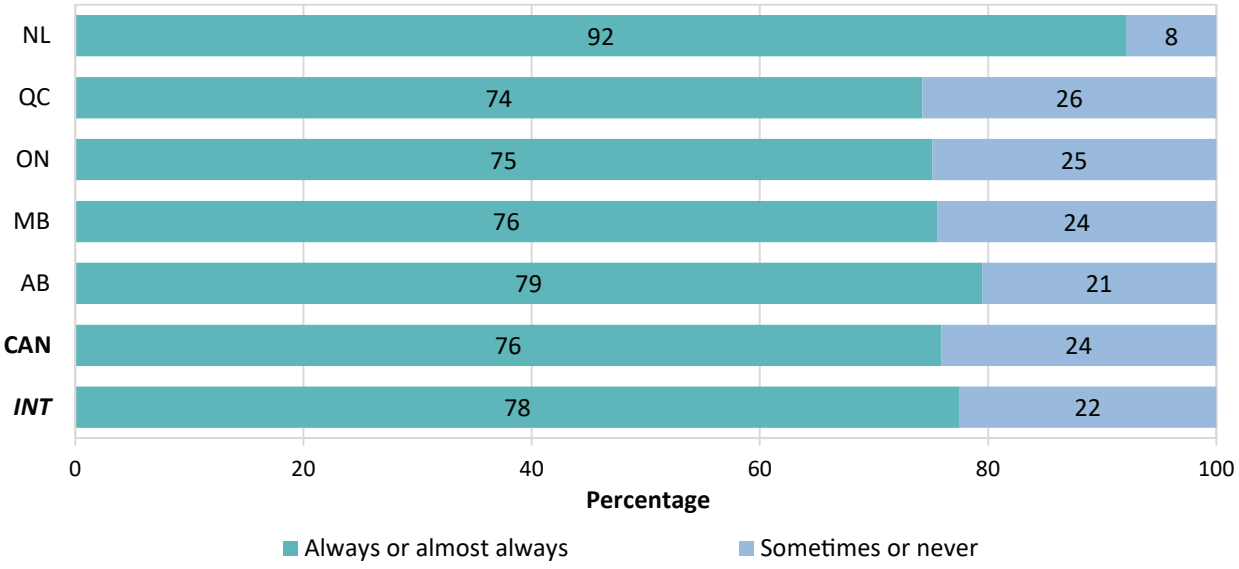
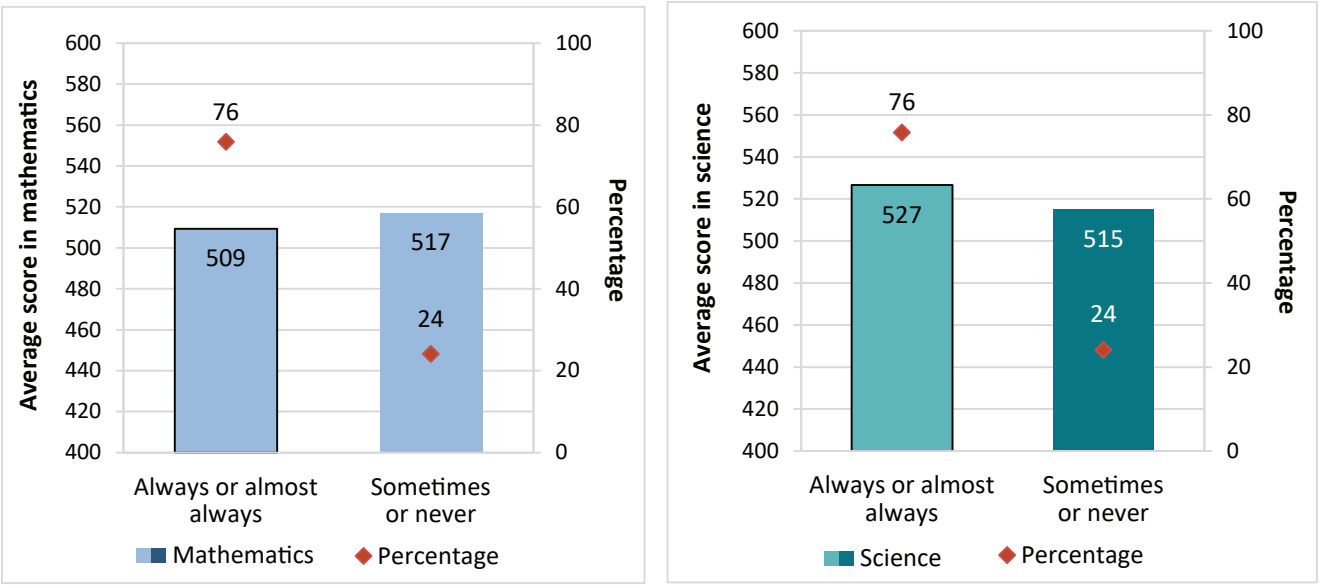


FIGURE 2.11 Relationship between percentage of students who speak the language of the test at home and achievement

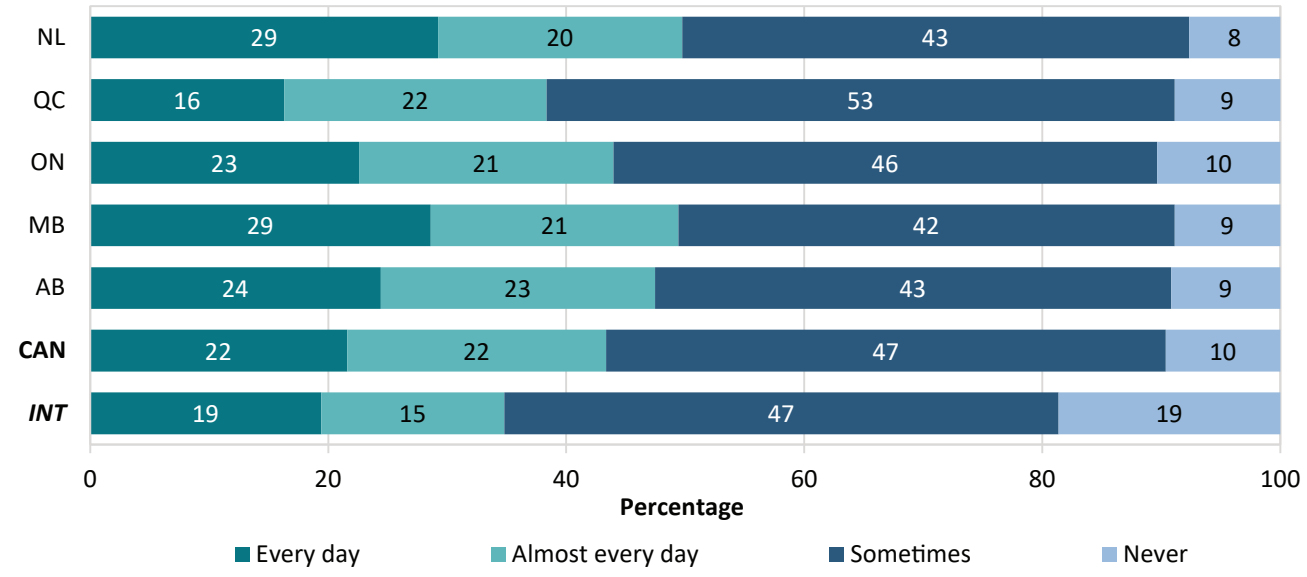


Note: Darker shade denotes significant difference compared to the always or almost always category.

Students feeling tired or hungry

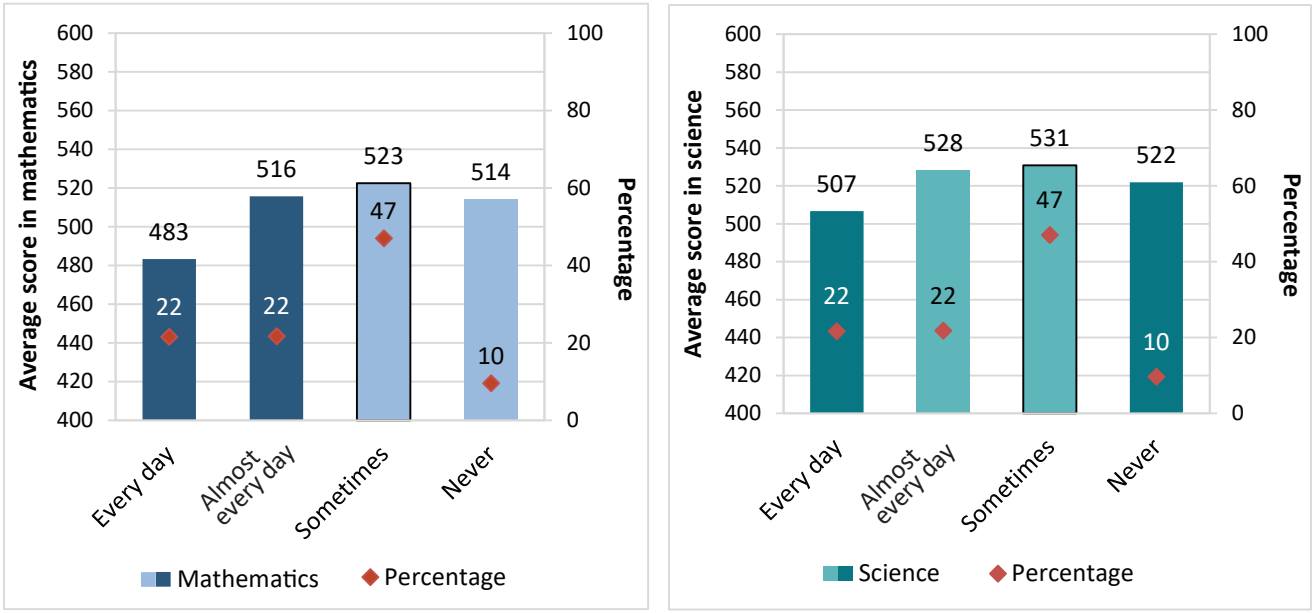
Before engaging with learning content, students must have positive physiological dispositions, free of nutritional problems (Taras, 2005) or sleep deprivation (Dewald, Meijer, Oort, Kerkhof, & Bögels, 2010). Otherwise, students' ability to learn in school may be affected by how tired or hungry they feel. In Canada, one in five Grade 4 students experience feeling tired at school every day or almost every day (22 percent). This was higher than the international proportion of students who expressed feeling tired every day (19 percent). Another 47 percent of students in Canada reported feeling tired at school sometimes, and roughly 10 percent reported never feeling tired at school. Newfoundland and Labrador and Manitoba had the highest rates of students reporting feeling tired every day (29 percent) while Quebec had the lowest rate of students reporting the same (16 percent) (Figure 2.12; Appendix B.2.7).

FIGURE 2.12 Percentage of students who feel tired at school



Canadian students who reported experiencing feeling tired at school every day achieved lower scores in mathematics (483 points) and science (507 points) than their peers who only sometimes felt tired (523 points and 531 points, respectively) (Figure 2.13). Similarly, students who reported experiencing feeling tired at school almost every day achieved lower scores in mathematics (516 points) than their peers who only sometimes felt tired. However, those who reported never feeling tired at school scored slightly lower in science than students who sometimes felt tired.

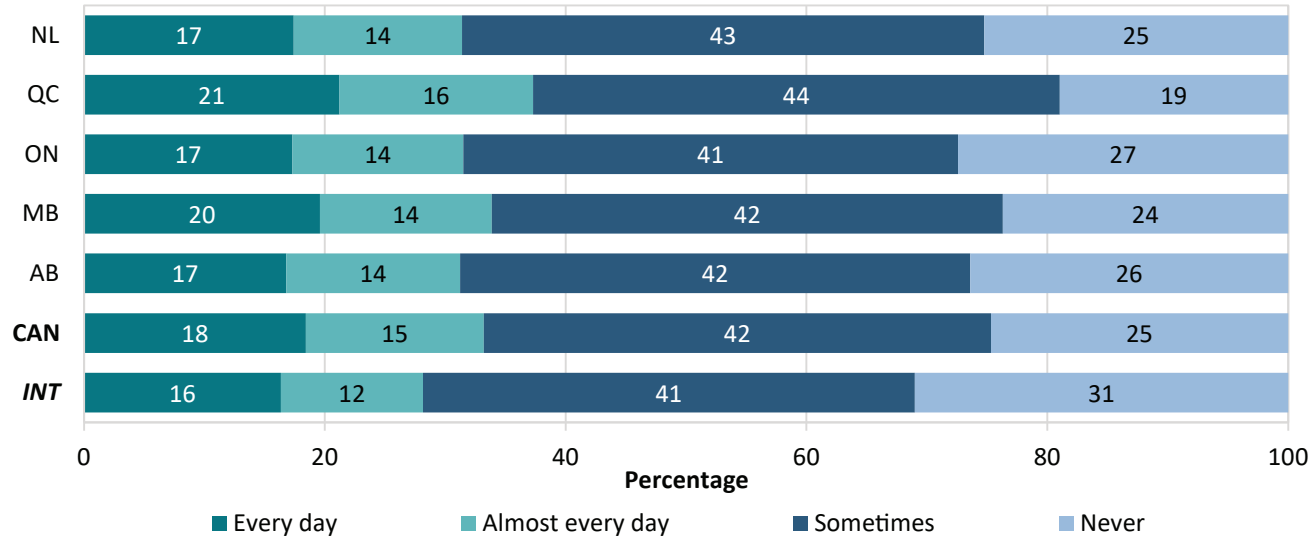
FIGURE 2.13 Relationship between feeling of tiredness and achievement



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

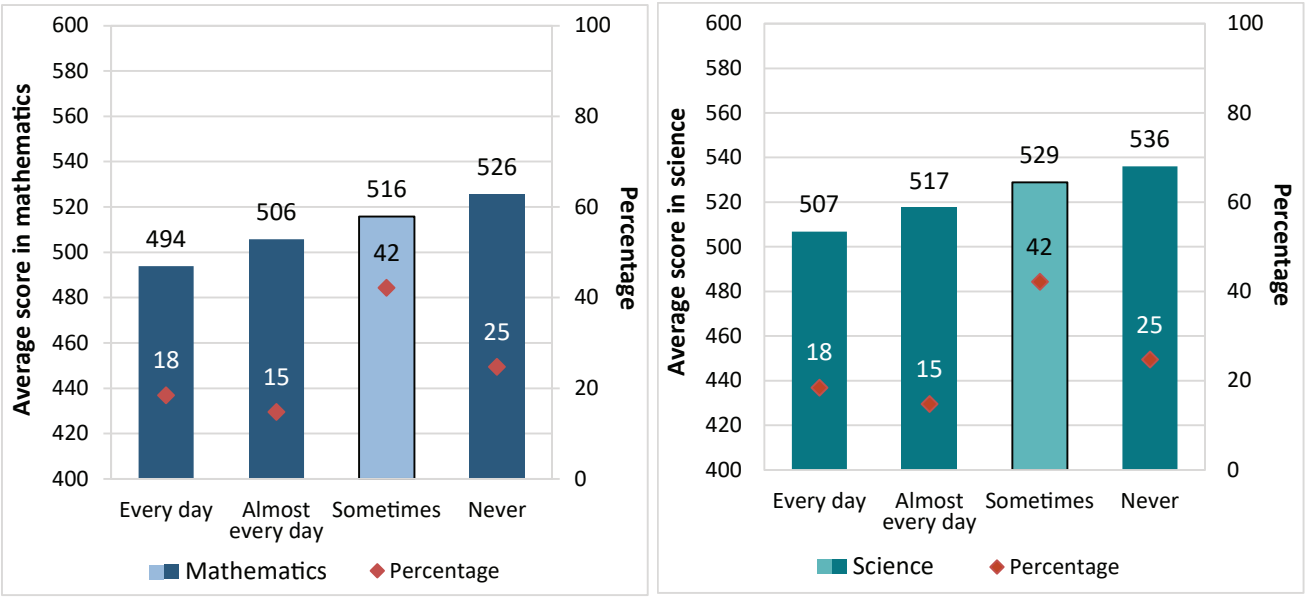
With reference to hunger, 18 percent of students in Canada experience feeling hungry every day at school. This is greater than the international average of 16 percent who reported feeling the same. Over 21 percent of students in Quebec experience hunger every day at school, while 17 percent of students in Alberta, Ontario, and Newfoundland and Labrador experience the same (Figure 2.14; Appendix B.2.8).

FIGURE 2.14 Percentage of students who feel hungry at school



Parallel to feelings of tiredness, students who reported experiencing feeling hungry at school every day had lower average scores in mathematics (494 points) and in science (507 points) than their peers who reported feeling hungry at school sometimes (516 points and 529 points, respectively). In a similar manner, those who reported never feeling hungry at school were associated with the highest mathematics score (526 points) and science score (536 points) (Figure 2.15). Multiple studies have shown that Canadian students who eat breakfast have better achievement results. However, the proportion of students never or almost never eating breakfast increases between Grade 4 (7 percent in TIMSS 2015 and PIRLS 2016) and Grade 8 (14 percent in TIMSS 2015) and remains high in Grade 10 (24 percent in PISA 2015) (CMEC, 2020).

FIGURE 2.15 Relationship between feeling of hunger and achievement



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

In-school factors

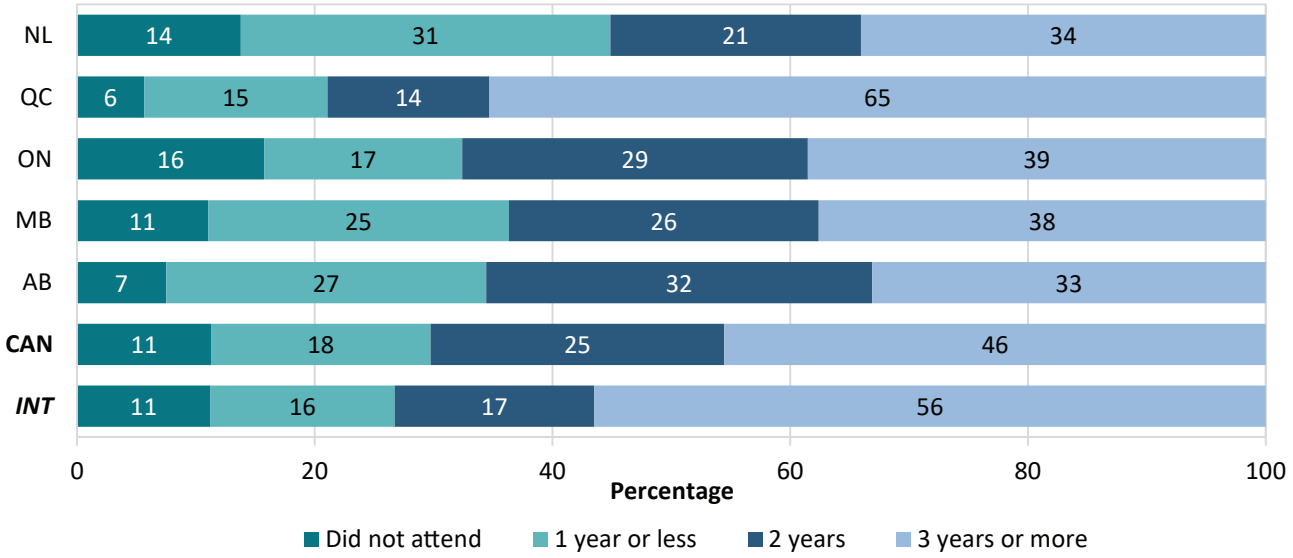
Preschool

In Canada, formal primary/elementary schooling begins in Grade 1, typically when the student is six years old. However, many families opt to enrol their children into kindergarten, a form of early childhood education and care. As such, though not mandatory in most provinces and territories, a large majority of students begin schooling in either Junior Kindergarten ("JK") at the age of four years or Senior Kindergarten ("SK") at the age of five years. Indeed, school readiness in the form of early literacy and numeracy skills and knowledge, even in advance of entering preschool, can bolster academic achievement later in students' academic trajectories (Pagani & Fitzpatrick, 2014). To this end, TIMSS 2019 asked students and their parents to report the number of years of having attended preschool, the frequency of having engaged in early literacy and numeracy activities before entering preschool, and the student's age at start of primary/elementary school.

Preschool attendance

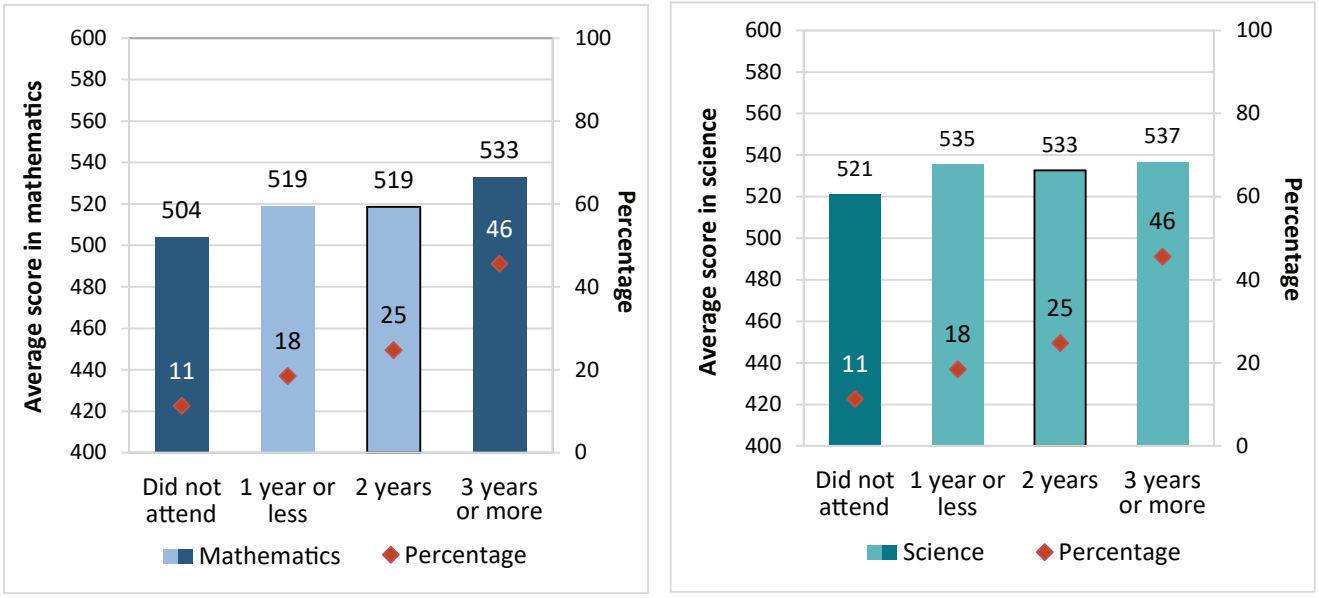
In Canada, approximately 46 percent of parents reported that their child attended preschool for three or more years. In Quebec, this rate was notably higher: 65 percent of parents reported three or more years of preschool attendance for their children. In each of the other provinces, less than 40 percent of parents reported the same (Figure 2.16; Appendix B.2.9).

FIGURE 2.16 Percentage of students who attended preschool



Students who were reported as not having attended any preschool achieved a mathematics score of 504 points and a science score of 521 points, 15 points and 11 points lower, respectively, than their peers who attended preschool for two years (Figure 2.17). As for students who attended preschool for three or more years, they achieved an average mathematics score of 533 points and an average science score of 537 points.

FIGURE 2.17 Relationship between preschool attendance and achievement



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

Early literacy and numeracy activities before preschool

To gauge students' activity level in literacy and numeracy before entering preschool, parents were asked to report the frequency that they or someone else in their home had engaged the child in activities at home. Parents were asked to select one of three response options (i.e., often, sometimes, never/almost never) to report on the frequency of their child's engagement in 18 different types of activities that ranged from reading, playing, writing, measuring, and drawing, among others (see Table 2.2). Based on these parent responses, an

Early Literacy and Numeracy scale was developed with three categories. The "often" category corresponded to students who had often engaged in nine of the 18 activities, the "never or almost never" category corresponded to students who never engaged in nine of the activities along with sometimes engaging in nine of the other activities. All other students were assigned the "sometimes" category.

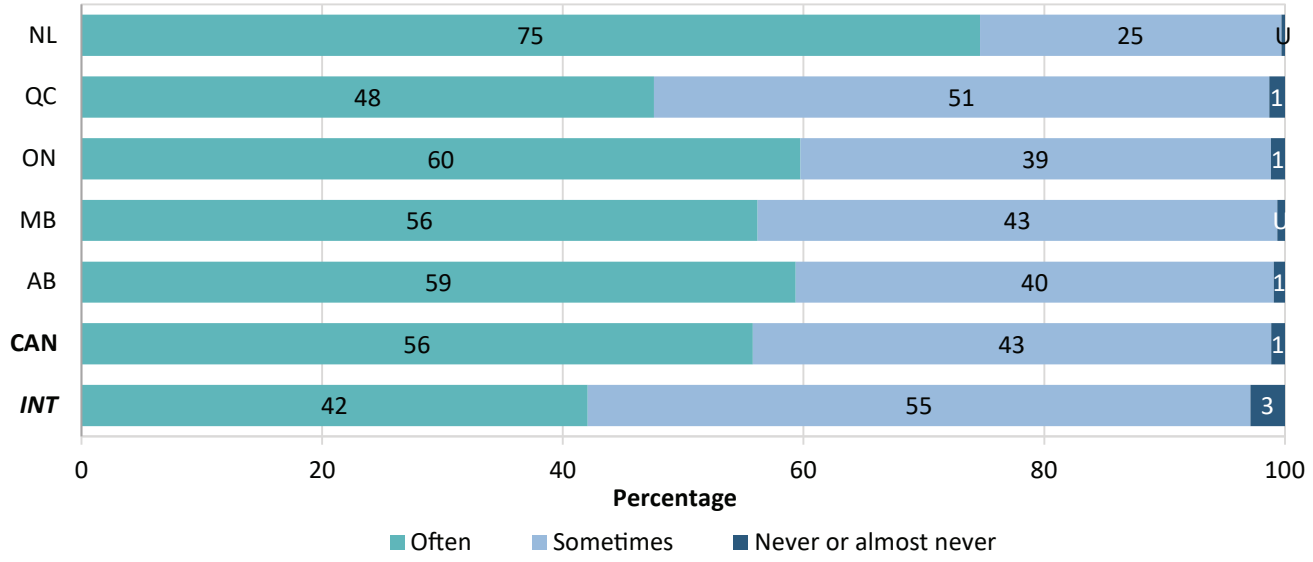
TABLE 2.2 Early literacy and numeracy activities before preschool (Home Questionnaire)

Before your child began primary/elementary school, how often did you or someone else in your home do the following activities with him/her?

1) Read books
2) Tell stories
3) Sing songs
4) Play with alphabet toys (e.g., block with letters of the alphabet)
5) Talk about thing you had done
6) Talk about what you had read
7) Play word games
8) Write letters or words
9) Read aloud signs and labels
10) Say counting rhymes or sing counting songs
11) Play with number toys (e.g. blocks with numbers)
12) Count different things
13) Play games involving shapes (e.g., shape shorting toys, puzzles)
14) Play with building blocks or construction toys
15) Play board or card games
16) Write numbers
17) Draw shapes
18) Measure or weigh things (e.g., when cooking)

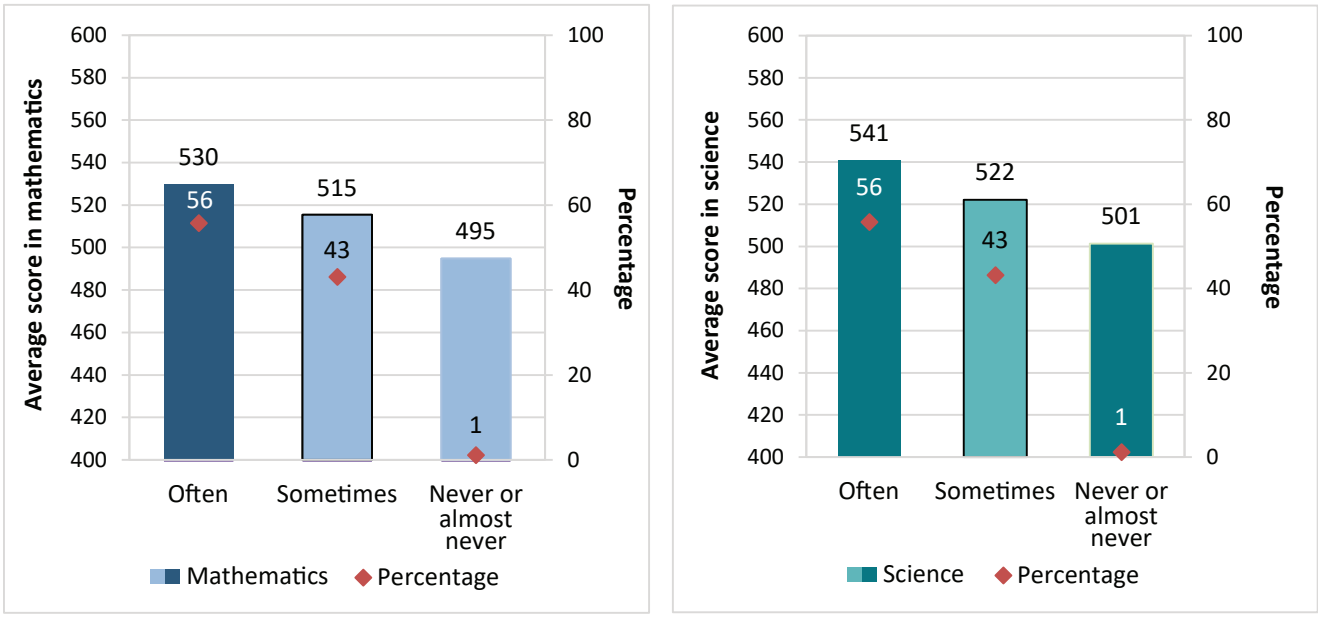
Over half of parents in Canada reported that their children often participated in literacy and numeracy activities even prior to entering preschool (Figure 2.18; Appendix B.2.10). In Newfoundland and Labrador this rate was particularly high compared to other participating provinces, with three quarters of parents reporting that their children often participated in such activities prior to preschool. In Canada, students who often engaged in early literacy and numeracy activities achieved on average 530 points in mathematics and 541 points in science (Figure 2.19).

FIGURE 2.18 Percentage of students who engaged in early literacy and numeracy activities before preschool



Note: U – data too unreliable to be published.

FIGURE 2.19 Relationship between early literacy and numeracy activities and achievement

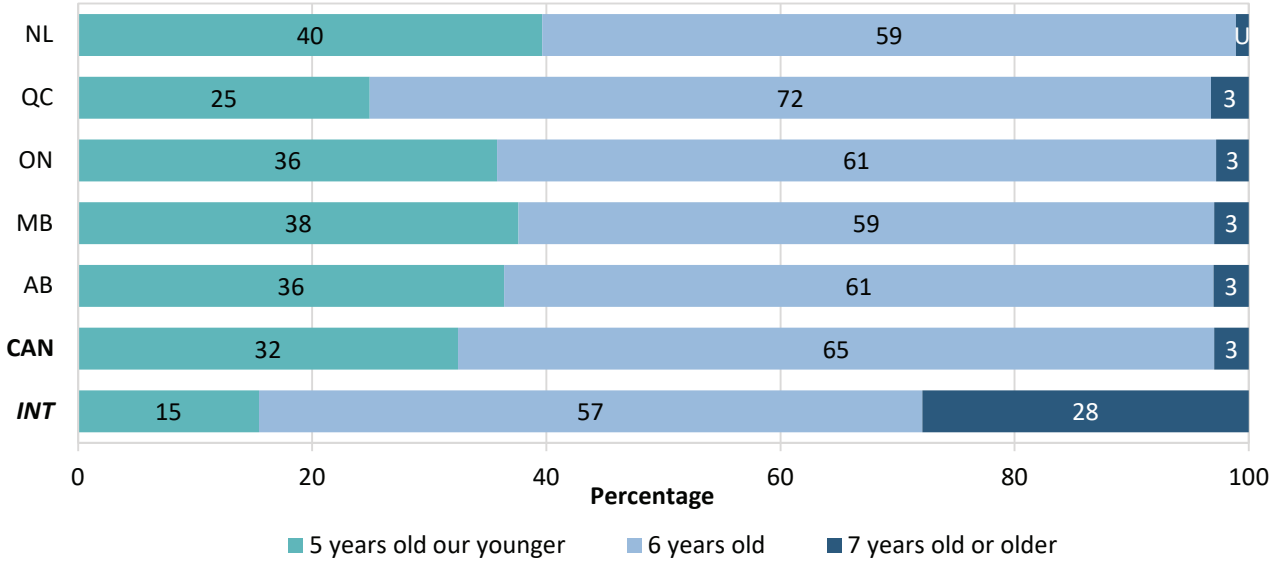


Note: Darker shade denotes significant difference compared to the sometimes category.

Age at start of primary/elementary school

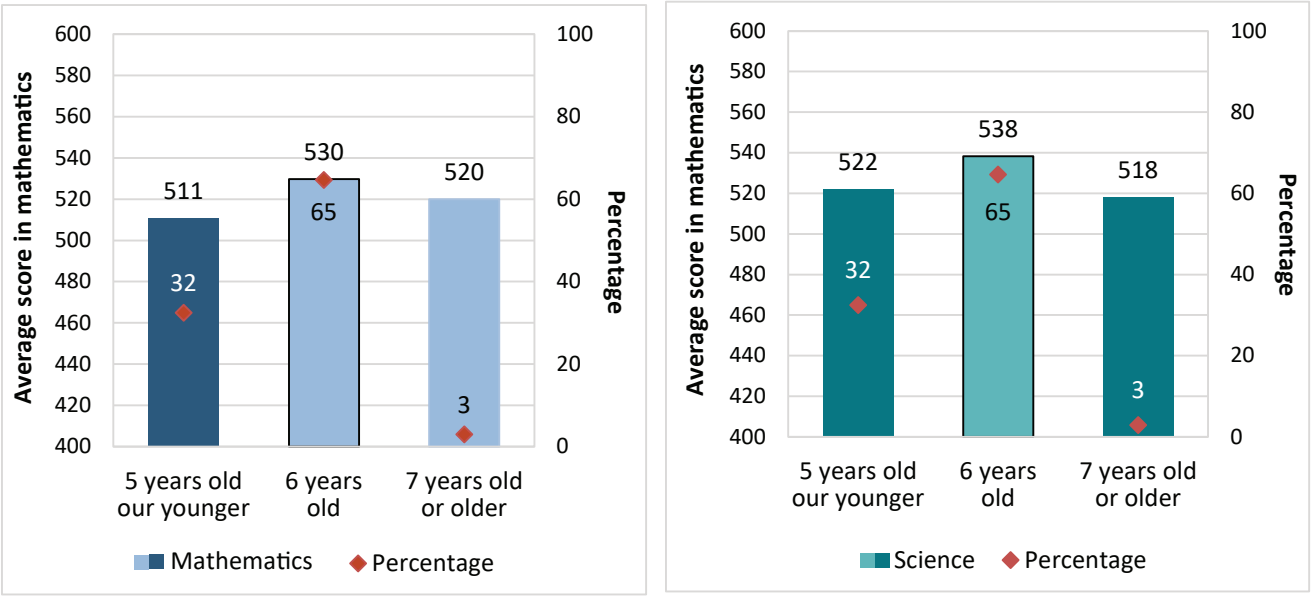
In Canada, a majority of students began primary/elementary school at the age of six years. In Quebec, the largest proportion of students entered school at this age (72 percent), whereas in Newfoundland and Labrador and Manitoba, the smallest proportion of students (59 percent) had begun school at the age of six (Figure 2.20; Appendix B.2.11). Compared to those who began primary/elementary school at 6 years of age, students in Canada who began primary/elementary school at the age of 5 years achieved a lower mathematics score (511 points vs. 530 points) and a lower science score (522 points vs. 538 points) (Figure 2.21).

FIGURE 2.20 Students' age at the start of primary school



Note: U – data too unreliable to be published.

FIGURE 2.21 Relationship between students' age at the start of primary school and achievement



Note: Darker shade denotes significant difference compared to the 6 years old category.

Student confidence and sense of belonging

Students' feelings pertaining to their academic achievement and their schooling may affect their achievement. Indeed, studies have investigated the influence of students' self-confidence, finding it to be a factor commonly influencing mathematics performance across international jurisdictions (Ker, 2016). TIMSS 2019 asked students to report on their sense of belonging, frequency of bullying experienced, and their levels of confidence in mathematics and science.

Students' sense of belonging

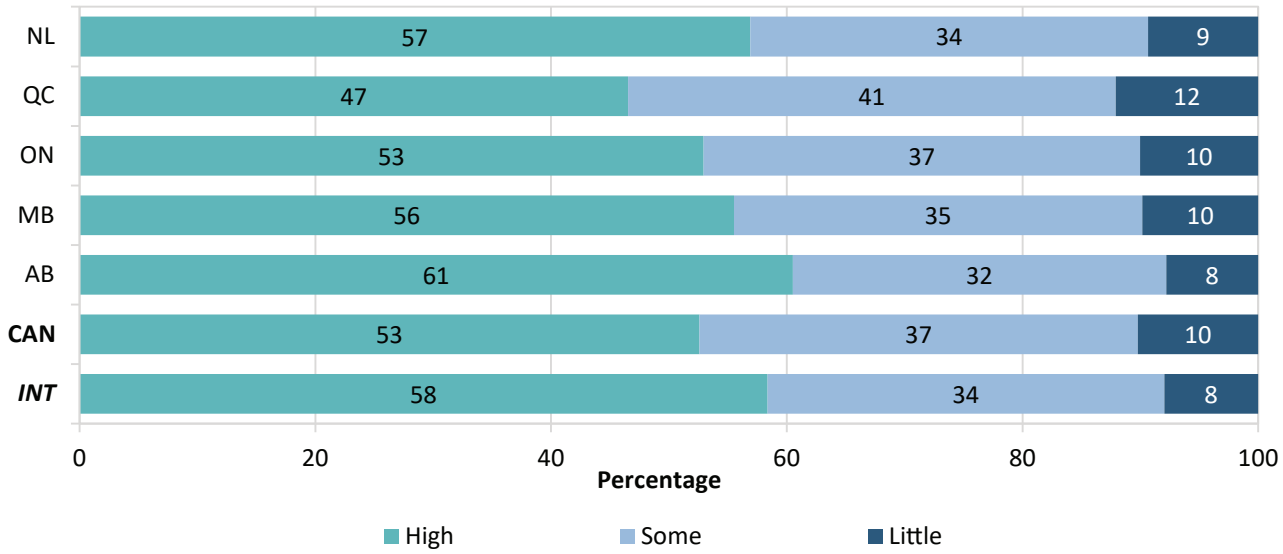
Students reported their feelings of belonging at school by selecting one of four response options (i.e., agree a lot, agree a little, disagree a little, disagree a lot) to five different items (see Table 2.3). Students who reported "agreeing a lot" with three of the five and "agreeing with a little" with the other two statements, on average, were categorized as a "high sense of school belonging". Students who responded with "disagreeing a little" to three of the five statements and "agreeing a little" with the other two statements, on average, were deemed to have "little sense of school belonging". All other students were categorized as "some sense of school belonging".

TABLE 2.3 Students' sense of school belonging (Student Questionnaire)

What do you think about your school? Tell how much you agree with these statements.
1) I like being in school
2) I feel safe when I am at school
3) I feel like I belong at this school
4) Teachers at my school are fair to me
5) I am proud to go to this school

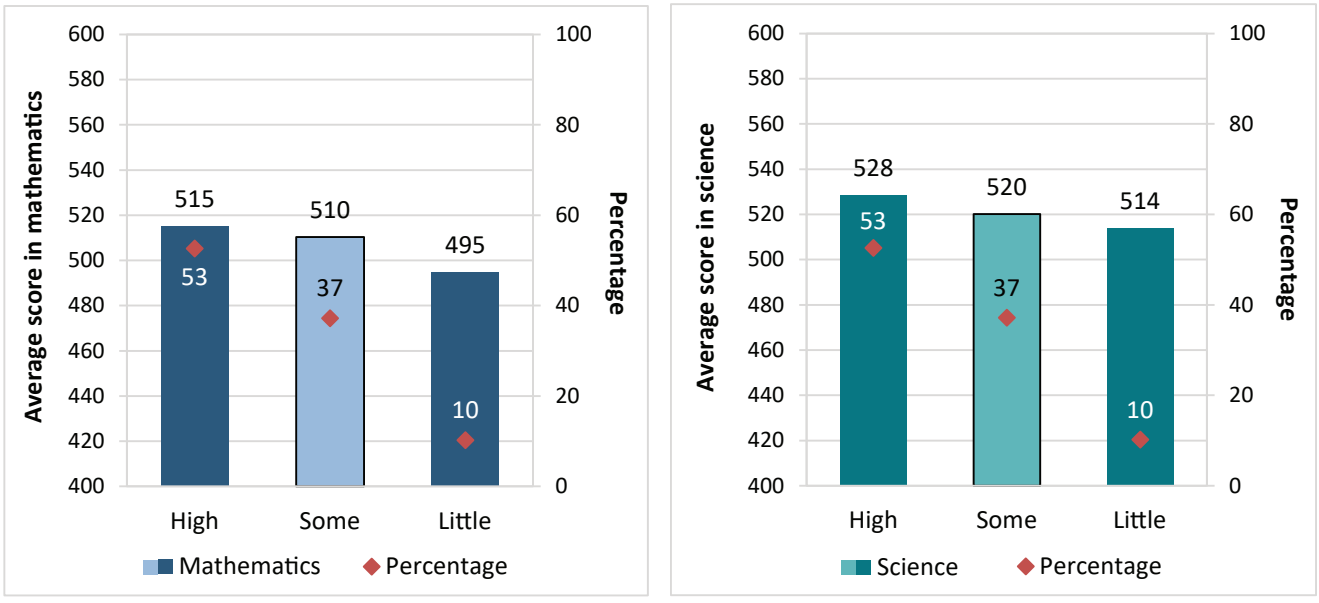
Over half of participating students in Canada reported feeling a high sense of belonging in school (Figure 2.22; Appendix B.2.12). Alberta had the highest proportion of these students (61 percent) while Quebec had the lowest proportion (47 percent).

FIGURE 2.22 Students' sense of belonging in school



In Canada, students who reported experiencing a high sense of belonging in school were associated with higher achievement scores than students who experienced some or little sense of belonging: students with a high sense of belonging scored 515 points in mathematics and 528 points in science (Figure 2.23). Conversely, students who reported experiencing little sense of belonging were associated with the lowest scores: 495 points in mathematics and 514 points in science.

FIGURE 2.23 Relationship between sense of belonging in school and achievement



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

Bullying

Students reported their experience with bullying at school by selecting one of four response options (i.e., never, a few times a year, once or twice a month, at least once a week) to 11 different items (see Table 2.4). Students who reported "never" experiencing 6 of the 11 bullying behaviours and who responded "a few times

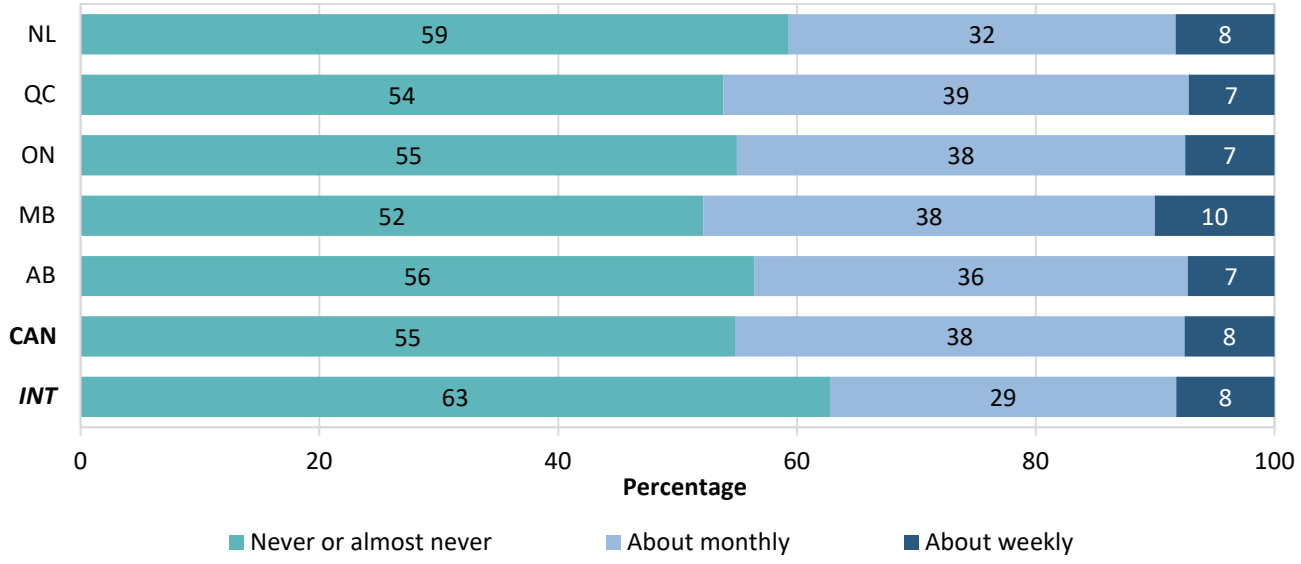
a year" to the other five statements, on average, were categorized as a "never or almost never" experiencing bullying overall. Students who responded with "once or twice a month" to 6 of the 11 bullying statements and "a few times a year" to the other five statements, on average, were categorized as experiencing bullying "about weekly". All other students were categorized as experiencing bullying "about monthly".

TABLE 2.4 Student bullying (Student Questionnaire)

During this year, how often have other students from your school done any of the following things to you, including through texting or the Internet?
1) Made fun of me or called me names
2) Left me out of their games or activities
3) Spread lies about me
4) Stole something from me
5) Damaged something of mine on purpose
6) Hit or hurt me (e.g. shoving, hitting, kicking)
7) Made me do things I didn't want to do
8) Sent me nasty or hurtful messages online
9) Shared nasty or hurtful messages about me online
10) Shared embarrassing photos of me online
11) Threatened me

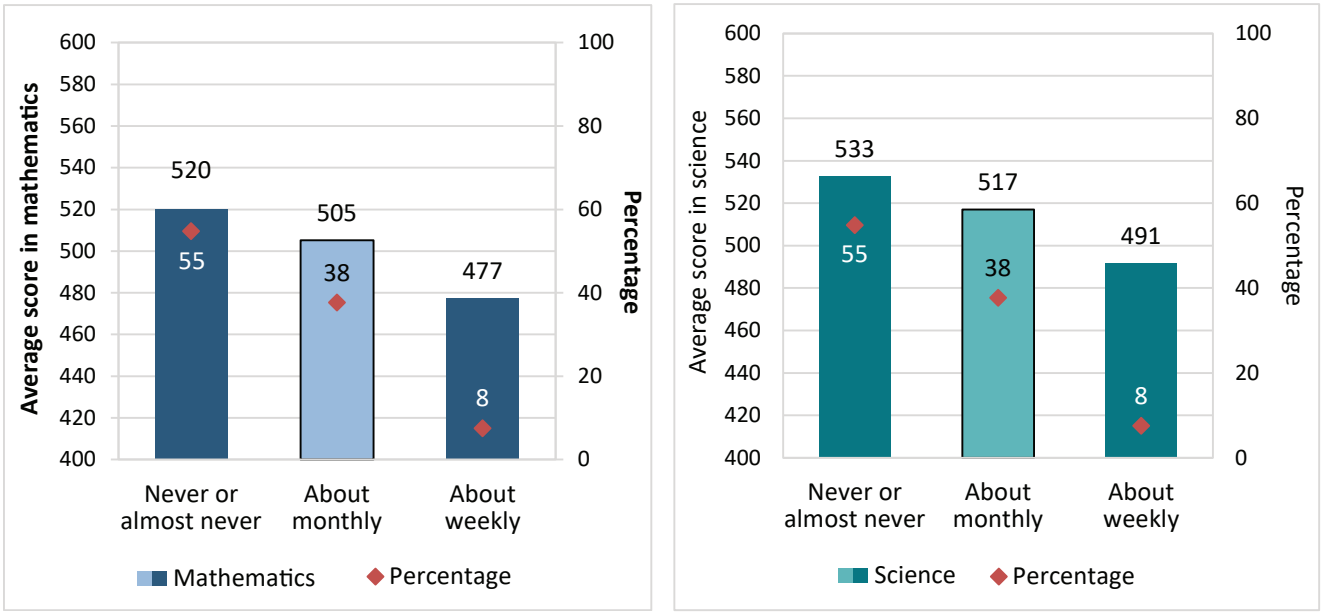
In Canada, over half of students reported never or almost never experiencing bullying (Figure 2.24; Appendix B.2.13). However, a sizeable proportion, 38 percent of students in Canada, experienced bullying every month, with 8 percent of students experiencing it weekly. Younger students report being victims of bullying more frequently than older students with close to one in five Grade 8 students and a similar proportion of 15-year-olds reporting bullying once a month or more (CMEC, 2019).

FIGURE 2.24 Frequency of students experiencing bullying



In Canada, students who reported never or almost never experiencing bullying achieved higher scores than those who experienced bullying about monthly: 15 points higher in mathematics (520 points vs. 505 points) and 16 points higher in science (533 points vs. 517 points) (Figure 2.25). Conversely, students who reported weekly experiences of bullying achieved lower scores than those who experienced bullying about monthly: 28 points lower in mathematics and 26 points lower in science.

FIGURE 2.25 Relationship between frequency of experiencing bullying and achievement



Note: Darker shade denotes significant difference compared to the about monthly category.

Students' confidence in mathematics and in science

Students reported their attitudes toward and experiences in mathematics and science by selecting one of four response options (i.e., agree a lot, agree a little, disagree a little, disagree a lot) to nine and seven different items, respectively (Table 2.5). The students' confidence scale consisted of three categories: very confident, somewhat confident, and not confident. The "very confident" category corresponded to students who reported "agreeing a lot" with five of the nine items for mathematics (four of the seven items for science) and "agreeing a little" with the other four statements, on average. The "not confident" category corresponded to students who responded with "disagreeing a little" to five of the nine items for mathematics (four of the seven items for science) and "agreeing a little" with the other four statements, on average. The "somewhat confident" category corresponded to all other student responses.

TABLE 2.5 Students' confidence in mathematics and in science

How much do you agree with these statements…
about mathematics?
1) I usually do well in mathematics
2) Mathematics is harder me than for many of my classmates
3) I am just not good at mathematics
4) I learn things quickly in mathematics
5) Mathematics makes me nervous
6) I am good at working out difficult mathematics problems
7) My teacher tells me I am good at mathematics
8) Mathematics is harder for me than any other subject
9) Mathematics makes me confused
about science?
1) I usually do well in science
2) Science is harder for me than for many of my classmates
3) I am just not good at science
4) I learn things quickly in science
5) My teacher tells me I am good at science
6) Science is harder for me than any other subject
7) Science makes me confused

A large percentage of students in Canada experienced feeling somewhat confident in mathematics (46 percent) and science (45 percent), with another sizeable portion of students feeling very confident in these two domains (35 percent and 32 percent, respectively) (Figure 2.26; Appendix B.2.14). Students who reported feeling very confident in mathematics and science were associated with a higher average score, achieving 555 points in mathematics and 540 points in science, than those who felt only somewhat confident (Figure 2.27). In contrast, students who reported feeling not confident in the two subjects achieved a mathematics score of 464 points and a science score of 498 points.

FIGURE 2.26 Students' sense of confidence in mathematics and science

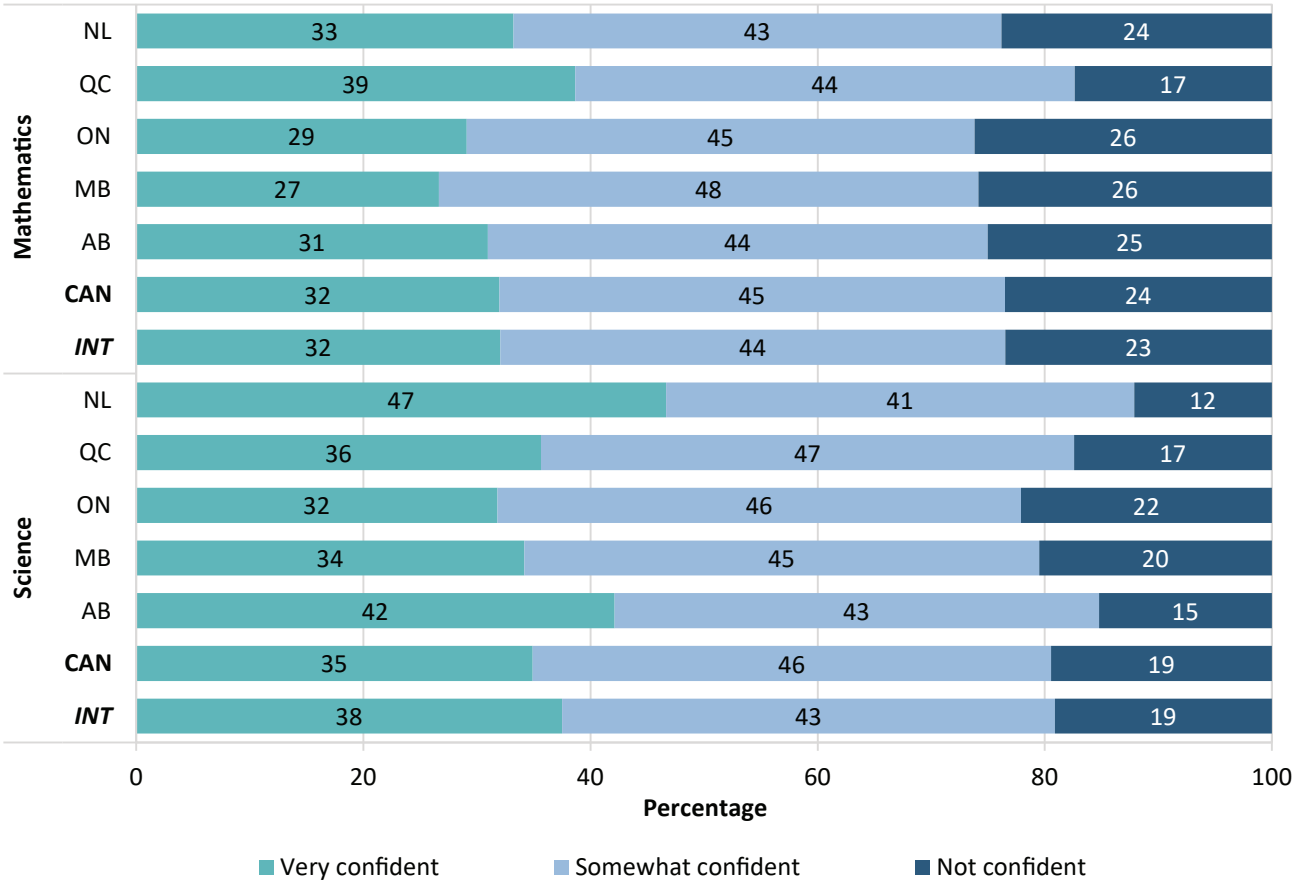
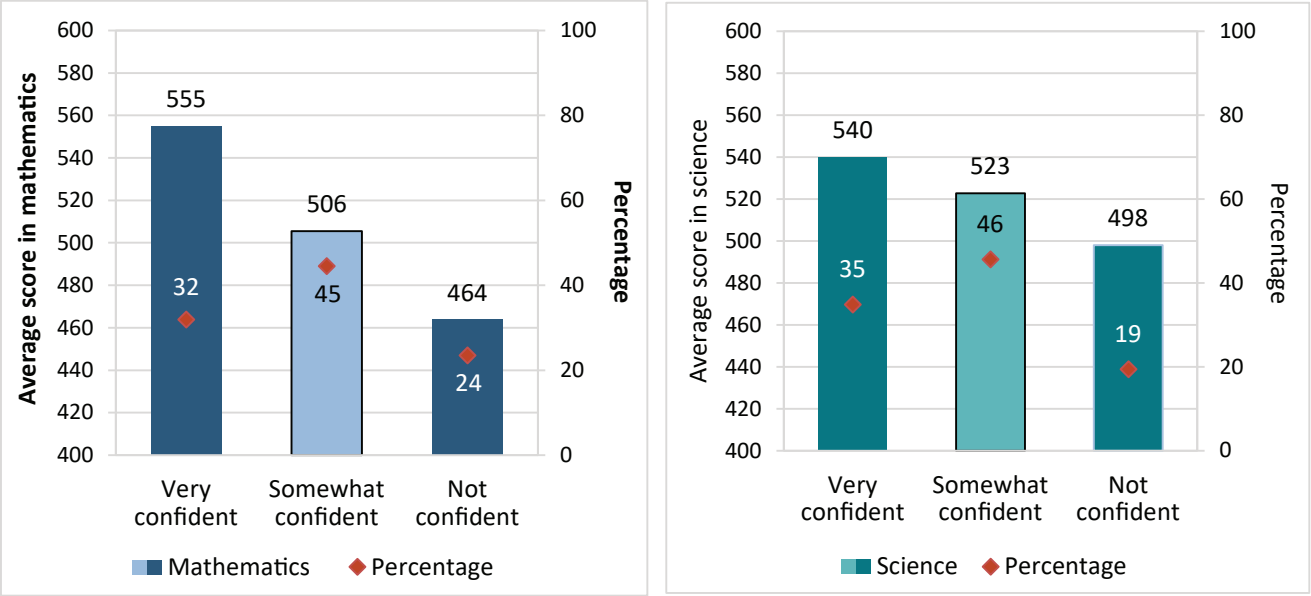


FIGURE 2.27 Relationship between confidence in mathematics and science and achievement



Note: Darker shade denotes significant difference compared to the somewhat confident category.

Summary

In this chapter, variation in student achievement was explored in relation to out-of-school factors and in-school factors. The former was defined by both parent involvement and student characteristics, whereas the latter was defined by preschool processes and student confidence and belonging. Both of these types of factors were explored in relation to student achievement in mathematics and science.

In regard to parent involvement, expected trends were observed in both parents' expectation of educational attainment and in students' supplementary mathematics lessons. Students with parents who expected them to attain a higher level of education achieved higher average mathematics and science scores. Moreover, students who participated in supplementary mathematics lessons for enrichment purposes were associated with the highest mathematics scores compared to those who attended for remedial purposes and for those did not take any supplementary lessons at all. As for student characteristics, several trends were observed in relation to mathematics and science achievement. First, the three percent of students who identified in non-binary gender terms achieved the higher scores in both mathematics and science compared to their peers who identified as girls or to those who preferred not to disclose while no significant difference was found compared to students who self-identified as boys. Students with many home resources for learning were associated with greater average mathematics and science achievement than those who had only some or few.

Based on the TIMSS 2019 data, approximately 89 percent of participating students were born in Canada and no significant difference in achievement between immigrant and non-immigrant students was found in Canada in either mathematics or science. Regarding the language of the test spoken at home, students who sometimes or never spoke the language of the test at home were associated with a lower average science score than students who always or almost always spoke the language. This was not seen in the scores for mathematics. Finally, students who reported feeling tired every day were associated with the lowest average achievement scores in both mathematics and science. The same trend was observed for those who reported feeling hungry every day.

In-school trends were also considered in relation to mathematics and science achievement. In terms of preschool attendance, students who did not attend preschool had lower math and science scores than students who attended preschool for any number of years. Additionally, students who had often engaged in early literacy and numeracy activities were associated with higher average achievement scores in mathematics and science compared to those who sometimes did so. In terms of students' sense of belonging those who reported feeling little sense of belonging achieved lower average achievement scores in mathematics and science compared to those who feel some or a high sense of belonging. Students experiencing bullying about weekly were associated with lower average achievement scores than those who experienced it less frequently. Finally, students who expressed being very confident in both mathematics and science were associated with a higher average score than students expressing that they feel less confident.

Overall, student and parent responses provided information on students' out-of-school and in-school contexts. Using this information, associations between students' contextual factors and their scores can help to explain the variation in mathematics and science achievement and enable better understanding of the differences in student performance across Canada.

CHAPTER 3
Context of Learning: Characteristics of Schools, Teachers, and Classrooms

TIMSS 2019 developed a compendium, the TIMSS 2019 Encyclopedia (Kelly, Centurino, Martin, & Mullis, 2020), that provides descriptions, at the system level in participating countries, of the structure and organization of education, the mathematics and science curricula (including how student learning is monitored), the characteristics of the teaching workforce, and the use and impact of TIMSS. The Canadian chapter was prepared by the Council of Ministers of Education, Canada, with contributions from provincial departments and ministries of education. It provides a valuable resource for comparing how participating provinces differ in the teaching of mathematics and science, as well identifying what proportion of the topics covered by the test have been taught.

As important as achievement results may be in assessing how well education systems meet the needs of students and society, understanding how contextual factors shape student learning is at least as important. Using information from TIMSS questionnaires, this chapter analyzes findings related to these three areas in Canada and at the provincial level, as well as internationally when relevant:

- school characteristics
- teacher and classroom characteristics
- technology in education

School characteristics

The TIMSS School Questionnaire was completed by principals or their designates. It covered seven areas of interest:

- school enrolment and characteristics
- instructional time
- resources and technology
- school emphasis on academic success
- school discipline and safety
- school readiness
- principal experience and education

Across Canada, 689 principals of schools that participated in the Grade 4 study responded to the School Questionnaire, for a Canadian response rate of 95 percent. Although the questionnaires cover many relevant areas, only a select number of results are presented here for illustrative purposes. Further, two areas of interest, student bullying and sense of school belonging, have been discussed in Chapter 2 of this report. More detailed analysis of these questionnaires will be presented in other reports and publications from CMEC in the future.

Socioeconomic status of the school

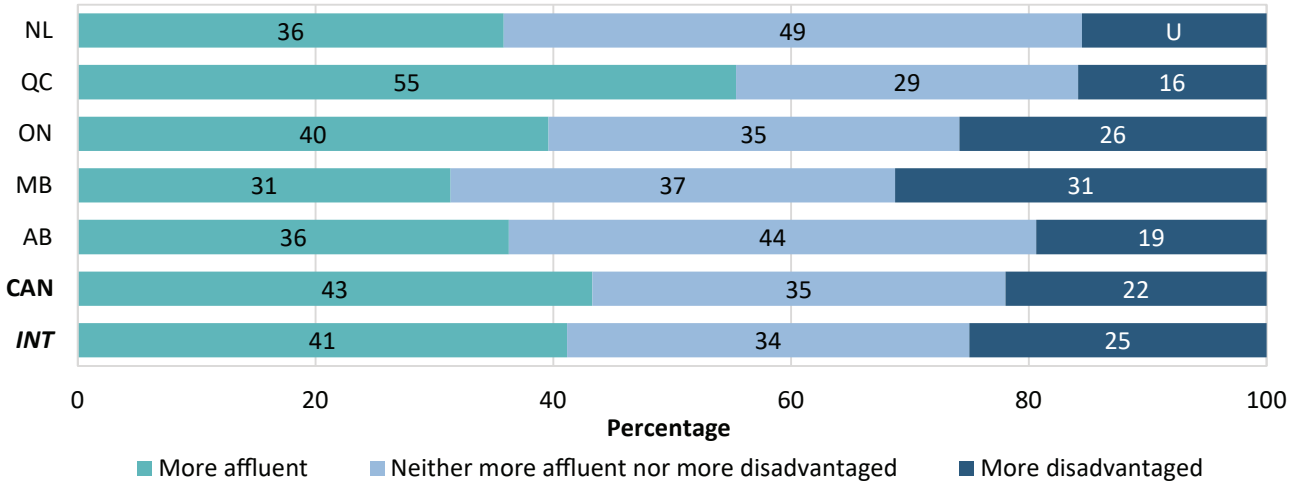
In his meta-analysis of studies between 1990 and 2000, Sirin (2005) concluded that there was a strong relationship between the socioeconomic level of a school and student achievement, suggesting that the socioeconomic environment of both the home and the school can affect student achievement. Because educational attainment is a central component of social mobility, policy-makers have a strong interest

in improving educational outcomes for all students, regardless of their socioeconomic backgrounds (Chevalier, Harmon, O'Sullivan, & Walker, 2013). Fortunately, evidence suggests that well-structured policy interventions can have a particularly strong positive effect on the most disadvantaged children and families (Causa, Dantan, & Johansson, 2009; Merry, 2013).

School principals were asked about the socioeconomic background of their students by identifying the proportion of their students that come from economically disadvantaged or economically affluent homes. There were four options: 0 to 10 percent, 11 to 25 percent, 26 to 50 percent, and more than 50 percent. For this scale, more affluent schools are considered those in which more than 25 percent of the student body comes from economically affluent homes while no more than 25 percent come from economically disadvantaged homes. More disadvantaged schools have the opposite proportions: more than 25 percent of the student body comes from economically disadvantaged homes while no more than 25 percent come from economically affluent homes.

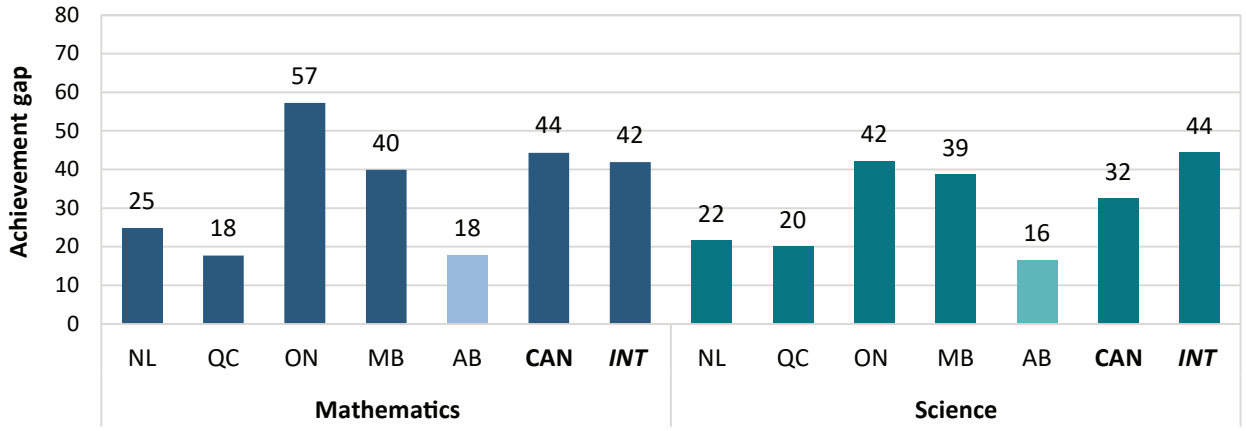
In Canada overall, 43 percent of students were in schools with relatively more affluent than disadvantaged students while 22 percent of students were in schools with more disadvantaged than affluent students. These proportions are similar to the international averages (Figure 3.1). Figure 3.2 shows the achievement gap between students in schools that are more affluent compared to those that are more disadvantaged. Achievement in both mathematics and science was highest for students in more affluent schools. For Canada overall, the achievement gap was 44 points in mathematics and 32 points in science at the Grade 4 level, whereas the gap was similar at the international level for both domains (42 points vs. 44 points, respectively). The size of the achievement gap by socioeconomic status of schools ranged from 16 points for science in Alberta to 57 points for mathematics in Ontario. Achievement gaps were significant for Canada and all provinces except for Alberta in both mathematics and science (Appendix B.3.1).

FIGURE 3.1 Socioeconomic composition of the student body in schools



Note: U – data too unreliable to be published.

FIGURE 3.2 **Difference in achievement between students in more affluent and those in more disadvantaged schools**



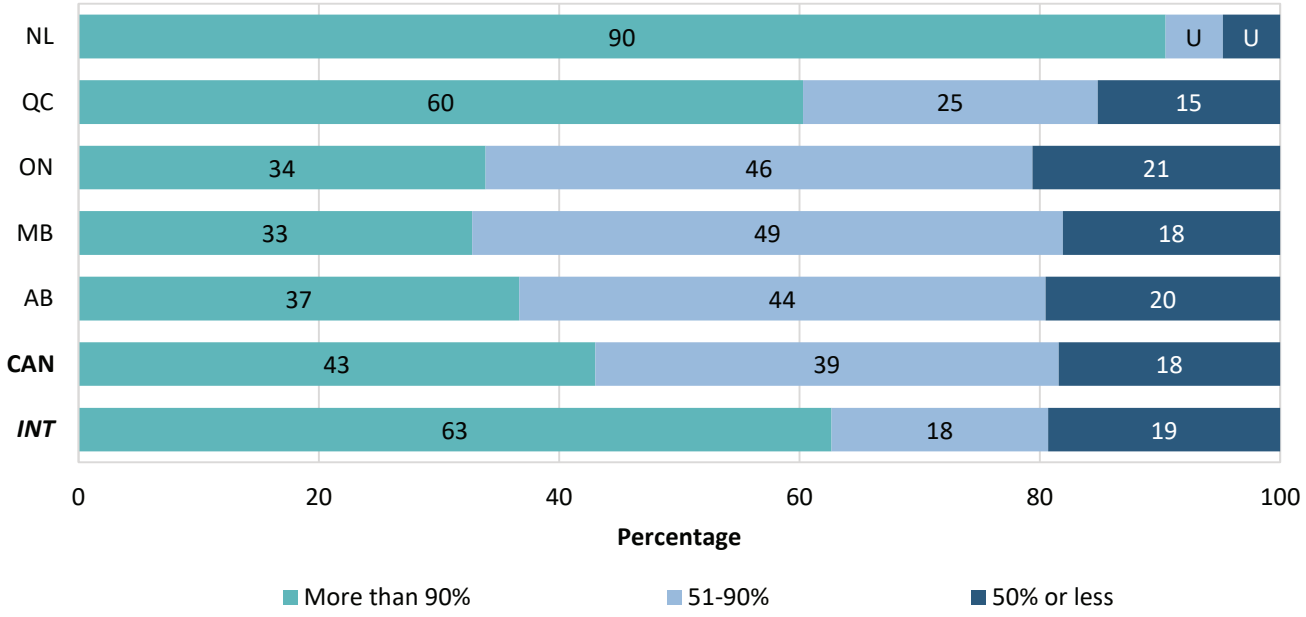
Note: Darker shade denotes significant difference between the more affluent category and more disadvantaged categories.

Speaking the language of the test at home

As was the case with students (refer to Chapter 2), principals were also asked about the home language of their students, specifically, what proportion of the students in their school had the language of the test as their first language. In Canadian anglophone schools this question asked about English while in francophone schools the question referred to French.

At the international level, 63 percent of students attended schools in which more than 90 percent of students spoke the language of the test at home while 18 percent were in schools where between 50 and 90 percent of students spoke the language of the test at home. In Canada, only 43 percent of students attended schools that reported that more than 90 percent of students spoke the language of the test at home; however, there were twice as many students in Canada (39 percent) that attended schools with 51 to 90 percent of students speaking the language of the test at home compared to the international average (Figure 3.3; Appendix B.3.2).

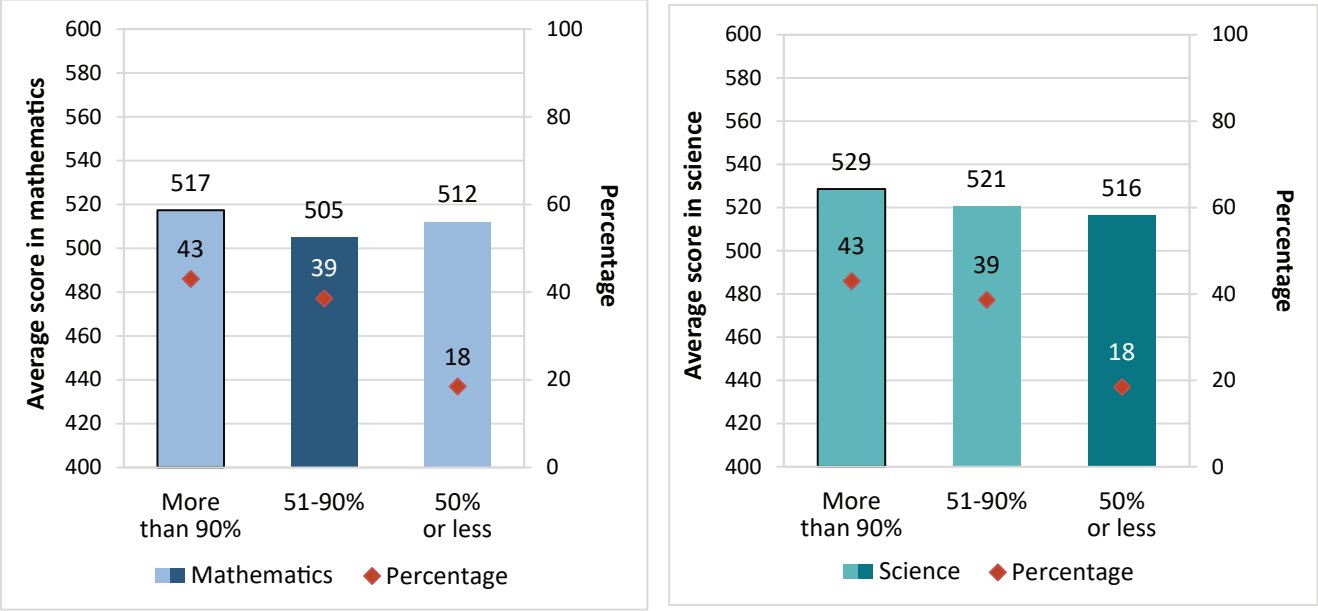
FIGURE 3.3 **Proportion of students speaking the language of the test at home**



Note: U – data too unreliable to be published.

In mathematics, students in Canadian schools in which 51 to 90 percent of students spoke the language of the test achieved significantly lower scores than those in schools in which for more than 90 percent of students the language of the test was the same as their home language. Results were similar between the more than 90 percent and 50 percent or less categories. In science, the only significant difference in achievement was found between students in schools with more than 90 percent of students speaking the language of the test compared with students attending schools with 50 percent or less speaking the language of the test as their first language (Figure 3.4). Few significant differences across categories were found at the provincial level (Appendix B.3.2).

FIGURE 3.4 Relationship between speaking the language of the test at home and student achievement



Note: Darker shade denotes significant difference compared to the more than 90% category.

School discipline

As was the case in TIMSS 2015, school principals were asked about their perceptions on discipline. Specifically, principals were asked to what degree discipline issues were a problem among fourth grade students in their schools. There were four response options (not a problem, minor problem, moderate problem, and severe problem). Based on the responses, the school discipline scale was developed with three categories: hardly any problems, minor problems, and moderate to severe problems. The 11 items that comprise the school discipline scale are shown in Table 3.1.

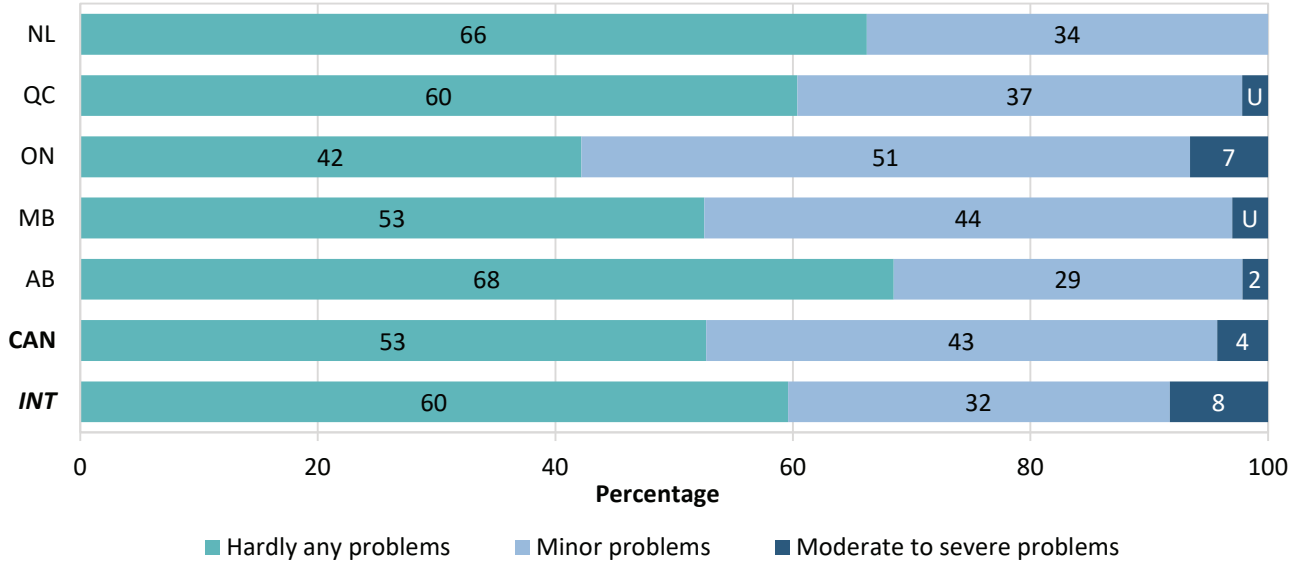
TABLE 3.1 Questionnaire items for the school discipline scale

To what degree is each of the following a problem among Grade 4 students in your school?
Arriving at school late
Absenteeism (i.e., unjustified absences)
Classroom disturbance
Cheating
Profanity
Vandalism
Theft
Intimidation or verbal abuse among students (including texting, emailing, etc.)
Physical fights among students
Intimidation or verbal abuse of teachers or staff (including texting, emailing, etc.)

At the Canada level, 53 percent of students were in schools that reported having hardly any discipline problems, which is lower than the international average (60 percent). More than 80 percent of students in four countries (Albania, Ireland, Kazakhstan, and the Netherlands) attended schools that reported having hardly any discipline problems. Among participating provinces, Ontario school principals reported the highest proportion for minor problems (51 percent) (Figure 3.5; Appendix B.3.3).

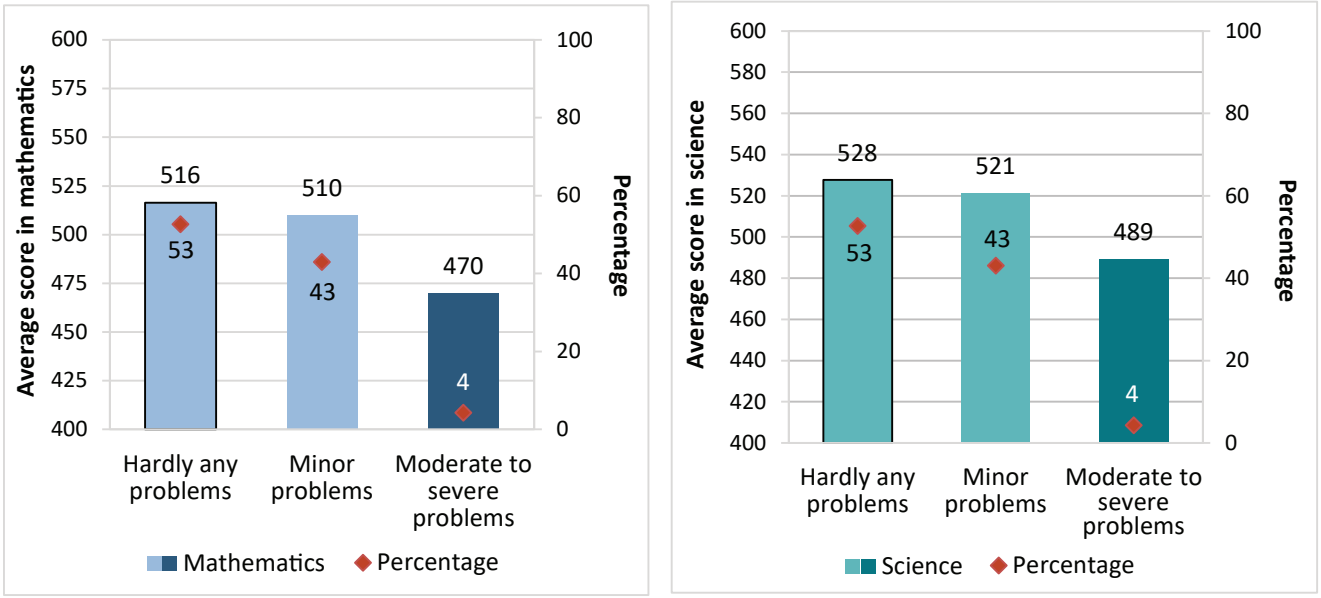
This index identified that very few students attended schools in Canada and across provinces in which principals reported having moderate to severe disciplinary problems. Comparing the hardly any problems category to the minor problems category, the difference was significant only in Manitoba for both mathematics and science achievement. Only two provinces had sufficient data in the moderate to severe problems category to report reliably. In Ontario, lower achievement was associated with greater discipline problems, while in Alberta no significant difference in achievement was found for either domain for these two categories (Figure 3.6; Appendix B.3.3).

FIGURE 3.5 Percentage of students by their principals' responses to items related to the school discipline scale



Note: U – data too unreliable to be published.

FIGURE 3.6 Relationship between the school discipline scale and student achievement



Note: Darker shade denotes significant difference compared to the hardly any problems category.

Safe and orderly schools

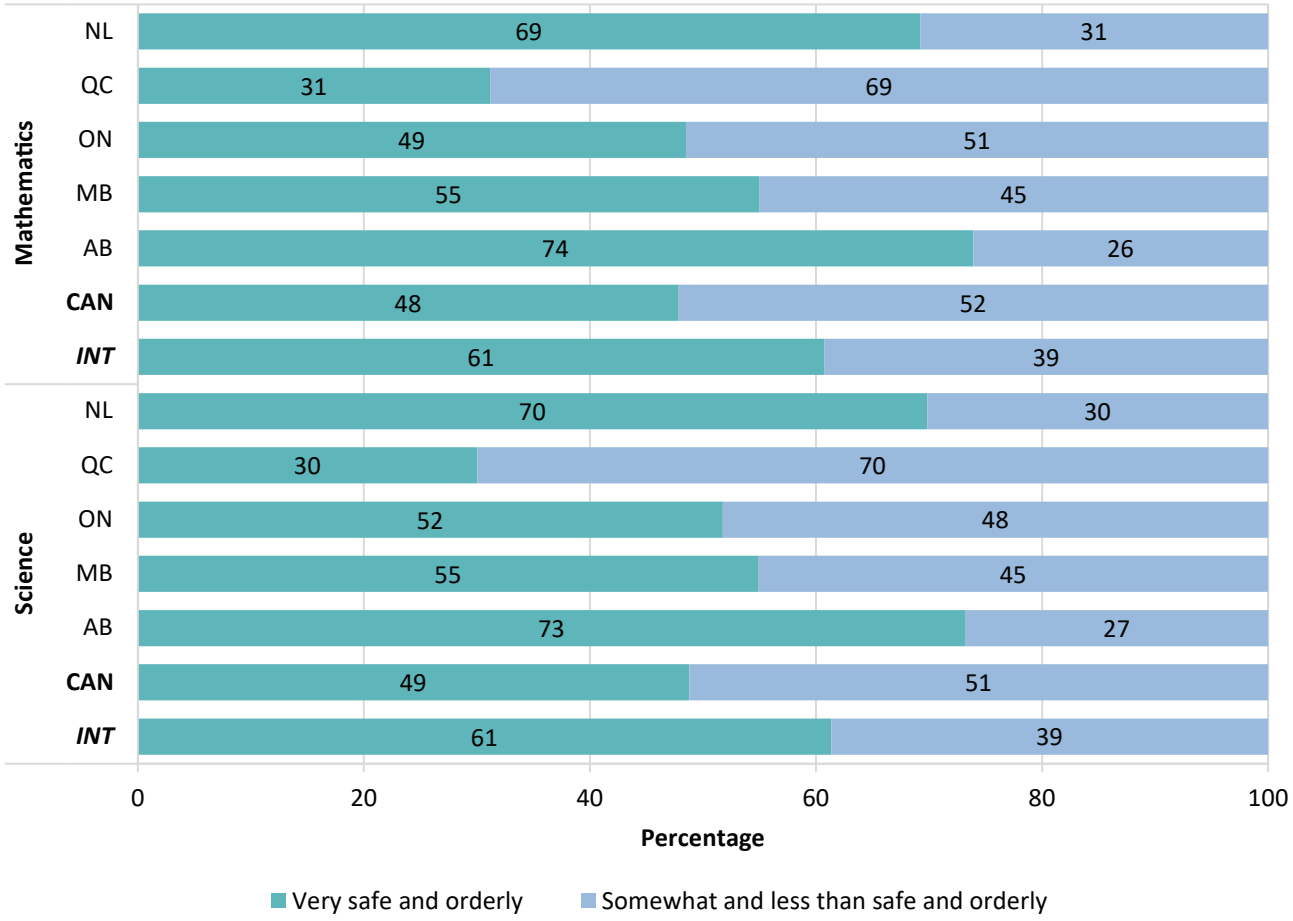
The safe and orderly schools scale was constructed based on teachers' responses (agree a lot, agree a little, disagree a little, disagree at lot) to the eight questions shown in Table 3.2.

TABLE 3.2 Questionnaire items for the safe and orderly schools scale

Thinking about your current school, indicate the extent to which you agree or disagree with each of the following statements.
This school is located in a safe neighbourhood
I feel safe at this school
This school's security policies and practices are sufficient
The students behave in an orderly manner
The students are respectful of the teachers
The students respect school property
This school has clear rules about student conduct
The school's rules are enforced in a fair and consistent manner

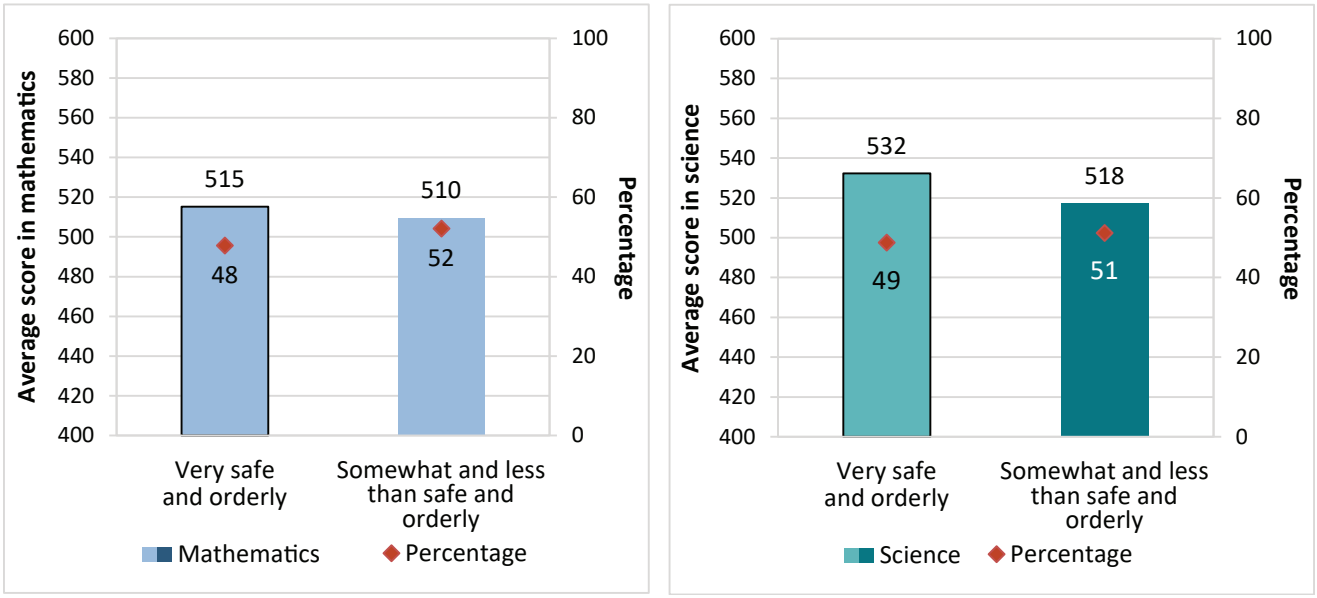
In the international report, the scale has three categories: very safe and orderly, somewhat safe and orderly, and less than safe and orderly. There were insufficient data to report on the final category reliably in three of the five provinces (Alberta, Quebec, and Newfoundland and Labrador) so in this report two categories are combined into the "somewhat and less than safe and orderly" category as shown in Figure 3.7. There are small variations in these categories as reported by mathematics and science teachers. The highest proportion of students whose teachers considered their school very safe and orderly were found in Alberta (74 percent for mathematics and 73 percent for science) and Newfoundland and Labrador (69 percent for mathematics and 70 percent for science) while less than half of students had teachers that reported that their schools were very safe and orderly in Ontario (science), Quebec (mathematics and science), and in Canada overall (mathematics and science).

FIGURE 3.7 **Percentage of students by their science teachers' responses to items related to the safe and orderly schools scale**



The achievement gap between students in schools that were considered by teachers to be very safe and orderly and somewhat safe and orderly was not significant at the Canada level in mathematics while at the provincial level the gap was significant in only Manitoba. For science, the relationship between the safe and orderly schools scale and achievement was significant for Ontario, Alberta, and Canada overall, with lower achievement associated with the perception of less safety and orderliness in schools (Figure 3.8; Appendix B.3.4).

FIGURE 3.8 **Relationship between the safe and orderly schools scale and student achievement**



Note: Darker shade denotes significant difference compared to the very safe and orderly category.

School resources

School principals were asked whether their school's capacity to provide instruction was affected by a shortage or inadequacy of resources. The results were used to construct two scales: instruction affected by mathematics resource shortages and instruction affected by science resource shortages. Both scales were composed of the general school resources questions in Table 3.3 and questions specific to the scale for the domain. Principals had four response options (not at all, a little, some, a lot) and the scale was divided into three categories based on the proportion of responses to items. For example, the category "not affected" would be assigned when a principal responded "not at all" to seven of the thirteen/fourteen resources and "a little" for the other six.

TABLE 3.3 Questionnaire items for the two scales related to resources shortage affecting instruction

How much is your school's capacity to provide instruction affected by a shortage or inadequacy of the following?

General school resources

a) Instructional materials (e.g., textbooks)
b) Supplies (e.g., papers, pencils, materials)
c) School buildings and grounds
d) Heating/cooling and lighting systems
e) Instructional space (e.g., classrooms)
f) Technologically competent staff
g) Audio-visual resources for delivery of instruction (e.g., interactive whiteboards, digital projectors)
h) Computer technology for teaching and learning (e.g., computers or tablets for student use)
i) Resources for students with disabilities

Resources for mathematics instruction

a) Teachers with a specialization in mathematics
b) Computer software/applications for mathematics instruction
c) Library resources relevant to mathematics instruction
d) Calculators for mathematics instruction
e) Concrete objects or materials (manipulatives) to help students understand quantities or procedures

Resources for science instruction

a) Teachers with a specialization in science
b) Computer software/applications for science instruction
c) Library resources relevant to science instruction
d) A science lab, science equipment, and materials for experiments

For Canada overall, students attended schools where principals reported that science instruction is more affected by a shortage of resources than was the case for mathematics (67 percent vs. 57 percent, respectively). However, the proportions are lower than the international averages for both domains. Resources shortages affecting instruction had an impact on students most frequently for mathematics in Ontario (65 percent) and for science in Ontario and Quebec (71 percent) (Figure 3.9; Appendix 3.5).

FIGURE 3.9 **Percentage of students by their principals' responses to items related to instruction affected by resources shortages scales**

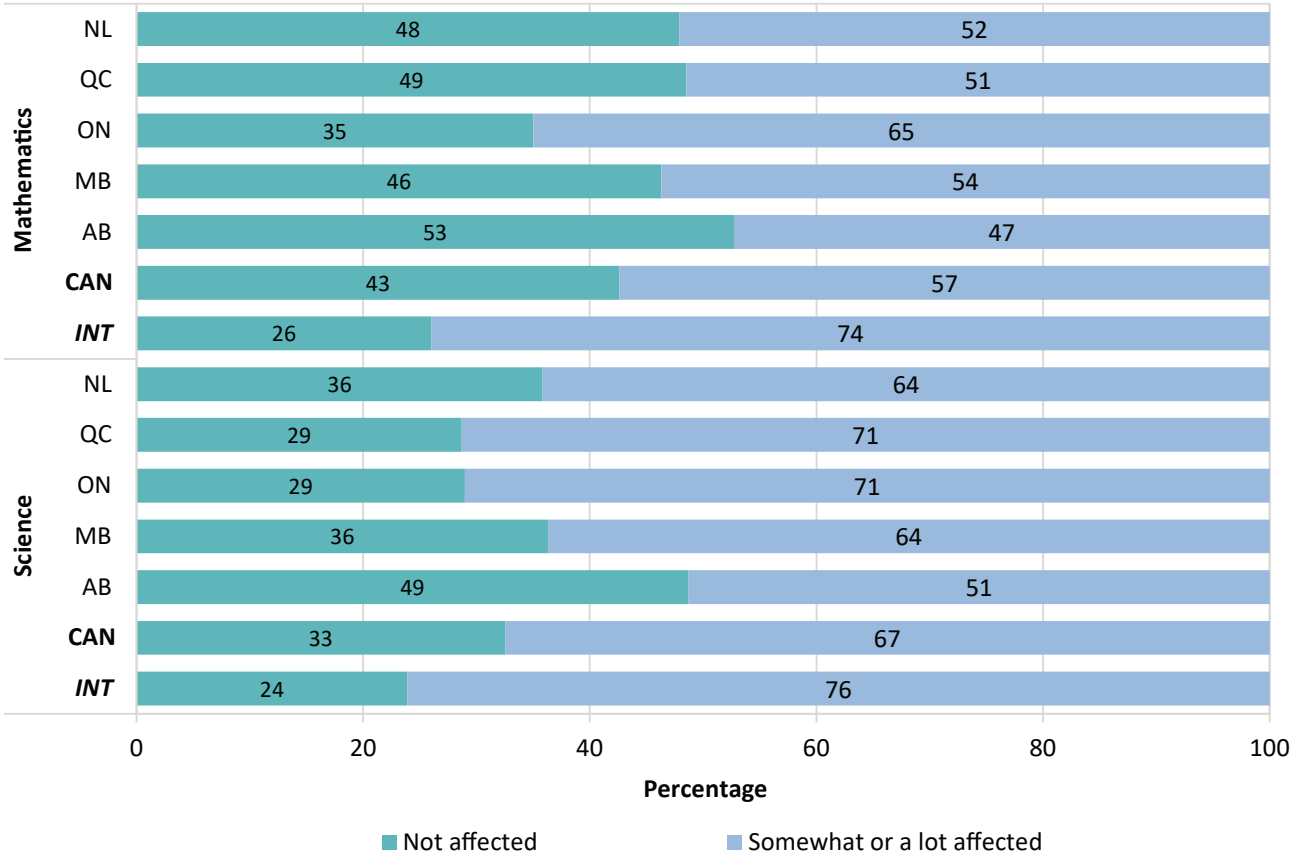
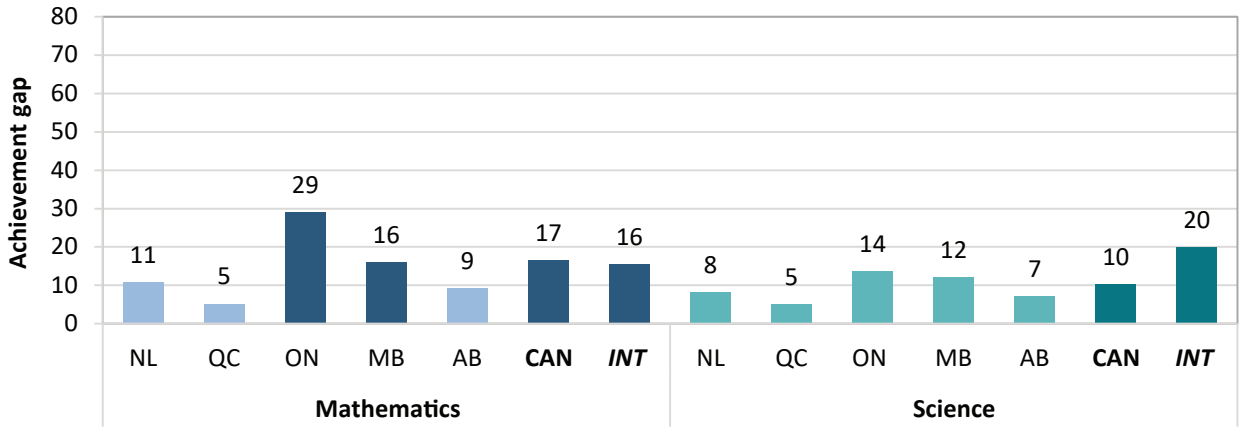


Figure 3.10 presents the achievement gap between students attending schools where principals reported that instruction was not affected by limited resources and those that reported that instruction was somewhat or a lot affected. The difference between these two categories was significant in Canada overall in both domains and in mathematics in Ontario and Manitoba. The difference was not significant in the remaining provinces.

FIGURE 3.10 **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.

Resources for science instruction

In addition to the questions regarding shortages of resources, two questions specific to resources for science instruction were asked of school principals: whether their schools had a science laboratory available for Grade 4 students and whether teachers usually have assistance available when students are conducting science experiments. Overall in Canada, only 11 percent of students attended a school where they had access to a science laboratory, compared to 36 percent of students internationally. Students in Newfoundland and Labrador and Alberta were more likely to have access to a laboratory. Another education professional may be in a science classroom to provide an accommodation for a student or additional supervision for hands-on tasks such as laboratory activities. Twenty percent of students in Canada had additional assistance during science experiments, with at least one-third having assistance in Quebec and Manitoba (Table 3.4; Appendix B.3.6).

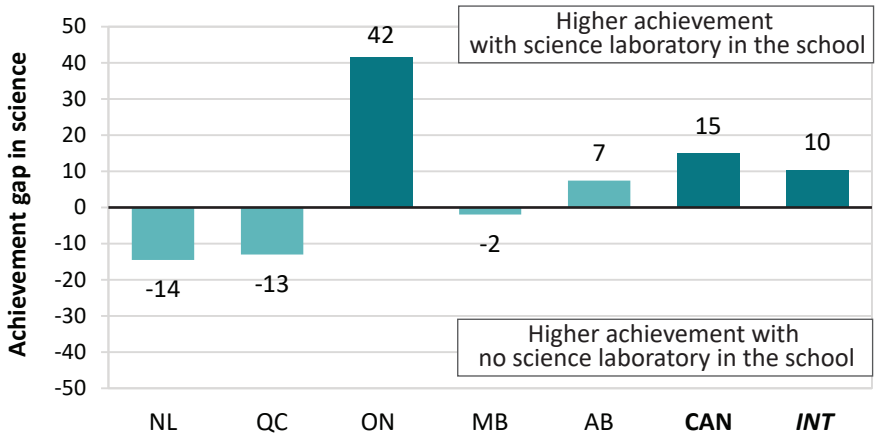
TABLE 3.4 Percentage of students by their principals' responses about resources for science instruction

	Schools have a science laboratory	Teachers have assistance available when students are conducting experiments
Newfoundland and Labrador	32	U
Quebec	7	33
Ontario	8	9
Manitoba	11	35
Alberta	22	23
Canada	**11**	**20**
International	**36**	**35**

Note: U – too unreliable to be published.

Figure 3.11 presents the science achievement gap between students whose school does have a science laboratory and those whose school does not have a laboratory. Students in schools with access to a laboratory at the Grade 4 level scored higher than students in schools without laboratories in Ontario and Canada, and on the international level. No significant difference was found in the remaining provinces. The science achievement gap between students who did have additional assistance during science experiments and those who did not was significant only in Manitoba (Appendix B.3.6).

FIGURE 3.11 Relationship between access to science laboratory in school and achievement



Note: Darker shade denotes significant difference between access to laboratory and no access to laboratory.

Availability of digital resources

School principals were asked two questions regarding the availability of digital resources in their school. The first question concerned school use of an online learning management system (e.g., teacher-student communication, management of student assessment and performance, student access to course materials) while the second question asked if the school provided students with access to digital learning resources (e.g., e-books, videos). For Canada overall, 61 percent of students attended a school where the principal reported that the school had an online learning management system, and students in Alberta were most likely to attend a school with such a system. Access to digital learning resources is more prevalent than access to an online learning management system in Canada (90 percent vs. 62 percent, respectively) (Table 3.5; Appendix B.3.6). In terms of achievement, there were no significant differences in mathematics or science scores for students in Canada related to the availability of digital resources, except for Ontario where students in schools without an online learning management system scored lower in mathematics (Appendix B.3.7).

TABLE 3.5 Percentage of students by their principals' responses to availability of digital resources

	Online learning management system	Access to digital learning resources
Newfoundland and Labrador	61	83
Quebec	66	85
Ontario	56	93
Manitoba	54	92
Alberta	73	88
Canada	**61**	**89**
International	**64**	**75**

Teacher and classroom characteristics

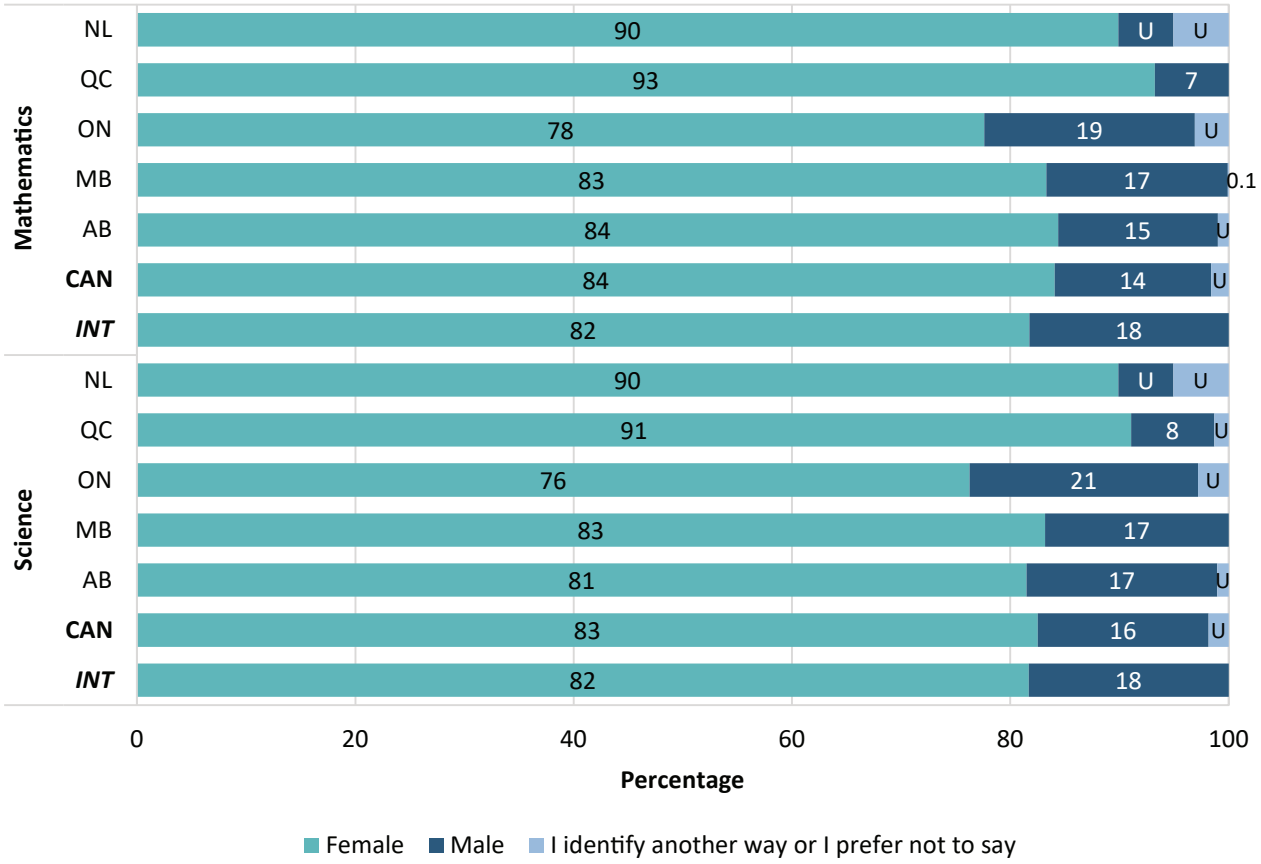
This section discusses teacher characteristics, with a focus on describing the background of those Grade 4 teachers who were involved in TIMSS 2019. Although the sample of schools and students who participated in TIMSS was drawn randomly in a two-stage design, as described in the introduction, classrooms and teachers were sampled to optimize student participation. In some schools, one classroom was selected, while in others, two or more classrooms participated. However, the participation rate of teachers cannot be determined, as we do not know the actual number of teachers at the target grade level in participating schools. Given this approach, care must be taken when interpreting and generalizing data from the Teacher Questionnaire, as it may not be representative of the entire population of teachers from participating schools. Therefore, any findings presented in this report on the percentage of teachers with certain characteristics should be interpreted as the percentage of students with teachers possessing such characteristics.

Characteristics of teachers

Teacher gender can matter because it shapes communication between teacher and student. Results of the National Education Longitudinal Survey (NELS) conducted in Grade 8 classrooms in the United States demonstrate that girls show better results when they are taught by women, and boys perform better when they are taught by men (Dee, 2006). In the Canadian questionnaires, as was the case with students (see Chapter 2), teachers were asked to self-identify by gender using four response options: female, male, I identify myself in another way, and I prefer not to say.

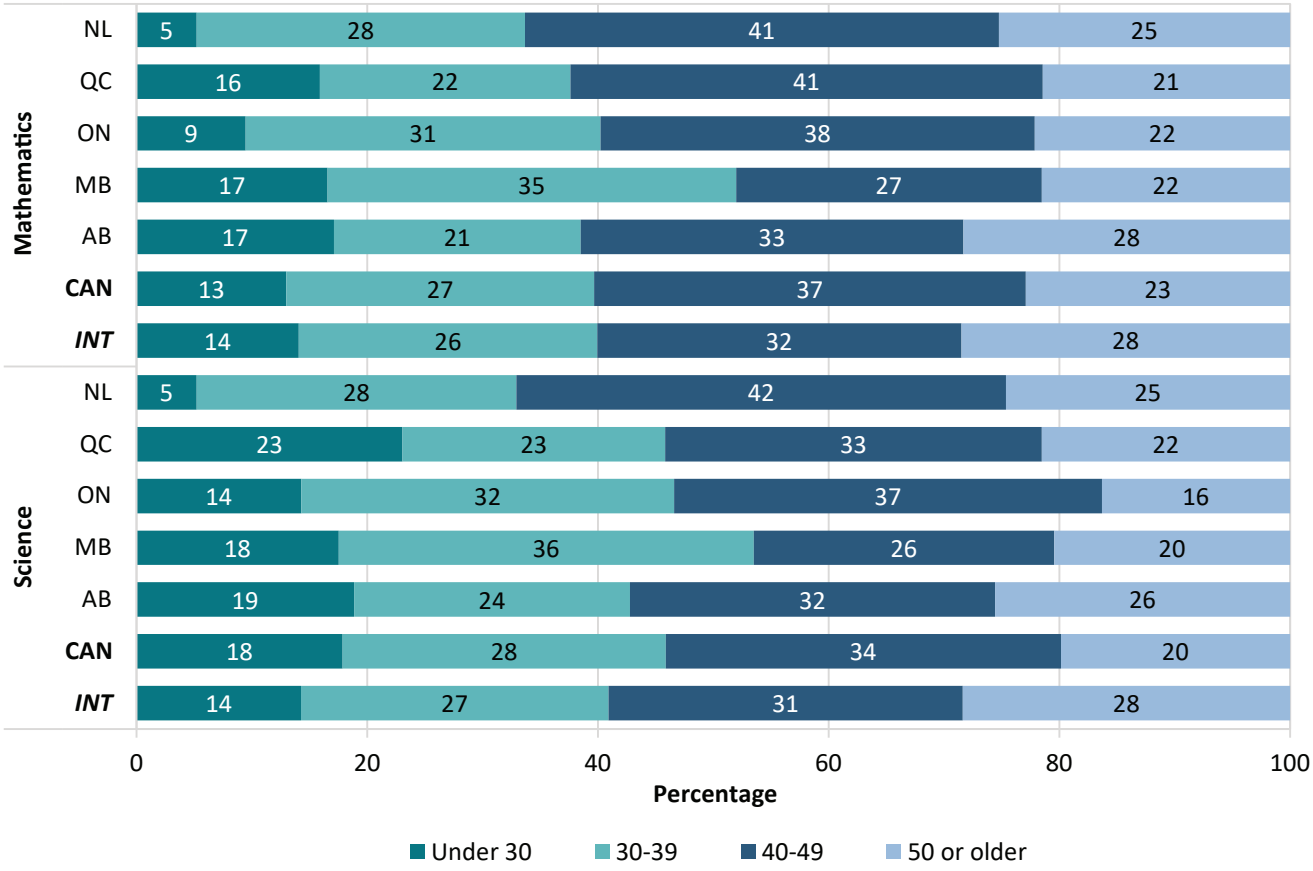
For Canada overall, as well as in most provinces, there were insufficient data for two categories (I identify myself in another way and I prefer not to say) and so the data do not add up to 100. The gender question in the international questionnaires offered only two response options (female and male). As shown in Figure 3.12, the majority of Grade 4 students are taught by female teachers. The highest proportion of students taught by female teachers is found in Newfoundland and Labrador and Quebec, for both mathematics and science (Appendix B.3.8).

FIGURE 3.12 Percentage of students by teachers' self-reported gender



There is a wide range of ages for Canadian Grade 4 teachers as shown in Figure 3.13. Although there are few students who have young teachers (under age 30), the distribution of ages in the three other categories in each province is quite even. The lowest proportion of students with teachers under 30 years old is found in mathematics and science classes in Newfoundland and Labrador and the highest proportion is found in science classrooms in Quebec (Appendix B.3.8).

FIGURE 3.13 **Percentage of students by their teachers' age**



Note: U – too unreliable to be published.

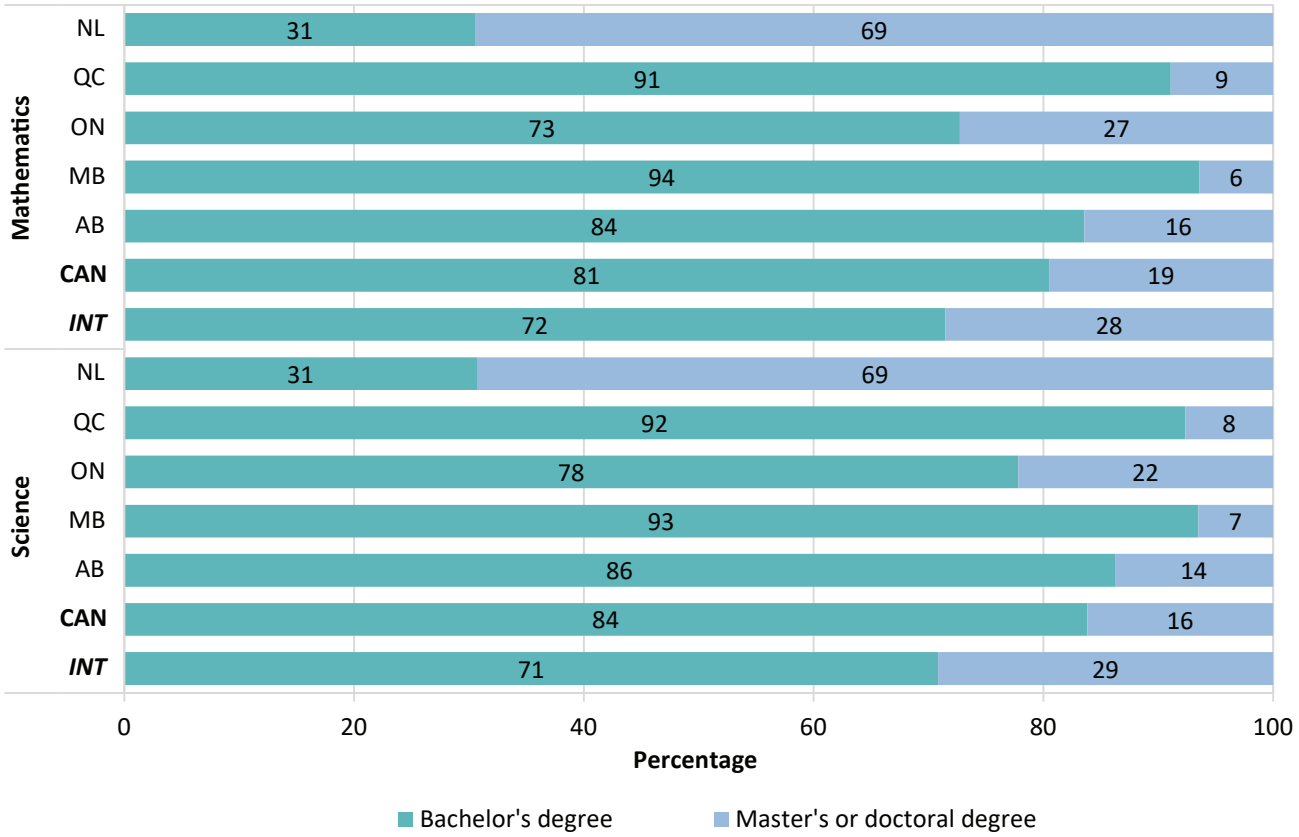
Teachers' education and specialization

Canadian teachers generally become qualified to teach by completing a Bachelor of Education degree, either concurrently with an undergraduate degree, or consecutively following the completion of the undergraduate degree from an accredited university. At least one supervised practicum in the field is required in any teacher education program. Its duration ranges from approximately two to six months depending upon the jurisdiction and accrediting institution. Some jurisdictions also require a qualifying examination, completion of a probationary teaching period, and/or completion of a mentoring or induction program that may provide another full year of professional support, including orientation, mentoring, and professional development in areas such as subject-specific content and processes, classroom management, and effective communication. In many jurisdictions or school districts, there are also incentives for teachers to further their qualifications by acquiring additional academic credentials or taking specialist courses. These incentives can be related to higher salaries or promotion. Data are available for teacher education requirements for mathematics teachers but no such study has been conducted for science teaching. The Teacher Education and Development Study in Mathematics 2008 (TEDS-M) surveyed teacher education in 17 countries, including several Canadian provinces (CMEC, 2010).

As Figure 3.14 shows, the majority of Canadian Grade 4 students are taught by teachers who hold a bachelor's degree (over 80 percent), while the remaining students are taught by teachers who hold a master's or doctoral degree. In Canada overall, students are more likely to be taught by a mathematics teacher who holds a graduate degree than a science teacher with a graduate degree. The highest proportion of students

that are taught by teachers with graduate degrees (69 percent in both mathematics and science) is found in Newfoundland and Labrador while the proportion is less than 10 percent for both subjects in Quebec and Manitoba. Internationally, close to 30 percent of students had teachers with a postgraduate university degree (Appendix B.3.8).

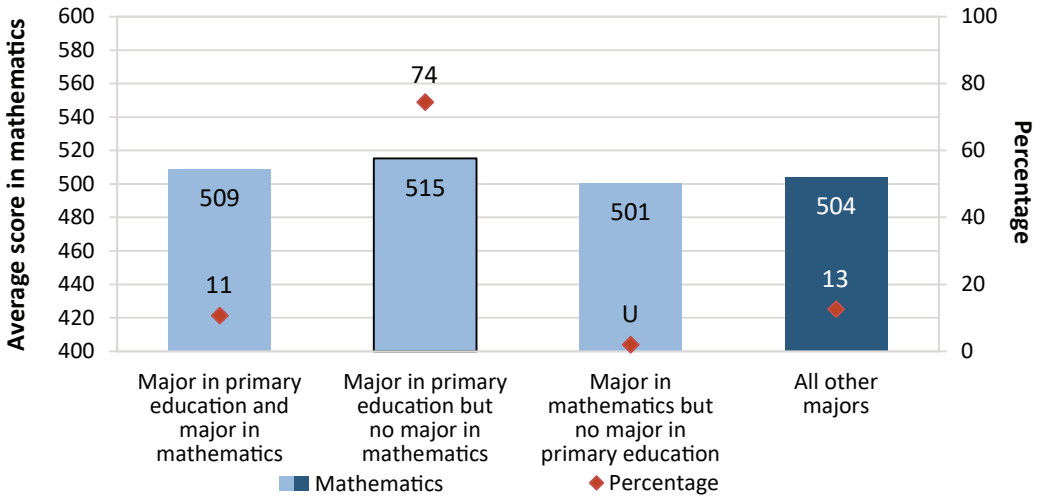
FIGURE 3.14 Percentage of students by teachers' highest level of education completed



There is widespread agreement among scholars that teachers should have a solid mastery of the content that they are teaching (Bolyard & Moyer-Packenham, 2008; Goldhaber & Brewer, 1996; Rice, 2003). According to an extensive review of the literature on science and mathematics teacher quality over the last 40 years by Bolyard and Moyer-Packenham (2008), evidence points to a generally positive association between subject matter preparation (as measured by subject-specific degrees and coursework) and student achievement.

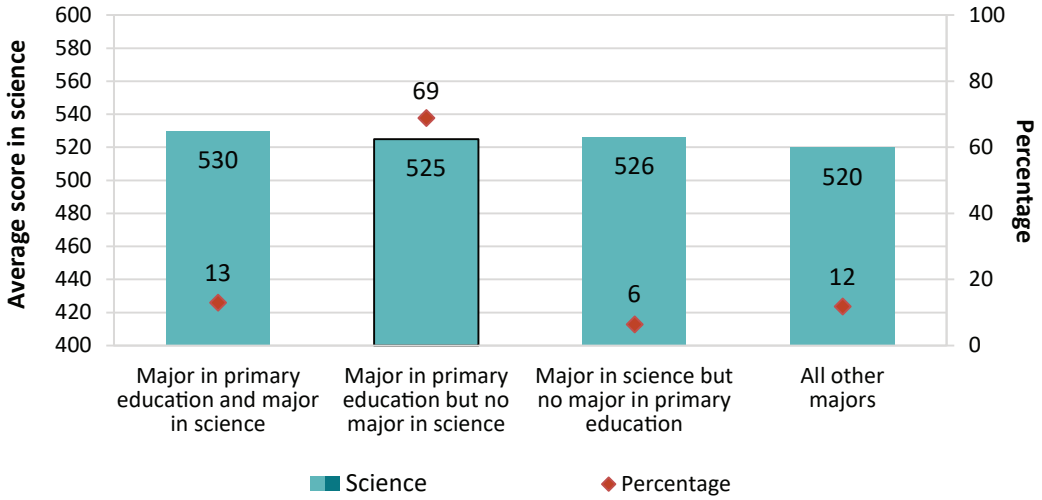
Teachers were asked about their major or specialization in primary education, mathematics, science, or other majors. Across countries, in Canada, and across provinces, the majority of Grade 4 students were taught by teachers with a major in primary education. In addition to a major in primary education, 11 percent of Canadian students have teachers who also have a specialization in mathematics and 13 percent have teachers with a specialization in science. These proportions are much lower than the international averages (33 percent and 29 percent, respectively). Compared to teachers who specialized in primary education (but not mathematics), there was no difference in student mathematics achievement based on teachers who majored in mathematics (but not primary education) or teachers who majored in both primary education and mathematics. However, compared to teachers who specialized in primary education (but not mathematics), teachers who majored in an area other than primary education or mathematics were associated with lower mathematics achievement (Figure 3.15). In science, there was no difference in student achievement based on teacher's specialization (Figure 3.16). This is similar to the trend found across countries (Appendix B.3.9).

FIGURE 3.15 Relationship between teachers' specialization and student achievement in mathematics



Note: Darker shade denotes significant difference compared to the major in primary education but no major in mathematics category.

FIGURE 3.16 Relationship between teachers' specialization and student achievement in science



Note: Darker shade denotes significant difference compared to the major in primary education but no major in science category.

Teachers' experience

It is generally assumed that "brand-new" teachers are not as effective as those with years of experience. Druva and Anderson's (1983) meta-analysis of 65 studies reported a positive relationship between student outcomes in science and teachers' experience. However, this relationship was not particularly strong. This is because the effects of teacher experience are rather complex and depend on a number of factors. For example, the impact of experience is strongest during the first years of teaching, but after that, only marginal effects remain (Rice, 2010).

On average, Canadian Grade 4 mathematics teachers had 15 years of experience and Canadian science teachers had 14 years of experience. Nearly 40 percent of students' mathematics and science teachers have between 10 and 19 years of experience. Only 13 percent of Canadian students' mathematics teachers and 16 percent of science teachers had less than 5 years of experience. On average, at the provincial level, years of teaching experience ranged from 13 years in Manitoba to 18 years in Newfoundland and Labrador for both mathematics and science teachers (Table 3.6; Appendix B.3.10).

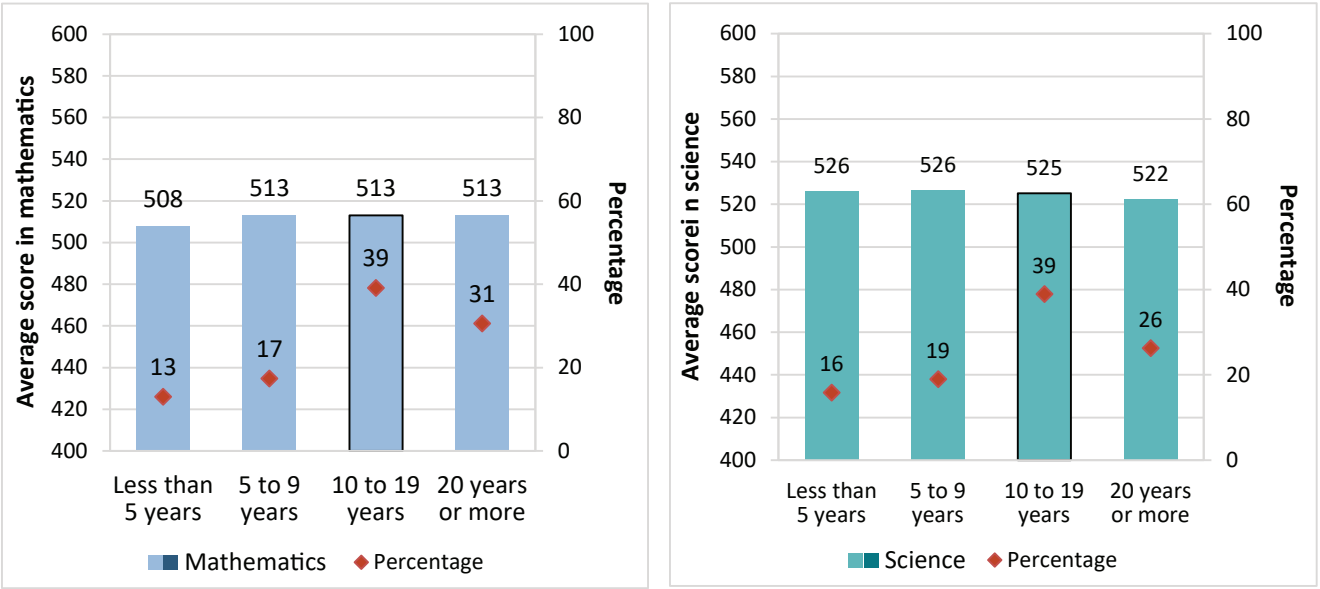
TABLE 3.6 Percentage of students by years of teaching experience for Grade 4 teachers

	Mathematics				Science			
	Less than 5 years	5 to 9 years	10 to 19 years	20 years or more	Less than 5 years	5 to 9 years	10 to 19 years	20 years or more
Newfoundland and Labrador	U	U	38	48	U	U	38	48
Quebec	13	14	37	36	17	19	32	33
Ontario	11	20	42	26	U	20	46	20
Manitoba	23	20	33	23	21	21	34	24
Alberta	17	15	35	32	19	17	35	30
Canada	**13**	**17**	**39**	**31**	**16**	**19**	**39**	**26**
International	**14**	**15**	**29**	**41**	**15**	**17**	**29**	**40**

Note: U – too unreliable to be published.

Figure 3.17 examines the relationship between students' mathematics and science achievement and teachers' years of experience. Internationally, average achievement in mathematics and science was generally higher for students whose teachers had more than 5 years of experience. In Canada overall, there was no significant difference in student achievement in relation to the number of years that their teacher had been teaching in either mathematics or science (Appendix B.3.10).

FIGURE 3.17 Relationship between teachers' experience and student achievement



Note: Darker shade denotes significant difference compared to the 10 to 19 years category. Percentage refers to percentage of students taught by teachers with the different categories of experience.

Teachers' professional development

Teachers have access to a wide variety of professional development (PD) opportunities that can be pursued both individually and collaboratively, depending upon teacher or school needs. Examples include informal dialogue and reading professional literature; conferences, courses, workshops, and additional qualification programs; or participation in research, mentoring, or peer observation. In Canada, most school boards or districts schedule professional development days that address specific school or district issues and initiatives. Across 23 participating countries in the Teaching and Learning International Survey (TALIS), the three areas most frequently reported by teachers as areas of high professional development need include teaching students

with special learning needs, information and communications technology (ICT) teaching skills, and student discipline and behaviour problems (OECD, 2009). In that study, the most frequently reported PD activities that teachers identified were informal dialogue to improve teaching, courses and workshops, and reading professional literature.

The relationship between teacher professional development and student achievement has been widely studied in education policy research. High-achieving countries tend to place a relatively significant value on teacher professional development in hopes of improving student outcomes (Darling-Hammond, 2014-15). While some results suggest a positive, yet largely inconclusive, relationship between professional development and student achievement (Blank & de las Alas, 2009; Yoon, Duncan, Lee, Scarloss, & Sharpley, 2007), other studies point to a relative lack of evidence connecting such development to student outcomes (Opfer & Pedder, 2011).

Mathematics and science teachers were asked whether they participated in PD activities in several areas, as shown in Tables 3.7 and 3.8. Mathematics teachers were asked about improving students' problem-solving skills while science teachers were asked about improving students' inquiry skills. Science teachers were also asked about PD related to integrating science with other subjects. Teachers from both domains were asked about improving students' critical thinking skills.

The most common areas of PD for students' mathematics teachers were mathematics content and mathematics pedagogy and instruction, for Canada overall and across countries. Students' science teachers were much less likely than mathematics teachers to participate in subject-related PD. In science, higher proportions of students were taught by teachers who participated in professional development related to improving students' critical thinking or inquiry skills and addressing individual student needs, although this was the case for less than a quarter of students. Across countries, approximately equal proportions of students were taught by teachers participating in each of the eight professional development categories (Appendix B.3.11 and B.3.12).

TABLE 3.7 Percentage of students by teachers participating in mathematics-related professional development in the last two years

	Mathematics content	Mathematics pedagogy / instruction	Mathematics curriculum	Integrating technology into mathematics instruction	Improving students' critical thinking or problem-solving skills	Mathematics assessment	Addressing individual student needs
Newfoundland and Labrador	24	31	19	25	21	18	32
Quebec	38	50	20	22	34	44	27
Ontario	81	81	66	49	76	61	68
Manitoba	62	67	49	37	62	43	48
Alberta	60	66	48	35	57	46	59
Canada	**62**	**68**	**47**	**37**	**58**	**52**	**52**
International	**45**	**45**	**41**	**35**	**44**	**37**	**43**

TABLE 3.8 **Percentage of students by teachers participating in science-related professional development in the past two years**

	Science content	Science pedagogy/ instruction	Science curriculum	Integrating technology into science instruction	Improving students' critical thinking or inquiry skills	Science assessment	Addressing individual student needs	Integrating science into other subjects
Newfoundland and Labrador	47	48	52	29	35	26	27	24
Quebec	19	17	U	12	U	U	U	9
Ontario	10	9	19	21	35	U	34	23
Manitoba	8	11	U	13	27	U	16	18
Alberta	25	17	27	22	32	14	29	32
Canada	**16**	**14**	**15**	**18**	**24**	**9**	**23**	**20**
International	**35**	**33**	**34**	**32**	**36**	**28**	**33**	**31**

Note: U – too unreliable to be published.

The teacher questionnaire also asked whether teachers needed additional subject-specific PD. Responses were similar between students' mathematics and science teachers in Canada overall, and across countries. Approximately 70 percent of students' teachers identified the need for more professional development for integrating technology into instruction and more than 60 percent of students' teachers identified a need for additional development for improving students' critical thinking and problem-solving skills (mathematics) and inquiry skills (science) (Tables 3.9 and 3.10; Appendix B.3.11 and B.3.12).

TABLE 3.9 **Percentage of students by teachers expressing a need for mathematics-related professional development**

	Mathematics content	Mathematics pedagogy / instruction	Mathematics curriculum	Integrating technology into mathematics instruction	Improving students' critical thinking or problem-solving skills	Mathematics assessment	Addressing individual student needs
Newfoundland and Labrador	32	44	31	78	77	63	62
Quebec	15	45	12	72	56	34	48
Ontario	38	49	38	79	61	55	56
Manitoba	41	54	35	69	73	57	65
Alberta	45	62	52	69	82	63	70
Canada	**32**	**50**	**32**	**75**	**64**	**50**	**56**
International	**45**	**55**	**44**	**72**	**69**	**54**	**64**

TABLE 3.10 **Percentage of students by teachers expressing a need for science-related professional development**

	Science content	Science pedagogy/ instruction	Science curriculum	Integrating technology into science instruction	Improving students' critical thinking or inquiry skills	Science assessment	Addressing individual student needs	Integrating science into other subjects
Newfoundland and Labrador	39	46	43	73	65	51	52	59
Quebec	52	59	39	66	57	53	45	61
Ontario	49	58	38	76	63	50	50	63
Manitoba	36	45	36	77	71	49	48	63
Alberta	51	53	57	63	62	47	47	60
Canada	**50**	**56**	**41**	**70**	**62**	**50**	**48**	**62**
International	**54**	**57**	**49**	**69**	**65**	**54**	**57**	**62**

The relationship between PD and student achievement in Canada overall shows some significant differences for specific professional development categories. A negative relationship was found between PD related to mathematics content and achievement but no further significant differences were found between teacher participation in PD and student mathematics scores at the Canada level. Higher mathematics achievement was found for students whose teachers identified a need for PD in mathematics curriculum. Higher achievement scores were attained by students whose teachers participated in PD related to science curriculum and the integration of technology into instruction. Few significant relationships were found between PD and achievement at the international or provincial level (Appendix B.3.13, B.3.14).

In addition to subject-specific PD questions, the TIMSS 2019 teacher questionnaire asked teachers how many total hours of formal professional development they attended over the past two years. As shown in Table 3.11, a higher proportion of students in Canada overall were taught by teachers who participated in mathematics professional development that those who participated in science professional development (88 percent vs. 40 percent, respectively). Further, the number of hours of mathematics PD attended was much higher than the number reported for science. No significant relationship was found between student achievement and hours of professional development in either mathematics or science in Canada overall, except in the comparison of the "6-15 hours" and the "more than 35 hours" categories where a negative relationship was found between mathematics scores and the highest number of hours of PD (Appendix B.3.15).

TABLE 3.11 Percentage of students by number of hours of professional development over past two years reported by teachers

	None	Less than 6 hours	6–15 hours	16–35 hours	More than 35 hours
Mathematics					
Newfoundland and Labrador	38	26	30	U	U
Quebec	24	37	30	8	U
Ontario	U	16	36	20	24
Manitoba	14	21	31	21	13
Alberta	12	28	27	26	7
Canada	**12**	**25**	**32**	**17**	**13**
International	**24**	**22**	**25**	**15**	**13**
Science					
Newfoundland and Labrador	42	23	32	U	--
Quebec	71	19	U	U	U
Ontario	60	20	10	U	U
Manitoba	61	23	11	U	U
Alberta	40	36	18	U	U
Canada	**60**	**23**	**11**	**U**	**U**
International	**37**	**23**	**20**	**11**	**10**

Note:-- Data not available; U – too unreliable to be published.

Characteristics of classrooms

Students' readiness to learn

Students' readiness to learn in class has important implications for their education success. Cleary and Kistantas (2017) found that some of the lack of preparedness that teachers face may be reduced by establishing motivation processes such as improving students' mathematics self-efficacy, task interest, and school connectedness. Teachers' self-efficacy may also play an important role: teachers' perception of their students' readiness to learn correlates with actual learning because teachers' confidence in their students' readiness to learn may have a positive impact on the teachers' ability to teach (Kearney & Garfield, 2019). Readiness to learn is also related to positive psychological dispositions such as feelings of belonging in school or an environment free of bullying (Konishi, Hymel, Zumbo, & Li, 2010) or cyberbullying (Tokunaga, 2010); these factors are discussed in Chapter 2.

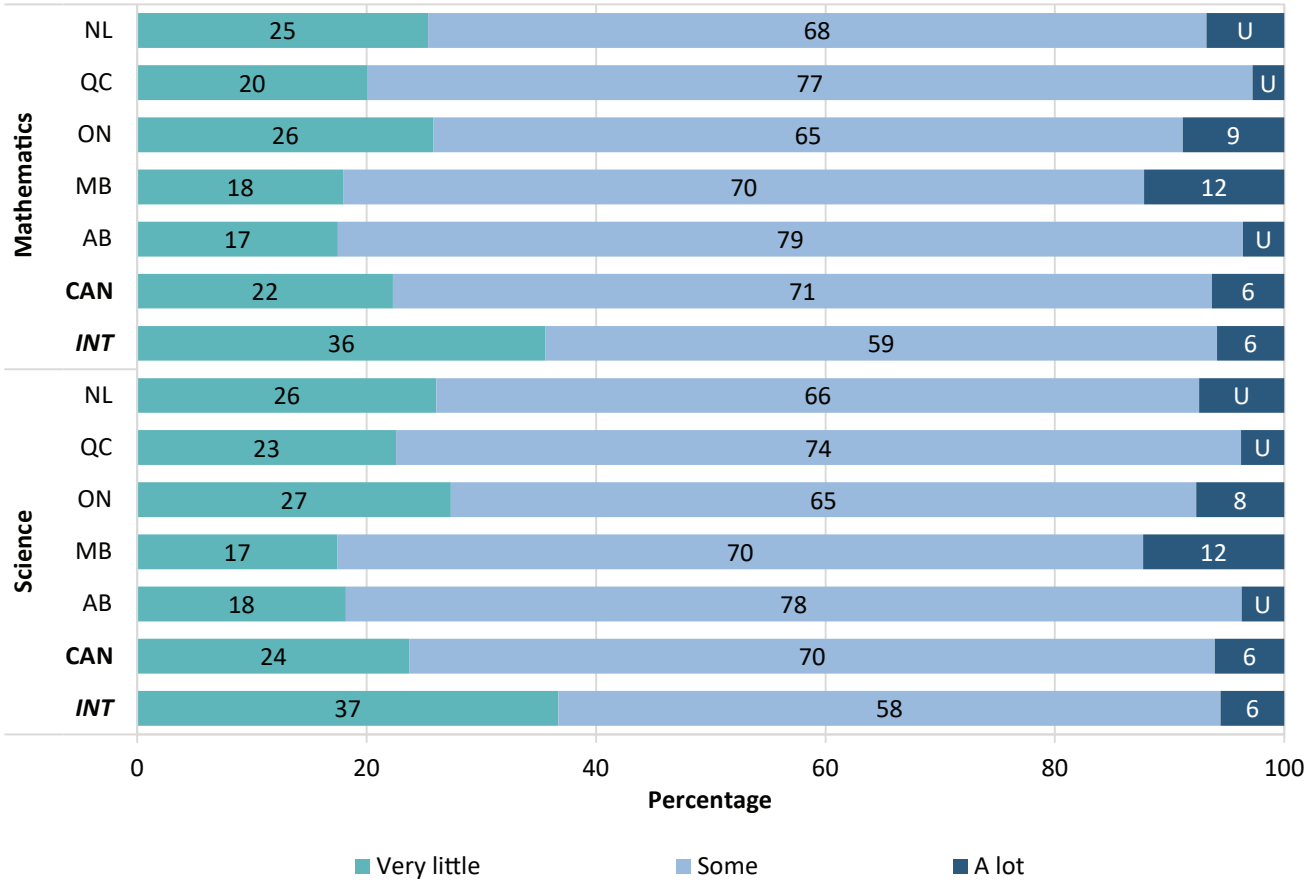
The TIMSS 2019 teacher questionnaire asked teachers a series of questions concerning to what extent (not at all, some, a lot) eight student attributes limit how they teach the class. The results were used to construct the classroom teaching limited by students not ready for instruction scale (Table 3.12), that was divided into three categories: very little, some, and a lot. Teachers who were classified as being limited "very little" reported that they were "not at all" limited by four of the eight student attributes and were limited "some" by the other four attributes while those who reported that they were limited "a lot" by four of the attributes and "some" for the other four attributes were assigned the "a lot" category.

TABLE 3.12 Questionnaire items for classroom teaching limited by students not ready for instruction scale

In your view, to what extent do the following limit how you teach this class?
Students lacking prerequisite knowledge or skills
Students suffering from lack of basic nutrition
Students suffering from not enough sleep
Students absent from class
Disruptive students
Uninterested students
Students with mental, emotional, or psychological impairment
Students with difficulties understanding the language of instruction

Close to one-quarter of Canadian students, compared to just over one-third of students across countries, were taught by teachers who reported that their teaching was limited very little by students not ready for instruction in mathematics and science. Unfortunately, six percent of students in Canada overall and across countries were in classrooms in which teachers believed that instruction was limited a lot by students not ready to learn. At the provincial level, there were too few observations to report on this scale reliably in Newfoundland and Labrador, Quebec, and Alberta, while in Ontario and Manitoba around 10 percent of students were taught by teachers reporting that their classroom instruction was limited to a greater degree by students not ready for instruction in mathematics and science classrooms (Figure B.3.18; Appendix B.3.16).

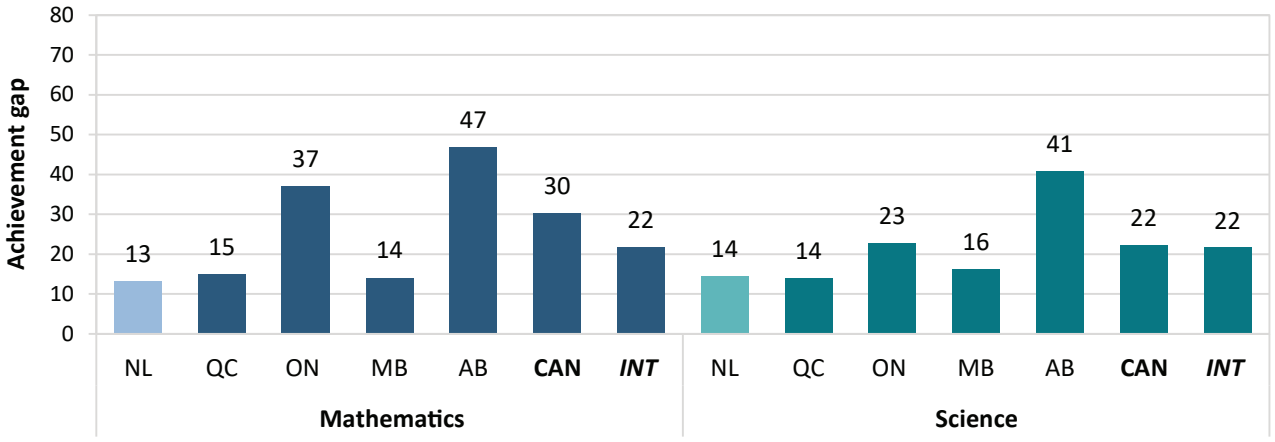
FIGURE 3.18 Percentage of students by their teachers' response to the classroom teaching limited by students not ready for instruction scale



Note: U – too unreliable to be published.

The relationship between student achievement and the classroom teaching limited by students not ready for instruction scale is statistically significant in Canada overall for both mathematics and science, as well as in all provinces, except for Newfoundland and Labrador. There is a difference of 30 points in mathematics achievement and 22 points in science achievement between the "very little" and the "some" categories of the scale in Canada compared to 22 points across all countries for both subjects (Figure 3.19). These differences increase to 53 points in mathematics and 44 points in science when comparing the "very little" and "a lot" categories in Canada, which is higher than the 41-point gap for both subjects internationally (Appendix B.3.16).

FIGURE 3.19 Relationship between the classroom teaching limited by students not ready for instruction scale and student achievement



Note: Darker shade denotes significant difference between the very little and some categories

Clarity of instruction

Student perceptions about the clarity of their lessons has significant implications for their perceived ability to learn, or self-efficacy. A strong sense of self-efficacy can affect students' willingness to take on challenging tasks and to make an effort and persist in tackling such tasks: it can thus have a key impact on motivation (Bandura, 1997).

Students were asked to respond to several questions about how much they agree (agree a lot, agree a little, disagree a little, disagree a lot) with statements about instruction in mathematics and science lessons. The questions were the same for the two subjects, except for one question asking about their perception of their teacher's ability to explain mathematics or science. The responses were used to develop the instructional clarity scales (Table 3.13), which were divided into three categories: high clarity, moderate clarity, and low clarity.

TABLE 3.13 Questionnaire items for instructional clarity scales

How much do you agree with these statements about your mathematics/science lessons?
Mathematics
I know what my teacher expects me to do
My teacher is easy to understand
My teacher has clear answers to my questions
My teacher is good at explaining mathematics
My teacher does a variety of things to help us learn
My teacher explains a topic again when we don't understand
Science
I know what my teacher expects me to do
My teacher is easy to understand
My teacher has clear answers to my questions
My teacher is good at explaining science
My teacher does a variety of things to help us learn
My teacher explains a topic again when we don't understand

Approximately three-quarters of Canadian students felt that instructional clarity in mathematics and science lessons was high which was similar to the proportion at the international level for both subjects (Figure 3.20).

FIGURE 3.20 Percentage of students by clarity of instruction in mathematics and science lessons

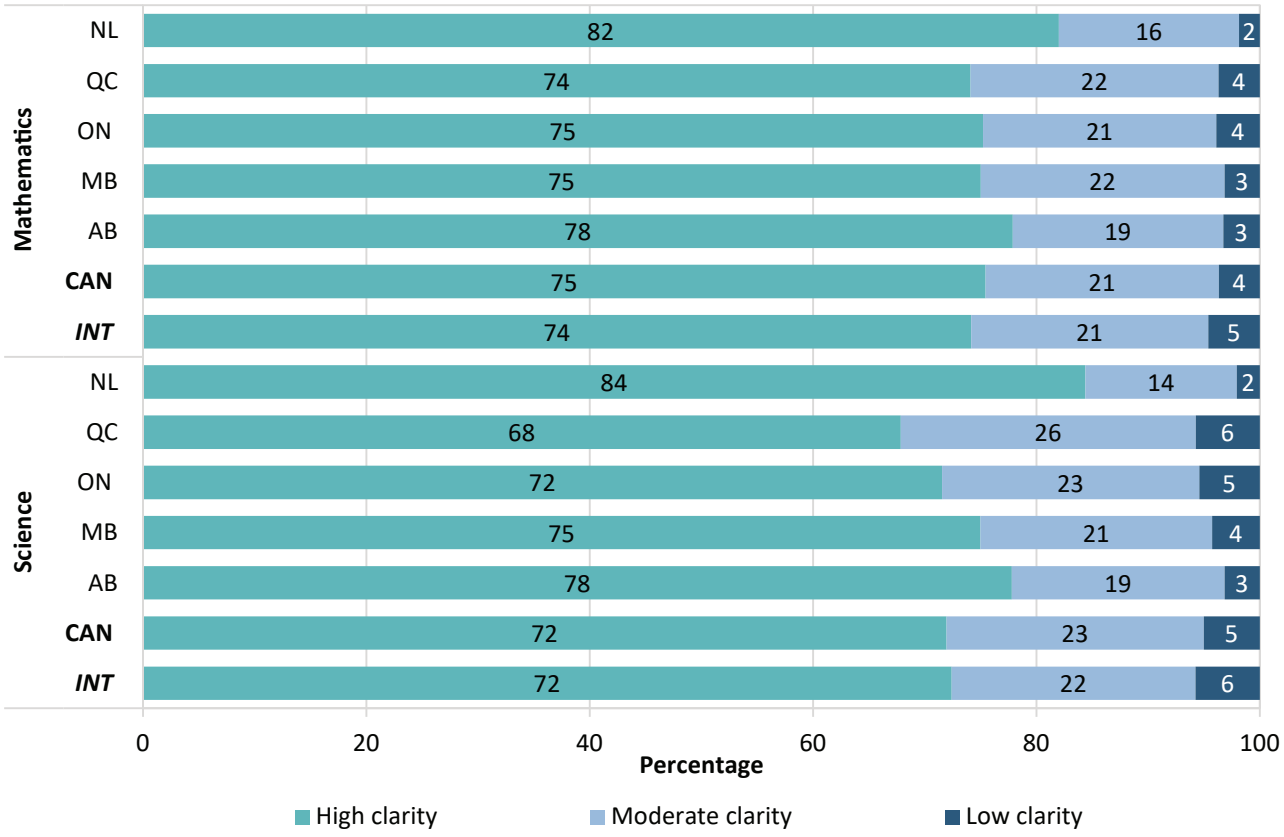
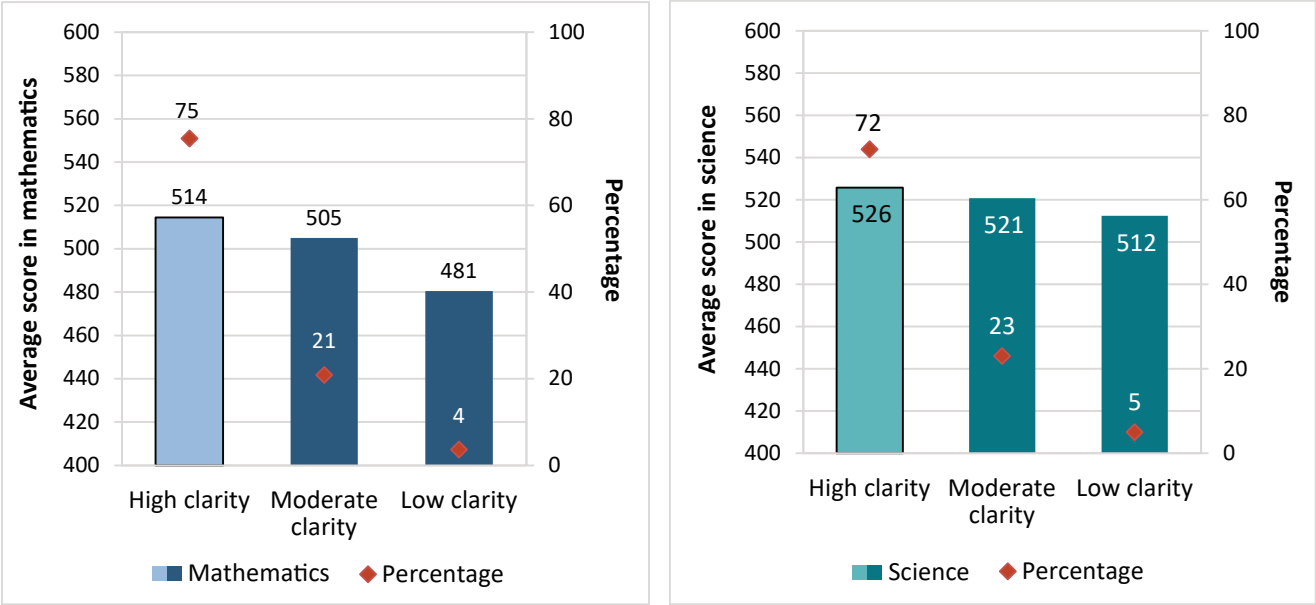


Figure 3.21 examines the relationship between mathematics and science achievement and the instructional clarity scale. In Canada overall, there are significant differences between the high clarity category compared to the moderate clarity and low clarity groups in both mathematics and science achievement. At the provincial level, significant differences in achievement were found between students reporting high clarity compared to

those reporting moderate clarity in their lessons in both mathematics and science in Manitoba and in science in Ontario. When the high clarity and low clarity in lessons categories were compared, significant differences in achievement were found in all provinces for mathematics except for Newfoundland and Labrador, and only in Quebec for science (Appendix B.3.17).

FIGURE 3.21 Relationship between instructional clarity in subject lessons and student achievement



Note: Darker shade denotes significant difference with the high clarity category.

Science instruction

The effectiveness of using hands-on and inquiry activities during science instruction has been an important focus of academic research as well as teacher-best-practice research for many years. An important aspect of learning science is to do science—students learn the processes and values of science while working like a scientist. Inquiry education in science has been shown to have a significant positive relationship with achievement when students receive sufficient scaffolding to support their learning of scientific processes. Although student-directed inquiry activities, in which students design experiments to answer their own questions, are highly motivating for students, a variety of instructional techniques is necessary to move students progressively toward stronger understanding and, ultimately, greater independence in their science learning (O'Grady & Houme 2015).

The TIMSS 2019 questionnaires included questions specific to science instruction and pedagogy, two of which will be explored in this section. A teacher emphasis on science investigation scale was created based on the frequency (every or almost every lesson, about half the lessons, some lessons, never) that science teachers reported that they asked students to do eight instructional activities as shown in Table 3.14. The teachers' emphasis on science investigation scale was developed with two categories: about half the lessons or more, and less than half the lessons.

TABLE 3.14 Questionnaire items for teacher emphasis on science investigation scale

In teaching science to the students in this class, how often do you ask them to do the following?
Observe natural phenomena and describe what they see
Watch me demonstrate an experiment of investigation
Design or plan experiments of investigations
Conduct experiments or investigations
Interpret data from experiments or investigations
Use evidence from experiments or investigations to support conclusions
Do field work outside the class

In Canada overall, 17 percent of students had teachers who self-reported emphasizing scientific investigation in about half the lessons or more, which was much lower than the average reported across countries (31 percent). Provincial numbers range from 15 percent in Quebec to 24 percent in Alberta for this category (Figure 3.22). Only in Alberta was there a statistically significant difference between the two groups, where students who had teachers who emphasized scientific investigation in more than half the lessons scored lower in science than students whose teachers emphasized scientific investigation in less than half the lessons (Figure 3.23; Appendix B.3.18).

FIGURE 3.22 Percentage of students by teachers' emphasis on science investigation scale

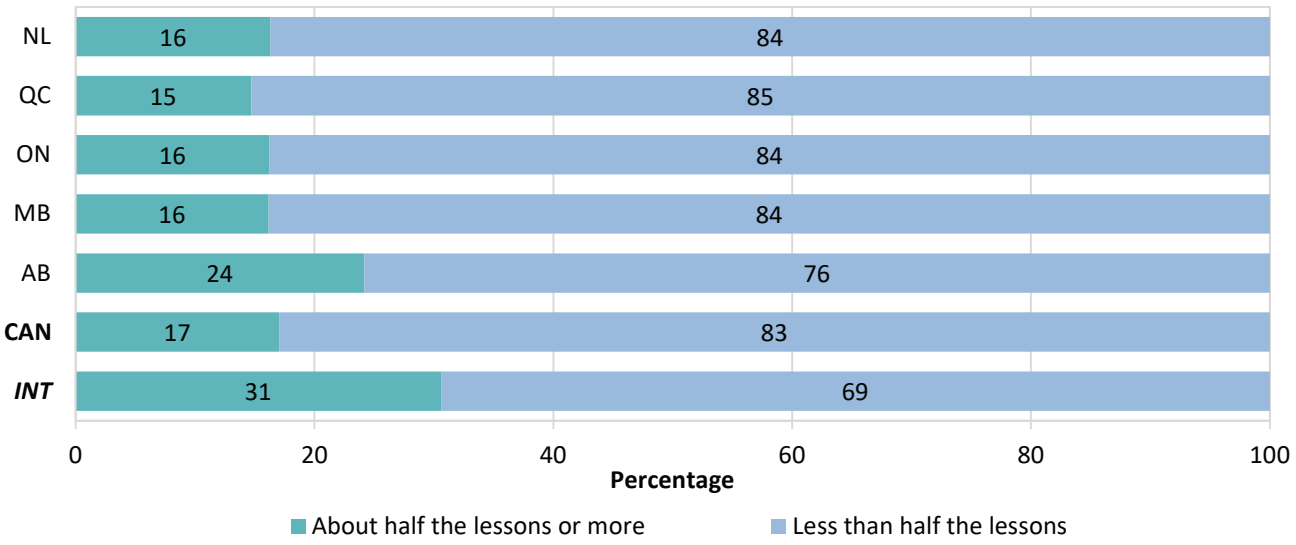
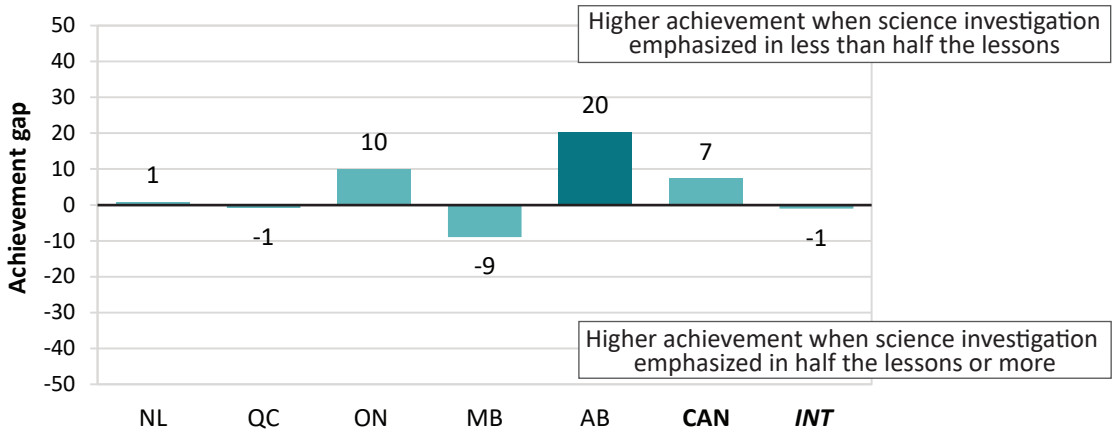


FIGURE 3.23 Relationship between teachers' emphasis on science investigation scale and student achievement



Note: Darker shade denotes significant difference between the two categories (less than half the lessons and about half the lessons or more).

Schroeder and colleagues (2007) concluded that alternative teaching strategies have a more positive influence on student achievement compared with the traditional teaching methods. Hands-on and collaborative strategies, or teacher-supported inquiry activities, involve students being guided through hands-on activities, typically in laboratory groupings in science class. Inquiry-based teaching was associated with significantly higher student achievement at age 15 in PISA (Jiang & McComas, 2015) and at the Grade 8/Secondary II level in PCAP (O'Grady & Houme, 2015). However, the level of openness in inquiry-based teaching was an important consideration, with higher achievement associated with teacher-supported inquiry instruction (e.g., conduct guided activities and draw conclusions from data), while student-directed inquiry (e.g., designing experiments) was associated with lower achievement scores but more positive attitude scores.

Students were asked about how often they conducted science experiments during science lessons using a four-point scale (at least once a week, once or twice a month, a few times a year, never). In Canada overall, 20 percent of students conducted an experiment in science class at least once a week, which is less than the international average of 31 percent. Nearly one-third of students in Canada either conducted experiments once or twice a month or a few times a year. A lower proportion of students at the Canada and provincial levels report that they never do experiments compared to the international average (Figure 3.24; Appendix B.3.19). Interestingly, students reporting that they do science experiments a few times a year tended to have higher achievement than each of the other three categories in Canada, across provinces, and at the international level (Figure 3.25).

FIGURE 3.24 Frequency students conduct experiments in science lessons

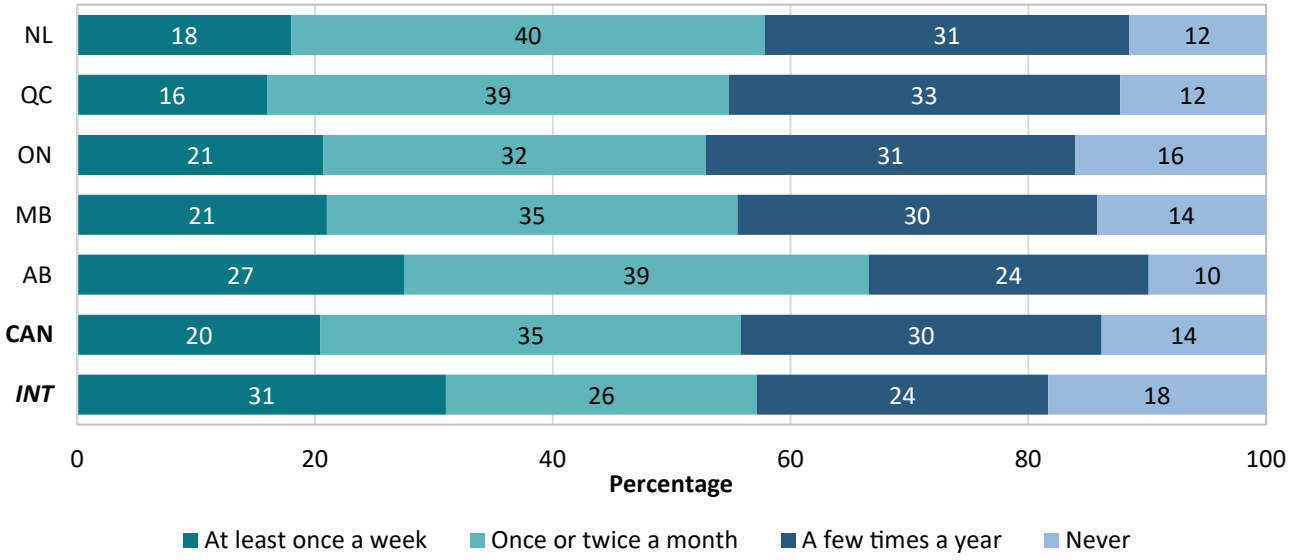
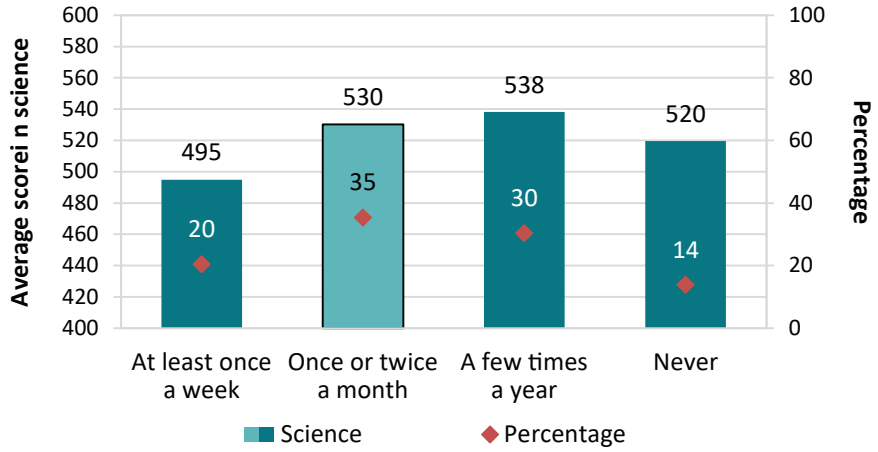


FIGURE 3.25 Relationship between the frequency students do science experiments and achievement



Note: Darker shade denotes significant difference compared to the once or twice a month category.

Homework

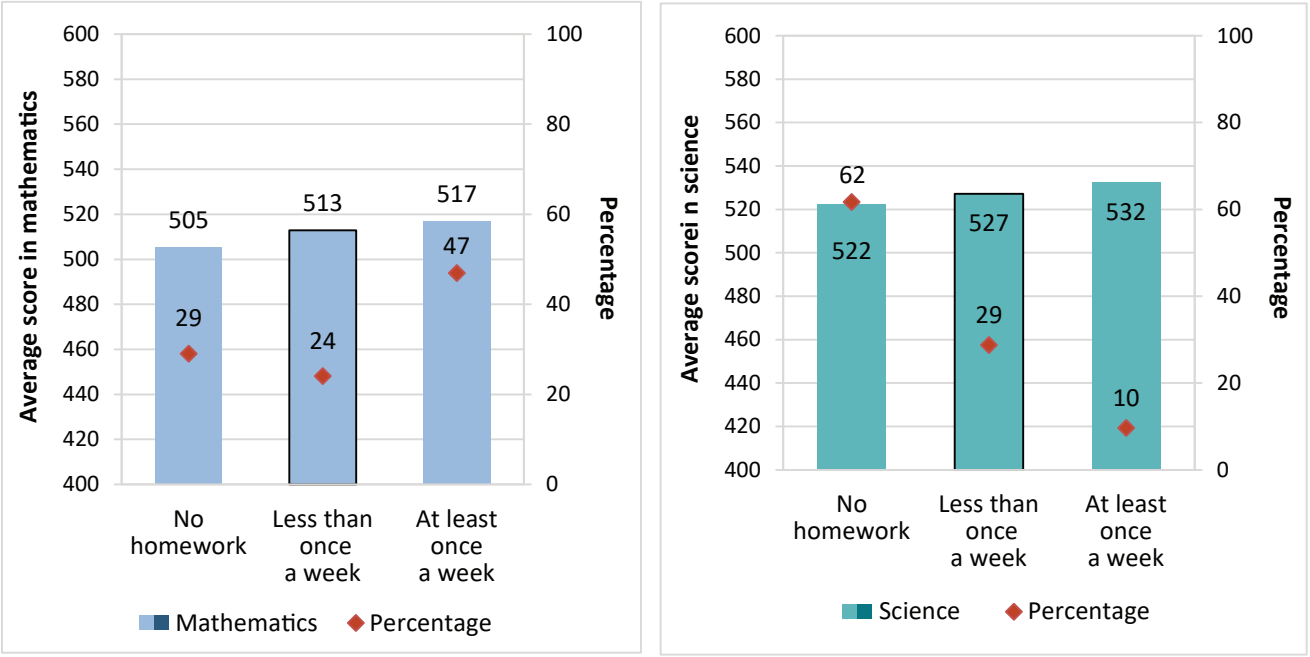
The evidence regarding the benefit to student achievement of time spent on homework and the amount of homework assigned suggests a complex relationship. Depending on the subject area and the grade level, research findings often appear to be contradictory (CMEC, 2014). Examining Grade 4 results from PIRLS and TIMSS, Jerrim, Lopez-Agudo and Marcenaro-Gutierrez (2019) found little evidence that the amount of time primary school children spend doing homework is related to their academic achievement. The results from TIMSS 2019 supports this finding—based on teachers' reports, there was no significant relationship between homework assigned per week and achievement in mathematics or science. In Canada overall and across provinces, homework is assigned more frequently in mathematics than in science (Table 3.15, Figure 3.26; Appendix B.3.20).

TABLE 3.15 Frequency of homework assignments

	Mathematics			Science		
	No homework	Less than once a week	At least once a week	No homework	Less than once a week	At least once a week
Newfoundland and Labrador	U	30	53	67	33	U
Quebec	35	17	48	88	11	U
Ontario	21	28	51	42	38	19
Manitoba	40	30	30	63	34	U
Alberta	37	25	39	64	34	U
Canada	**29**	**24**	**47**	**62**	**29**	**10**
International	**7**	**8**	**85**	**25**	**28**	**46**

Note: U – too unreliable to be published.

FIGURE 3.26 Relationship between homework assigned per week and student achievement



Note: Darker shade denotes significant difference compared to the less than once a week category.

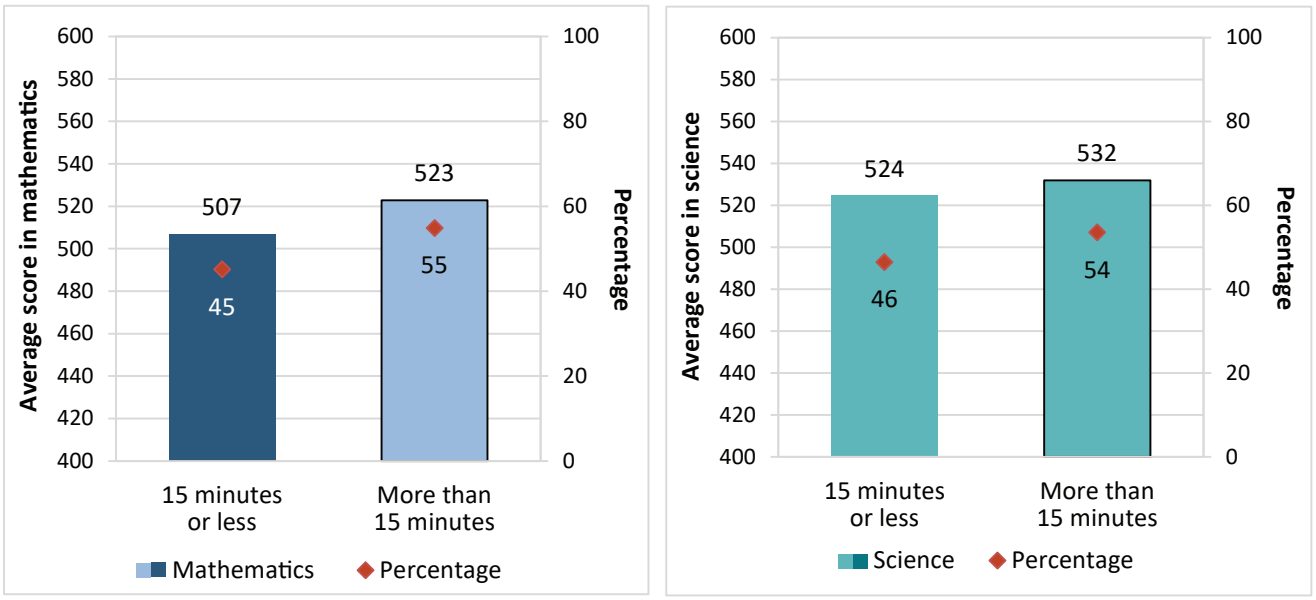
Teachers were asked about the homework time per assignment that was given in mathematics and science using four response categories: 15 minutes or less, 16-30 minutes, more than 30 minutes, more than 60 minutes. There were too few responses at the Canada and provincial levels to report reliably for the more than 30 and more than 60 minute categories so these data were included in a category more than 15 minutes. Teachers assigned a similar amount of homework time per assignment in mathematics and science lessons at the Canada level (Table 3.16). At the Canada level higher achievement scores were attained by students who were assigned longer times on mathematics assignments, although there was no significant difference found for science (Figure 3.27). No significant differences were found for homework time for either mathematics or science at the provincial level, with the exception of Ontario for homework time for mathematics (Appendix B.3.21).

TABLE 3.16 Percentage of students by time spent on homework by assignment

	Mathematics		Science	
	15 minutes or less	More than 15 minutes	15 minutes or less	More than 15 minutes
Newfoundland and Labrador	71	29	61	U
Quebec	40	60	U	64
Ontario	40	60	39	61
Manitoba	68	32	68	32
Alberta	64	36	75	25
Canada	**45**	**55**	**46**	**54**
International	**34**	**66**	**44**	**56**

Note: U – too unreliable to be published.

FIGURE 3.27 Relationship between time assigned on homework per assignment and student achievement



Note: Darker shade denotes significant difference between the two categories.

Technology in education

The use of computers and other information and communications technology (ICT) in the classroom, as well as investments in educational software, has largely increased over the past decade. However, studies have found little evidence that greater computer and ICT use among students in the classroom has a positive impact on student achievement (OECD, 2015). Based on meta-analyses of over 80 research articles pertaining to computer-based instruction and student achievement, Hattie (2013) found that the impact on student learning is about the same as most well-intentioned teaching interventions.

The TIMSS 2019 questionnaires asked a variety of questions relating to technology in the classroom, three of which will be examined in this chapter. Table 3.17 presents information about students' access to computers at school based on teachers' reports. At the Grade 4 level, students generally have access to a computer that is shared in their mathematics or science class, or computers that are shared within the school. The proportion of students whose teachers reported that each student has a computer is similar at the Canada

and international levels; however, a higher proportion of students have access to shared computers in Canada compared to other countries.

TABLE 3.17 Percentage of students with access to computers at school

	Mathematics			Science		
	Each student has a computer	The class has a computer that students can share	The school has computers that the class can sometimes use	Each student has a computer	The class has a computer that students can share	The school has computers that the class can sometimes use
Newfoundland and Labrador	U	47	62	U	51	65
Quebec	8	17	28	10	20	32
Ontario	13	42	49	15	52	61
Manitoba	7	41	54	11	53	68
Alberta	25	26	49	33	38	62
Canada	**13**	**32**	**43**	**16**	**40**	**52**
International	**13**	**17**	**29**	**14**	**22**	**36**

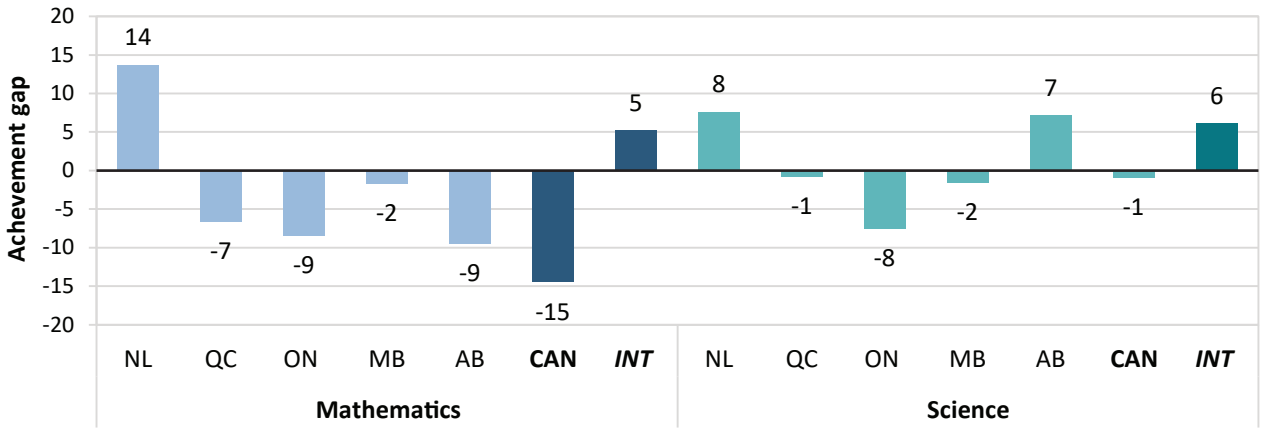
Teachers were also asked about the availability of computers for students during mathematics and science lessons. In Canada overall, about half of Grade 4 students had access to computers for mathematics lessons, while nearly two-thirds had access to devices during science classes. Students in Quebec were less likely to have access to computers for mathematics and science lessons compared to students in all other provinces (Table 3.18; Appendix B.3.22).

TABLE 3.18 Percentage of students with computers available to use during mathematics and science lessons

	Mathematics	Science
Newfoundland and Labrador	64	67
Quebec	32	38
Ontario	59	75
Manitoba	62	76
Alberta	63	79
Canada	**51**	**64**
International	**39**	**45**

In Canada overall, students who did not have access to devices for mathematics lessons scored 15 points higher than students who did have access to computers or tablets, although this pattern was not found in science. Access to computers for lessons had no relationship with achievement in either mathematics or science at the provincial level (Figure 3.28; Appendix B.3.22).

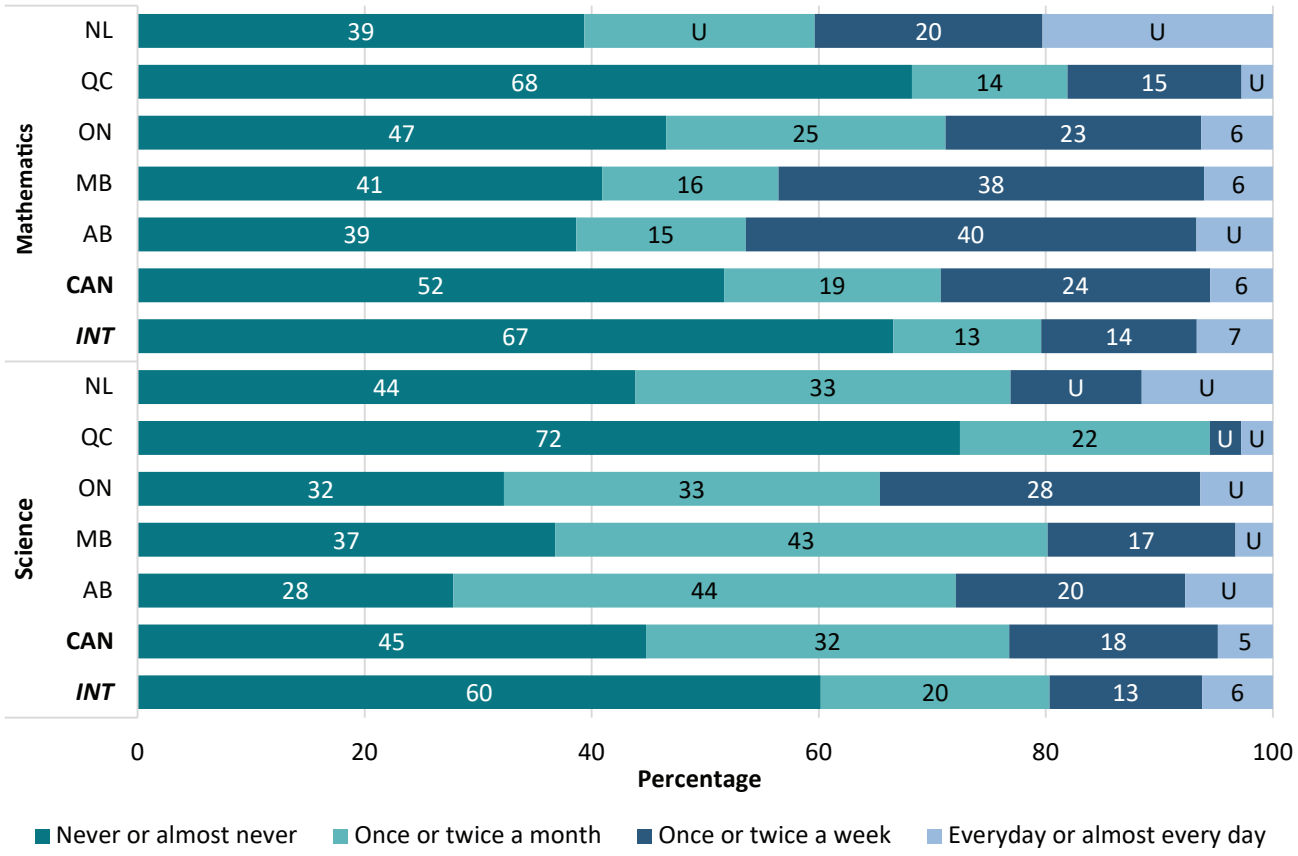
FIGURE 3.28 Relationship between access to computers for lessons and achievement



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

Teachers were also asked questions relating to how often their students use computers or tablets in the classroom for lessons and tests. Just over half of students in Canada never used computers during mathematics lessons, while 45 percent of Canadian students never used devices for science lessons. Internationally, students were less likely to use computers for lessons in comparison to students in Canada. There were relatively small provincial differences for computer usage during lessons. Students in Quebec were less likely to use devices while students in Manitoba and Alberta were more likely to use computers or tablets for lessons at least monthly (Figure 3.29; Appendix B.3.23). At the Canadian level, although higher scores were achieved by students using computers one or twice a month in mathematics and science compared to those who never or almost never used computers, there were no further gains found for students whose teachers used computers to support learning more frequently.

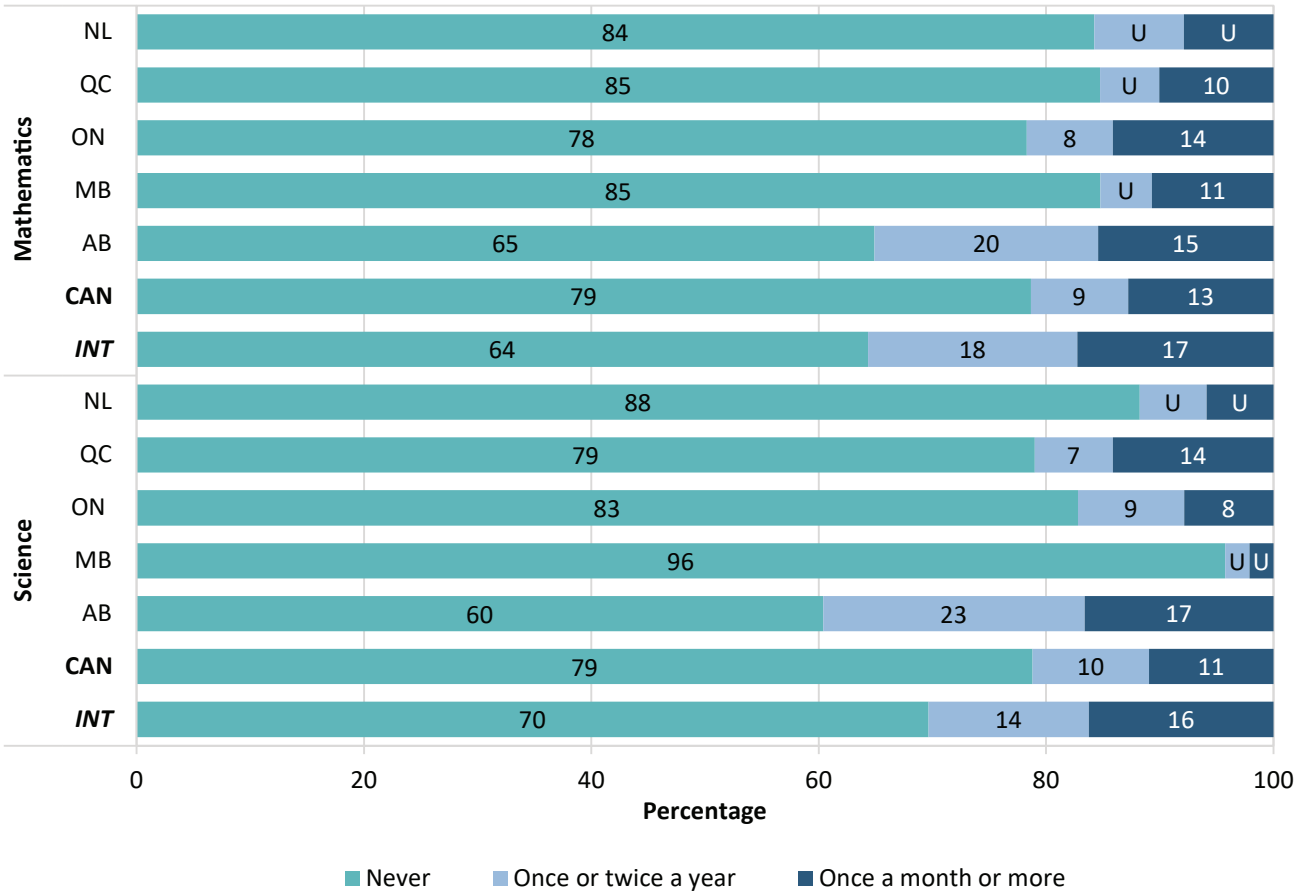
FIGURE 3.29 Percentage of students by frequency teachers support learning with computers during lessons



Note: U – too unreliable to be published.

Figure 3.30 examines how often students take tests on computers or tablets in their mathematics or science classes. Overall in Canada, 79 percent of students never took a mathematics or science test using a digital device. Students in Alberta were more likely to have taken tests in mathematics and science on computers or tablets while students in Manitoba were least likely to be tested on digital devices.

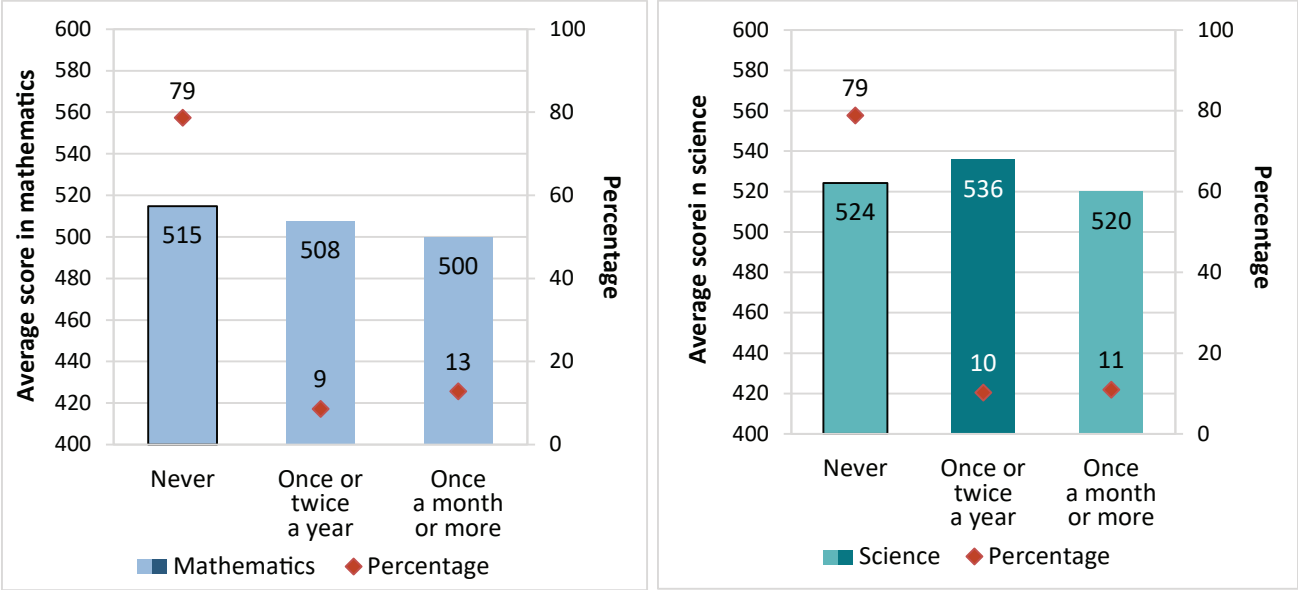
FIGURE 3.30 **Percentage of students by frequency students take tests on computers/tablets**



Note: U – too unreliable to be published.

In Canada, and in about half of participating countries, TIMSS was administered on computers for the first time in 2019. In Canada, students who took science tests on computers or devices once or twice a year had higher performance than those who never did the same. No significant differences were found at the Canadian level in mathematics (Figure 3.31; Appendix B.3.24).

FIGURE 3.31 Relationship between frequency students take tests on computers and student achievement



Note: Darker shade denotes significant difference compared to the never category.

Intended curriculum

An important element of TIMSS is its ability to identify what proportion of the topics covered by the assessment have been taught to students. As part of the Teacher Questionnaire, classroom teachers were asked to describe when students in their classes were taught each mathematics and science subdomain covered by TIMSS. In each case, teachers had to select among three choices: mostly taught before this year, mostly taught this year, and not yet taught or just introduced. The information provided by this process allows provinces to identify opportunities for improvement in their programs. However, because curriculum is under the exclusive jurisdiction of Canadian provinces and territories, provincial results were not compared.

TIMSS curriculum topics covered in Newfoundland and Labrador

In Grade 4 mathematics, most students in Newfoundland and Labrador had been taught all the topics in the *number* and *data* subdomains, although approximately one-quarter of students had not been taught or had just learned concepts of fractions and decimals at the time of the TIMSS assessment. On the other hand, in the *measurement and geometry* subdomain, four out of the seven topics had not yet been taught or had just been introduced to 63 percent or more of students: *solving problems involving mass, volume, and time*; *finding and estimating perimeter, area, and volume*; *parallel and perpendicular lines*; and *comparing and drawing angles* (Appendix B.3.25). In science, most topics in the *life science* subdomain had been taught to a majority of students, with the exception of two topics (*major body structures and their functions in humans, other animals, and plants*; and *characteristics of plants and animals that are inherited*). The same is true for the majority of topics in *Earth science* subdomain; however, there were two topics in *Earth science* that had not yet been taught or had just been introduced to more than 75 percent of students: *objects in the solar system* and *Earth's motion and related patterns observed on Earth*. In contrast, in the *physical science* subdomain, more than half of the topics had not yet been taught or had just been introduced to 53 percent or more of students (Appendix B.3.26).

TIMSS curriculum topics covered in Quebec

Teachers reported that students in Quebec had been taught the majority of topics in the three Grade 4 mathematics subdomains. About one quarter of students had not been taught or had just learned concepts of fractions and about one third of students not been taught or had just learned to solve problems involving mass, volume, and time (Appendix B.3.27). In science, most of the topics in the *physical science* subdomain had not yet been taught or had just been introduced to more than half of students. However, in the remaining two subdomains, *life science* and *Earth science*, most of the topics were taught to a majority of students. Only one topic in *life science* (*characteristics of plants and animals that are inherited*) and two topics in *Earth science* (*changes in Earth's surface over time* and *fossils and what they can tell us about past conditions on Earth*) had not yet been taught or had just been introduced to 60 percent or more of students (Appendix B.3.28).

TIMSS curriculum topics covered in Ontario

In Grade 4, according to teachers' responses, the majority of students in Ontario had been taught all the topics in the three mathematics subdomains (Appendix B.3.29). Most Ontario students also had been taught many of the topics in the three science subdomains. However, five topics in *physical science* had not yet been taught or had just been introduced to more than half of students (*classifying materials based on physical properties*; *mixtures, including methods for separating a mixture into its components*; *chemical changes in everyday life*; *heat transfer*; and *electricity and simple electrical circuits*). In addition, there were also three topics in the *Earth science* subdomain (*physical makeup of Earth's surface*; *objects in the solar system (the Sun, the Earth, the Moon, and other planets) and their movements*; and *Earth's motion and related patterns observed on Earth*) and two topics in the *life science* subdomain (*major body structures and their functions in humans, other animals, and plants*; and *human health*) that had not yet been taught or had just been introduced to more than half of the students (Appendix B.3.30).

TIMSS curriculum topics covered in Manitoba

In Manitoba, almost all the topics in the *number* and *data display* mathematics subdomains had been taught to students, although concepts of decimals had not yet been taught or had just been introduced to more than half of students. In the *measurement and geometry* subdomain, three topics had not yet been taught or had just been introduced to more than half of students: *solving problems involving mass, volume, and time*; *parallel and perpendicular lines*; and *comparing and drawing angles* (Appendix B.3.31). In science, almost all the topics in the *life science* subdomain, except *major body structures and their functions in humans, other animals, and plants*, had not yet been taught or had just been introduced to more than half of students. In addition, there were three topics in the *physical science* subdomain that had not yet been taught or had just been introduced to more than half of students: *chemical changes in everyday life*, *heat transfer*, and *electricity and simple circuits*. In the *Earth science* subdomain, three topics had not yet been taught or had just been introduced to more than half of students: *weather and climate*, *objects in the solar system*, and *Earth's motion and related patterns observed on Earth* (Appendix B.3.32).

TIMSS curriculum topics covered in Alberta

In Grade 4 mathematics, the majority of students in Alberta had been taught all the topics in the *number* and *data display* subdomains. However, four topics in the *measurement and geometry* subdomain had not yet been taught or had just been introduced to more than half of the students: *solving problems involving mass*, *volume, and time*; *finding and estimating perimeter, area, and volume*; *parallel and perpendicular lines*; and *comparing and drawing angles* (Appendix B.3.33). In Grade 4 science, most topics in the *life science* subdomain had been taught to the majority of students, with the exception of *major body structures and their functions in humans,*

other animals, and plants; and *characteristics of plants and animals that are inherited*. In the *physical science* subdomain, half of the topics had not been taught or had just been introduced to more than 60 percent of students. In addition, four topics in the *Earth science* subdomain had not been taught or had just been introduced to more than half of students (Appendix B.3.34).

Summary

The TIMSS 2019 questionnaires provide valuable information on school, teacher, and classroom characteristics and the relationship between these important educational contexts and student achievement in mathematics and science. In addition, the questionnaires closely examined the use of technology in education, as schools, school boards/districts, and governments invest further in information and communications technology in classrooms.

Socioeconomic status continues to be a predictor of academic success. Students attending schools with relatively more affluent students had higher achievement than those attending schools with relatively more disadvantaged students in both mathematics and science. The pattern has been consistently reported in the academic literature as well in in other large-scale assessment projects, such as PISA, PCAP, and PIRLS.

Across countries, approximately 60 percent of students were in schools in which more than 90 percent of students spoke the language of the test. In Canada, only 43 percent of students were in schools characterized by such language homogeneity which speaks to the multilingual and multicultural character of this country. However, the proportion of students in schools with less than 50 percent of students with the language of the test as their home language was similar at the Canada and international levels (approximately 20 percent). The relationship between language composition of the school and achievement was not linear and there were few significant differences at the provincial level.

In Canada, approximately half of students attended schools considered to be very safe and orderly by their teachers, which is about 10 percent lower than the international average. Although science achievement was higher for students who attended schools in which teachers reported minimal discipline issues, no significant relationship was found for mathematics achievement.

Adequate school resources, including supplies, computers, buildings, and libraries, are considered to be integral to student development and school management. In Canada, approximately 60 percent of students attend schools in which principals reported that instruction was affected somewhat or a lot by shortages of resources (57 percent for mathematics and 67 percent for science). Although only 11 percent of students have access to a science laboratory at the Grade 4 level, compared to 36 percent internationally, the relationship to achievement is significant in Canada overall. Further, 20 percent of students are in schools in which teachers have assistance during science experiments; however, no significant relationship to achievement was found.

As students progress through public education, they learn increasingly challenging and sophisticated curriculum, and they also learn how to learn. An important aspect of success is students' readiness to learn and engage critically during lessons. However, the teachers of three-quarters of Canadian students and two-thirds of students internationally, reported that their teaching was limited some or a lot by students not being ready for instruction, and this was related to lower achievement in both mathematics and science. When asked about the clarity of instructions in their lessons, approximately three-quarters of students in Canada and across countries reported that their mathematics and science lessons were taught with high instructional clarity which had a significant positive relationship with achievement.

TIMSS 2019 surveyed the availability of digital resources in schools. At the Grade 4 level, students generally have access to a computer that is shared in their class or computers that are shared within the school. The proportion of students whose teachers reported that each student has a computer is similar at the Canada and international levels (13 percent); however, a higher proportion of students have access to shared computers in Canada compared to other countries. In Canada overall, 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, which is higher than the international averages (39 percent and 45 percent, respectively). However, the majority of students have teachers who do not assess students in mathematics or science using a digital device at the Grade 4 level. More than 60 percent of students attended a school in Canada with an online learning management system and close to 90 percent of students had access to digital learning resources in their school.

CONCLUSION

The Trends in International Mathematics and Science Study (TIMSS) is an international assessment that measures trends in mathematics and science achievement at the equivalent of the Grade 4 and Grade 8/ Secondary II levels. The International Association for the Evaluation of Educational Achievement (IEA) has organized this study every four years since 1995. In 2019, over 330,000 students from around the world took part in the Grade 4 assessment, and over 250,000 students took part in the Grade 8 assessment. In Canada, 13,653 students from five provinces (Alberta, Manitoba, Ontario, Quebec, and Newfoundland and Labrador) participated at the Grade 4 level in 2019.

TIMSS provides comparative information on the abilities of students at the elementary level. TIMSS data allow researchers and other stakeholders to compare countries and provinces with respect to the knowledge and skills of fourth grade students; the data also provide information that permits change in performance to be monitored over time.

Overall results

TIMSS Grade 4 mathematics has been proposed by the UNESCO Institute for Statistics as an indicator for mathematics at the end of primary school with the TIMSS low international benchmark of 400 TIMSS points as the global minimum proficiency level. In Canada, 92 percent of students reached this proficiency level in mathematics while six percent of students reached the highest level of proficiency (advanced international benchmark). Canadian Grade 4 students achieved a mean score of 512 in mathematics, which is above the international centrepoint of 500 but substantially below the highest performing country, Singapore, which had an average score of 625.

In science, the low international benchmark was reached by 95 percent of Canadian students, while seven percent of students reached the advanced international benchmark. Thirty-two countries, including Canada and all Canadian provinces had higher achievement than the TIMSS centrepoint of 500, which is the point of reference that remains constant from one TIMSS assessment to the next.

Performance by language of the school system

In four of the five provinces that participated in TIMSS (Alberta, Manitoba, Ontario, and Quebec) samples were representative of both majority and minority official language groups. For mathematics, a higher proportion of students in francophone schools achieved at least 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 at least the basic (low benchmark) level of achievement in Canada overall in both language systems. At the highest level of achievement, more anglophone students (eight percent) than francophone students (five percent) reached the advanced benchmark. The achievement gap between anglophone and francophone school systems favoured francophone students in mathematics by 26 points and anglophone students in science by seven points.

Results by gender

In Canada overall, more boys than girls reached the basic level of achievement (low international benchmark (94 percent vs. 91 percent)) and attained the highest level of proficiency (advanced international benchmark (eight percent vs. four percent)) in mathematics. In science, the same proportion of girls and boys (95 percent) reached the basic level of achievement (low international benchmark); however, a higher proportion of boys than girls attained the highest level of proficiency (eight percent vs. six percent, respectively). Moreover, in Canada, two additional gender options were included: "I identify in another way" and "I prefer not to say".

In Canada as a whole, and in 26 other countries, boys outperformed girls in mathematics; however, 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 four points. In seven countries, including Canada, boys outperformed girls in science; however, girls outperformed boys in 18 countries.

Results over time

TIMSS 2019 marks the second time that Canada has participated with a sample size that was large enough to obtain country-level results. At the Canada level, results at the Grade 4 level have been relatively stable in both mathematics and science for overall results by both performance level and average score, as well as by the content and cognitive subscales for these two subjects.

The achievement gap for the two language groups decreased by five points for mathematics between 2015 and 2019. For science, although there was no significant achievement gap between anglophone and francophone schools in 2015, the gap became significant in 2019.

The achievement gap favouring boys in mathematics became even greater in 2019. In science, no gender difference was found in 2015 while boys outperformed girls in science in 2019.

Student background characteristics influencing mathematics and science scores

Several student background characteristics were measured in TIMSS 2019. Socioeconomic factors remain one of the most consistently significant predictors associated with academic achievement. First, both the home resources for learning index along with the socioeconomic composition of the student body in schools show significant achievement differences in mathematics and science when comparing more advantaged students to more disadvantaged students. Secondly, parent and home environments were also considered. Parental expectation for their child's educational attainment was associated with significant differences in mathematics and science performance. Moreover, students who sometimes or never spoke the language of the test at home were associated with significantly lower achievement in science compared to those who always or almost always spoke the language at home. Thirdly, significant differences were found in preschool learning, such as years of attendance and engagement in early numeracy and literacy activities. Students who had begun school at age six had higher scores in both mathematics and science than those who had begun school at age five. Finally, students' feelings, attitudes and experiences were also considered. Significant differences in predictable directions were found consistently in trends regarding students' feelings of tiredness and hunger, school belonging, student confidence, and frequency of being bullied.

Contextual factors influencing mathematics and science scores

In addition to student background characteristics, teacher, classroom, and in-school factors also influence academic achievement. For instance, students in schools with more general school resources as well as resources specific to mathematics and science instruction score significantly higher than their peers in schools with limited resources. However, achievement differences are less prevalent for information and communication technology (ICT) resources. Students with access to digital learning resources do not score significantly higher in mathematics or science than students without this access, and students who do not have access to computers or tablets for mathematics lessons score significantly higher in mathematics than their peers who have these devices available to them in the classroom. The TIMSS 2019 contextual questionnaires present a better picture of how resources are associated with higher achievement, and which resources are most effective.

What occurs while in the classroom can also influence academic achievement. When teachers report that classroom learning is only minimally affected by students not ready for instruction and when students report that their lessons are taught with high clarity, students score significantly higher in mathematics and science compared to students in classes with more learning disruptions and less instructional clarity. The relationship between achievement and the amount of homework assigned and time spent on homework is not as clear. There are no significant achievement differences between the amount of homework assigned and results in mathematics and science, while students who spend 15 minutes or less on mathematics homework do score lower in mathematics than students who spent more than 15 minutes on homework.

Final statement

The results from the TIMSS 2019 assessment provide a comprehensive picture of Grade 4 students' skills in mathematics and science at the provincial and pan-Canadian levels and in comparison with other participating countries. They also highlight the different factors in the students' home, classroom, and school environments contributing to their performance in mathematics and science. Although Canadian students are performing well in mathematics and science, this report helps to identify areas that could be improved. Over the coming months, CMEC, in collaboration with ministries and departments of education, will continue to analyze the results from TIMSS, in conjunction with other education indicators, to better inform the teaching of mathematics and science and related educational policies.

REFERENCES

Andon, A., Thompson, C. G., & Becker, B. J. (2014). A quantitative synthesis of the immigrant achievement gap across OECD countries. *Large-Scale Assessments in Education*, *2*(1), 7. Retrieved from http://doi.org/10.1186/s40536-014-0007-2

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Macmillan.

Blank, R.K., & de las Alas, N. (2009). *Effects of teacher professional development on gains in student achievement: How meta-analysis provides scientific evidence useful to education leaders*. Washington, D.C.: Council of Chief State School Officers.

Bolyard, J.J., & Moyer-Packenham, P.S. (2008). A review of the literature on mathematics and science teacher quality. *Peabody Journal of Education, 83*(4): 509–535.

Bose, J. (2001). Nonresponse bias analyses at the National Center for Education Statistics. In *Proceedings of Statistics Canada Symposium 2001. Achieving data quality in a statistical agency: A methodological perspective.* Retrieved from https://nces.ed.gov/FCSM/pdf/IHSNG_StatsCan2_JB.pdf

Brochu, P., O'Grady, K., Scerbina, T., Khan, G., & Muhe, N. (2017). *TIMSS 2015. Canadian results from the trends in international mathematics and science study*. Toronto: Council of Ministers of Education, Canada. Retrieved from https://www.cmec.ca/Publications/Lists/Publications/Attachments/373/TIMSS2015_Report_EN.pdf

Brochu, P., O'Grady, K., Scerbina, T., & Tao, Y. (2018). *PIRLS/ePIRLS 2016: Canada in context – Canadian results from the Progress in International Reading Literacy Study*. Toronto: Council of Ministers of Education, Canada.

Bruckauf, Z. (2016). *Falling behind: Socio-demographic profiles of educationally disadvantaged youth. Evidence from PISA 2000–2012*. UNICEF Office of Research, Innocenti Working Papers. Retrieved from https://www. unicef-irc.org/publications/pdf/IWP_2016_11.pdf

Causa, O., Dantan, S., & Johansson, A. (2009). *Intergenerational social mobility in European OECD countries*. OECD Economics Department Working Papers, No. 709. Paris: OECD Publishing. Retrieved from http://doi.org/10.1787/223043801483

Chevalier, A., Harmon, C., O'Sullivan, V., & Walker, I. (2013). The impact of parental income and education on the schooling of their children. *IZA Journal of Labor Economics*, *2*(8), 1–22. Retrieved from http://doi.org/10.1186/2193-8997-2-8

Cleary, T. J., & Kistantas, A. (2017). Motivation and self-regulated learning influences on middle school mathematics achievement. *School Psychology Review, 46*(1), 88–107. Doi: 10.17105/ SPR46-1.88-107

Collin, C., and Jensen, H. (2009). *A statistical profile of poverty in Canada*. Library of Parliament Cat. No. PRB 09-17E. Retrieved from http://www.parl.gc.ca/content/lop/researchpublications/prb0917-e.pdf

Council of Ministers of Education, Canada (CMEC). (2010). *Teacher education and development study in mathematics 2008. Canadian Report*. Toronto: Author. Retrieved from http://www.cmec.ca/ Publications/Lists/Publications/Attachments/277/WEB%20TEDS-M_Report_Eng.pdf

Council of Ministers of Education, Canada. (2014). Homework alert: How much is enough? *Assessment Matters!* 7. Retrieved from https://www.cmec.ca/Publications/Lists/Publications/Attachments/338/AMatters_No7_Homework_EN.pdf

Council of Ministers of Education, Canada. (2015). Immigrants in Canada: Does socioeconomic background matter? *Assessment Matters!* 9, 1–8. Toronto: Author. Retrieved from https://cmec.ca/Publications/Lists/Publications/Attachments/343/AMatters_No9_EN.pdf

Council of Ministers of Education, Canada. (2019). Bullying: What's happening in our schools? *Assessment Matters!* 12. Retrieved from https://cmec.ca/Publications/Lists/Publications/Attachments/391/AMatters_2019_No12_EN.pdf

Council of Ministers of Education, Canada. (2020). What did you have for breakfast this morning? *Assessment Matters!* 15. Retrieved from https://cmec.ca/Publications/Lists/Publications/Attachments/408/AMatters_2020_No15_EN.pdf

Darling-Hammond, L. (2014–15). Want to close the achievement gap? *American Educator*, Winter, 14–18.

Druva, C.A., & Anderson, R.D. (1983). Science teacher characteristics by teacher behavior and by student outcome: A meta-analysis of research. *Journal of Research in Science Teaching, 20*, 467–479.

Duff, P. A., & Becker-Zayas, A. (2017). Demographics and heritage languages in Canada. In O. Kagan, M. Carreira, & C. Hitchens (Eds.), *The Routledge handbook of heritage language education: From innovation to program building* (pp. 57–67). New York and Abingdon, UK: Routledge.

Goforth, K., Noltemeyer, A., Patton, J., Bush, K. R., & Bergen, D. (2014). Understanding mathematics achievement: An analysis of the effects of student and family factors. *Educational Studies, 40*(2), 196–214.

Goldhaber, D.D., & Brewer, D.J. (1996). *Evaluating the effect of teacher degree level on educational performance*. Washington, DC: NCES. Retrieved from http://nces.ed.gov/pubs97/97535l.pdf

Hattie, J. (2013). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. London: Routledge.

Jerrim, J., Lopez-Agudo, L.A., & Marcenaro-Gutierrez, O.D. (2019). The association between homework and primary school children's academic achievement. International evidence from PIRLS and TIMSS. *European Journal of Education, 55*(2), 248-260. Retrieved from https://doi.org/10.1111/ejed.12374

Jiang, F., & McComas, W.F. (2015). The effects of inquiry teaching on student science achievement and attitudes: Evidence from propensity score analysis of PISA data. *International Journal of Science Education, 37*(3), 554−577

Kearney, W.S. & Garfield, T. (2019). Student readiness to learn and teacher effectiveness: Two key factors in middle grades mathematics achievement. *Research in Middle Level Education Online, 42*(5), 1−12. Retrieved from https://doaj.org/article/5d5655d1f6ec4d1fae25a0ff27ca14f4

Kelly, D.L., Centurino, V.A.S., Martin, M.O., & Mullis, I.V.S. (Eds.) (2020). *TIMSS 2019 Encyclopedia: Education Policy and Curriculum in Mathematics and Science*. Boston College: TIMSS & PIRLS International Study Center. Retrieved from https://timssandpirls.bc.edu/timss2019/encyclopedia/

Ker, H. W. (2016). The impacts of student-, teacher- and school-level factors on mathematics achievement: an exploratory comparative investigation of Singaporean students and the USA students. *Educational Psychology, 36*(2), 254-276.

Kirschner, P.A., Sweller, J., & Clark, R.E. (2006). Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. *Educational Psychologist, 41*(2), 75−86.

Konishi, C., Hymel, S., Zumbo, B.D., & Li, Z. (2010). Do school bullying and student–teacher relationships matter for academic achievement? A multilevel analysis. *Journal of School Psychology, 25*(1), 19–39.

Merry, J. J. (2013). Tracing the U.S. deficit in PISA reading skills to early childhood. *Sociology of Education*, *86*(3), 234–252. Retrieved from http://doi.org/10.1177/0038040712472913

Martin, M. O., von Davier, M., & Mullis, I. V. S. (Eds.). (2020). *Methods and Procedures: TIMSS 2019 Technical Report*. Boston College: TIMSS & PIRLS International Study Center. Retrieved from https://timssandpirls.bc.edu/timss2019/methods

Minner, D.D., Levey, A.J., & Century, J. (2010). Inquiry-based science instruction—What is it and does it matter? Results from a research synthesis years 1984 to 2002. *Journal of Research in Science Teaching, 47*(4), 474–496.

Mullis, I. V. S., Martin, M. O., Foy, P., Kelly, D., & Fishbein, B. (2020). *TIMSS 2019 International Results in Mathematics and Science*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College. Retrieved from http://timssandpirls.bc.edu/timss2019/international-results/

Mullis, I. V. S., & Martin, M. O. (Eds.). (2017). *TIMSS 2019 Assessment Frameworks*. Boston College: TIMSS & PIRLS International Study Center. Retrieved from http://timssandpirls.bc.edu/timss2019/frameworks/

OECD. (2010). *Pathways to success: How knowledge and skills at age 15 shape future lives in Canada*. Paris: OECD Publishing. Retrieved from https://www.oecd.org/canada/pathwaystosuccess-howknowledgeandskil lsatage15shapefuturelivesincanada.htm

OECD (2015). How computers are related to students' performance. In *Students, computers and learning: Making the connection* (pp. 145-164). Paris: OECD Publishing. Retrieved from https://doi.org/10.1787/9789264239555-en

O'Grady, K., Deussing, M-A., Scerbina, T., Tao, Y., Fung, K., Elez, V., & Monk, J. (2019). *Measuring up: Canadian Results of the OECD PISA 2018 Study. The Performance of Canadian 15-Year-olds in Reading, Mathematics, and Science.* Toronto: Council of Ministers of Education, Canada. Retrieved from https://www.cmec.ca/Publications/Lists/Publications/Attachments/396/PISA2018_PublicReport_EN.pdf

O'Grady, K., Fung, K., Servage, L., & Khan, G. (2018). PCAP 2016: Report on the pan-Canadian assessment of reading, mathematics, and science. Toronto: Council of Ministers of Education, Canada. Retrieved from https://cmec.ca/Publications/Lists/Publications/Attachments/381/PCAP-2016-Public-Report-EN.pdf

O'Grady, K. & Houme, K. (2015). PCAP 2013 Contextual Report on Student Achievement in Science. Toronto: Council of Ministers of Education, Canada. Retrieved from https://www.cmec.ca/Publications/Lists/Publications/Attachments/350/PCAP2013_ContextualReport_Final_Web_EN.pdf

Opfer, V.D., & Pedder, D. (2011). The lost promise of teacher professional development in England. *European Journal of Teacher Education*, *34*(1), 3–24.

Pagani, L.S. & Fitzpatrick, C. (2014). Children's School Readiness: Implications for Eliminating Future Disparities in Health and Education. *Health Education & Behavior 2014, 41*(1), 25–33. DOI: 10.1177/1090198113478818 heb.sagepub.com.

Parkin, A. (2015). *International report card on public education: Key facts on Canadian achievement and equity*. Toronto: Environics Institute. Retrieved from https://www.environicsinstitute.org/projects/project-details/international-report-card-on-public-education-key-facts-on-canadian-achievement-and-equity

Reardon, S. F. (2011). The Widening Academic-Achievement Gap between the Rich and the Poor: New Evidence and Possible Explanations. In G. J. Duncan & R. J. Marnane (Eds.), *Whither Opportunity? Rising Inequality, Schools, and Children's Life Chances* (pp. 91–118). New York: Russell Sage Foundation.

Rice, J.K. (2003). *Teacher quality: Understanding the effectiveness of teacher attributes*. Washington, DC: Economic Policy Institute.

Rice J.K. (2010). *The impact of teacher experience: Examining the evidence and policy implications*. Washington, DC: National Center for the Analysis of Longitudinal Data in Education Research, Urban Institute. Retrieved from http://www.urban.org/uploadedpdf/1001455-impact-teacherexperience.pdf

Schroeder, C.M., Scott, T.P., Tolson, H., Huang, T.-Y., & Lee, Y.-H. (2007). A meta-analysis of national research: Effects of teaching strategies on student achievement in science in the United States. *Journal of Research in Science Teaching, 44*(10), 1436–1460.

Sirin, S.R. (2005). Socioeconomic status and academic achievement: A meta-analytic review of research. *Review of Educational Research, 75*(3), 417–453.

Statistics Canada. (2017). Census in brief: Linguistic diversity and multilingualism in Canadian homes. Retrieved from https://www12.statcan.gc.ca/census-recensement/2016/as-sa/98-200-x/2016010/98-200-x2016010-eng.cfm

Tokunaga, R.S. (2010). Following you home from school: A critical review and synthesis of research on cyberbullying victimization. *Computers in Human Behavior, 26*(3), 277–287.

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

UNESCO. (2016b). *Education for People and Planet: Creating Sustainable Futures for All. Global education monitoring report*. Retrieved from https://unesdoc.unesco.org/ark:/48223/pf0000245745?posInSet=1&queryId=bfba404a-cd31-4522-8a7d-e8f2f207f800

UNESCO Institute for Statistics. (2020). *Evidence-based Projections and Benchmarks for SDG Indicator 4.1.1*. UIS Information Paper No. 63. Retrieved from http://gaml.uis.unesco.org/wp-content/uploads/sites/2/2020/01/IP63-evidence-based-projections-and-benchmarks-for-SDG-indicator-4-1-1.pdf

Wech, D., & Weinkam, T. (2016). *Determinants of the educational situation of young migrants*. Munich: CESifo Group. Retrieved from https://www.ifo.de/DocDL/dice-report-2016-3-wech-weinkam-september.pdf

Wise, K.C. (1996). Strategies for teaching science: What works? *The Clearing House: A Journal of Educational Strategies, Issues and Ideas, 69*(6), 337–338.

Yoon, K.S., Duncan, T., Lee, S. W.-Y., Scarloss, B., & Sharpley, K. (2007). *Reviewing the evidence on how teacher professional development affects student achievement* (Issues & Answers Report, REL 2007–No. 033). Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Southwest. Retrieved from https://ies.ed.gov/ ncee/edlabs/regions/southwest/pdf/rel_2007033.pdf

APPENDIX A
Exclusion and response rates in Canada

TIMSS is designed to assess mathematics and science achievement of students in their fourth and eighth year of schooling. The international target population in TIMSS is defined in terms of the number of years of formal schooling to ensure the international comparability of results. In Canada and in most other countries, the target grade of four years of schooling would be Grade 4; similarly, the target grade of eight years of schooling would be Grade 8 (or Secondary II in Quebec)[15]. TIMSS uses a two-stage random sample design, with a sample of schools drawn as a first stage and at least one intact class of students selected from each of the sampled schools as a second stage. However, school-entry age varies across countries. Therefore, in order to avoid testing very young students, the average age of fourth grade students at the time of testing must be at least 9.5 years. In Canada, Grade 4 students were on average 9.9 years old at the time of testing.

The 2019 cycle of TIMSS marked the beginning of the transition from a paper-based to a digital assessment. TIMSS was offered both in a digital format as well as in a paper-and-pencil format. More than half of the participating countries, including Canada, administered the digital version of the assessment, while the other half administered the paper version. To control for mode effects and allow data linking across modes, the administration of a bridge study was required. As part of the bridge study, countries transitioning to the digital assessment of TIMSS administered the paper version of the trend items to a separate, equivalent sample of students. In Canada, the bridge study was administered to a sample of 1,604 Grade 4 students across 83 schools. While the results of the bridge study were used to control for mode effects and to link the digital and paper versions of TIMSS, the achievement scores of students who participated in the bridge study were not included in the reporting of TIMSS achievement results. Likewise, the results of the problem solving and inquiry (PSI) items (see the introduction) are not included in this report. Consequently, the schools and students that participated in the bridge study or students who were administered PSI items are not included in the exclusion and participation rates presented in this section of the report, consistent with the TIMSS international report.

The total weighted rate of school-level exclusions in Canada was 3.1 percent (Table A.1). These included geographically remote schools, schools having very few students, schools with a radically different grade structure or curriculum, and schools providing instruction solely to students with special needs, as determined by the provincial education authority. At the provincial level, school-level exclusions ranged from 2.3 percent in Ontario to 6.7 percent in Manitoba.

The total weighted rate of student-level exclusions in Canada was 3.9 percent (Table A.1). These included:

- ***Students with functional disabilities.*** This category comprised students who had permanent physical disabilities such that they could not perform in the TIMSS testing situation. Students with physical disabilities who were able to take the test had to be included.
- ***Students with intellectual disabilities.*** This category consisted of students who were considered, in the professional opinion of the school principal or other qualified staff, to have intellectual disabilities and/or who had been psychologically tested as such. The category included students who were emotionally

[15] The sample size of Grade 8/Secondary II was not large enough to obtain overall results for Canada. Therefore, this report, including this section on the exclusion and participation rates, will cover the results at the Grade 4 level only.

or mentally unable to follow even the general instructions of the test. It should be noted that students could not be excluded solely because of poor academic performance or normal disciplinary problems. Systematic exclusion of all students with dyslexia, or other such learning disabilities, was not acceptable–students had to be accommodated in the test situation, if possible, rather than excluded.

- ***Non-native language speakers.*** This category included students who were unable to read or speak the language of the test (English or French) and would be unable to overcome the language barrier in the test situation. Typically, a student who had received less than one year of instruction in the language of the test had to be excluded.

It was the responsibility of individual schools to determine whether a student should be included or excluded from participating in the TIMSS assessment, based on the international guidelines described above. At the provincial level, student-level exclusions ranged from 1.2 percent in Quebec to 6.2 percent in Alberta.

The exclusion rates must be kept to a minimum so that national samples accurately represent the national target population. The overall weighted student exclusion rate (including both school-level and within-school exclusions) in Canada was 7.0 percent, which exceeds the maximum exclusion rate of 5 percent allowed by quality standards in TIMSS. The overall weighted student exclusion rate ranged from 4.4 percent in Quebec to 10.7 percent in Manitoba. Further steps will be required in future TIMSS cycles to address the issue of high exclusion rates for schools and students in some provinces.

TABLE A.1 TIMSS 2019 exclusion rates by type of exclusion

	School-level exclusions (%)	Student-level exclusions (%)	Overall (%)
Grade 4			
Newfoundland and Labrador	6.1	3.6	9.7
Quebec	3.3	1.2	4.4
Ontario	2.3	4.7	7.0
Manitoba	6.7	4.0	10.7
Alberta	3.9	6.2	10.1
Canada	**3.1**	**3.9**	**7.0**

Note: Non-participating provinces/territories are taken into account when calculating the exclusion rates for Canada overall.

In order to minimize the potential for non-response bias,[16] TIMSS quality standards require minimum participation rates for schools, classrooms, and students. At the national level, for a sample to be fully acceptable, it must have either:

- a minimum school participation rate of 85 percent, based on originally sampled schools, and
- a minimum classroom participation rate of 95 percent, from originally sampled schools and replacement schools, and
- a minimum student participation rate of 85 percent, from sampled schools and replacement schools, or
- a minimum combined school, classroom, and student participation rate of 75 percent, based on originally sampled schools (although classroom and student participation rates may include replacement schools).

Tables A.2 and A.3 show school and student sample sizes, and Table A.4 shows school, class, and student participation rates. In Canada overall, the weighted school participation rate based on originally sampled

[16] Non-response bias may occur when all sampled units (schools and students, in the case of TIMSS) do not participate in the survey (Bose, 2001).

schools was 86 percent, the weighted classroom participation rate was 100 percent, and the weighted student participation rate was 95 percent. Thus, the international standards for participation in the assessment were successfully maintained in Canada. Furthermore, the overall weighted participation rate (at school, classroom, and student levels) was 86 percent in Canada. This overall weighted participation rate ranged from 78 percent in Alberta to 91 percent in Manitoba.

TABLE A.2 TIMSS 2019 school sample sizes

	Number of schools in original sample†	Number of eligible schools in original sample††	Number of schools in original sample that participated	Number of replacement schools that participated	Total number of schools that participated
Grade 4					
Newfoundland and Labrador	100	98	91	0	91
Quebec	172	172	140	8	148
Ontario	171	170	160	3	163
Manitoba	165	164	158	24	158
Alberta	180	173	120	0	144
Canada	**788**	**777**	**669**	**35**	**704**

† This number includes participating, not participating, and excluded schools.
†† This number includes participating and not participating schools.

TABLE A.3 TIMSS 2019 student sample sizes in participating schools

	Number of sampled students in participating schools†	Number of eligible students in the sample††	Number of students absent	Number of students assessed
Grade 4				
Newfoundland and Labrador	1,475	1,370	124	1,246
Quebec	4,047	4,001	164	3,837
Ontario	4,251	4,073	243	3,830
Manitoba	2,611	2,462	163	2,299
Alberta	2,780	2,630	189	2,441
Canada	**15,164**	**14,536**	**883**	**13,653**

† This number includes participating, not participating, and excluded students.
†† This number includes participating and not participating students.

TABLE A.4 TIMSS 2019 participation rates (weighted)

	School participation (%)		Class participation (%)	Student participation (%)	Overall participation (%)	
	Before replacement	After replacement			Before replacement	After replacement
Grade 4						
Newfoundland and Labrador	93	93	100	92	85	85
Quebec	82	86	100	96	79	83
Ontario	93	95	100	95	88	90
Manitoba	97	97	100	94	91	91
Alberta	68	83	100	93	64	78
Canada	**86**	**90**	**100**	**95**	**82**	**86**

APPENDIX B — TIMSS 2019 data tables

TABLE B.1.1a Discrete percentage of students reaching the international benchmarks: MATHEMATICS

Country or province	Advanced benchmark (625)		High benchmark (550)		Intermediate benchmark (475)		Low benchmark (400)		Below low benchmark (under 400)	
	%	Standard error	%	Standard error	%	Standard error	%	Standard error	%	Standard error
Canada	**6.4**	**(0.6)**	**25.3**	**(0.9)**	**37.0**	**(0.9)**	**23.7**	**(0.7)**	**7.6**	**(0.6)**
Newfoundland and Labrador	U‡	(0.4)	13.6	(1.6)	37.8	(2.0)	33.7	(1.9)	14.1	(1.8)
Quebec	7.8	(0.8)	32.8	(1.4)	39.4	(1.1)	17.3	(1.1)	2.7	(0.5)
Ontario	7.2	(1.0)	25.0	(1.6)	35.4	(1.4)	24.6	(1.3)	7.7	(0.9)
Manitoba	1.4	(0.4)	13.3	(1.1)	33.4	(1.7)	32.4	(1.5)	19.5	(1.8)
Alberta	3.6	(0.8)	17.2	(1.4)	38.3	(1.4)	29.0	(1.8)	11.9	(1.6)
Albania	5.3	(0.6)	20.5	(1.2)	36.0	(1.5)	24.6	(1.0)	13.6	(1.3)
Armenia	2.7	(0.5)	19.8	(1.1)	41.8	(1.4)	27.3	(1.2)	8.3	(0.7)
Australia	10.1	(0.9)	25.5	(1.0)	34.0	(1.1)	20.6	(1.0)	9.8	(1.0)
Austria	9.3	(0.7)	35.3	(1.2)	39.0	(1.1)	14.8	(1.0)	1.7	(0.4)
Azerbaijan, Republic of	7.8	(0.6)	27.9	(1.1)	36.1	(1.2)	20.2	(1.1)	8.1	(0.8)
Bahrain	4.3	(0.4)	16.7	(0.8)	33.2	(0.8)	27.2	(1.1)	18.6	(1.0)
Belgium (Flemish)	8.4	(0.5)	31.9	(1.1)	39.8	(0.9)	17.2	(1.0)	2.6	(0.4)
Bosnia and Herzegovina	0.6	(0.2)	8.2	(0.7)	30.8	(1.1)	36.8	(1.2)	23.7	(1.1)
Bulgaria	8.2	(0.6)	29.2	(1.4)	33.4	(1.1)	18.7	(1.2)	10.5	(1.5)
Chile	0.6	(0.1)	6.7	(0.5)	25.7	(1.1)	37.3	(1.0)	29.6	(1.5)
Chinese Taipei	36.7	(1.3)	41.6	(1.0)	17.5	(0.9)	3.8	(0.5)	U‡	(0.2)
Croatia	3.8	(0.6)	24.2	(1.2)	42.0	(1.4)	24.6	(1.1)	5.4	(0.7)
Cyprus	11.7	(0.9)	30.7	(1.1)	34.6	(1.1)	17.7	(1.0)	5.4	(0.6)
Czech Republic	10.2	(1.0)	32.1	(1.1)	36.2	(1.1)	17.3	(1.0)	4.3	(0.6)
Denmark	8.4	(0.9)	28.8	(0.9)	37.5	(1.4)	20.5	(0.8)	4.7	(0.5)
England	21.3	(1.4)	32.0	(1.1)	29.4	(1.5)	13.4	(1.0)	3.9	(0.5)
Finland	10.8	(0.8)	31.4	(1.3)	35.8	(1.0)	17.2	(0.9)	4.8	(0.6)
France	3.2	(0.5)	18.0	(1.0)	35.4	(1.2)	28.1	(1.1)	15.3	(1.2)
Georgia	2.8	(0.4)	17.3	(1.3)	35.7	(1.3)	28.0	(1.2)	16.2	(1.4)
Germany	6.0	(0.6)	29.5	(1.4)	39.1	(1.0)	20.9	(1.1)	4.4	(0.6)
Hong Kong, SAR	37.9	(1.9)	40.6	(1.1)	17.1	(1.3)	4.1	(0.6)	U‡	(0.2)
Hungary	9.0	(0.8)	29.6	(1.2)	35.0	(1.1)	19.6	(1.0)	6.8	(0.8)
Iran, Islamic Republic of	1.9	(0.3)	11.3	(0.8)	25.7	(1.1)	29.2	(0.9)	31.9	(1.5)
Ireland	15.3	(1.0)	36.4	(1.0)	31.9	(1.0)	13.0	(0.8)	3.4	(0.5)
Italy	4.3	(0.5)	26.0	(1.3)	42.7	(1.0)	22.5	(1.2)	4.5	(0.5)
Japan	33.1	(1.3)	41.1	(1.2)	20.6	(0.9)	4.5	(0.4)	0.6‡	(0.2)
Kazakhstan	4.5	(0.6)	24.6	(1.1)	41.7	(1.1)	24.4	(1.2)	4.8	(0.6)
Korea, Republic of	37.1	(1.4)	40.1	(1.3)	18.0	(1.0)	4.2	(0.5)	0.6‡	(0.2)
Kosovo	0.6	(0.2)	7.7	(0.7)	28.8	(1.3)	35.4	(0.9)	27.5	(1.4)
Kuwait	0.7	(0.2)	5.0	(0.7)	15.7	(1.1)	25.1	(1.0)	53.4	(1.8)
Latvia	11.3	(0.9)	39.1	(1.3)	34.0	(1.5)	13.2	(1.0)	2.3	(0.6)
Lithuania	13.4	(1.1)	34.3	(1.2)	33.7	(1.2)	14.8	(1.0)	3.8	(0.6)
Malta	5.0	(0.5)	26.7	(0.8)	37.4	(0.9)	21.7	(0.7)	9.2	(0.6)
Montenegro	1.2	(0.2)	9.8	(0.8)	32.0	(0.8)	32.7	(0.8)	24.3	(0.9)
Morocco	U	(0.8)	4.4	(0.6)	12.9	(1.1)	24.3	(1.3)	57.2	(1.7)
Netherlands	7.2	(0.9)	36.7	(1.5)	40.3	(1.6)	14.2	(0.9)	1.7	(0.4)
New Zealand	6.2	(0.5)	18.5	(1.0)	31.2	(0.9)	26.9	(0.9)	17.3	(0.9)
North Macedonia	4.6	(0.8)	16.8	(1.3)	30.1	(1.3)	26.7	(1.4)	21.8	(1.7)
Northern Ireland	25.9	(1.4)	33.9	(1.3)	24.9	(1.0)	11.3	(0.9)	4.0	(0.6)
Norway	13.2	(0.9)	34.5	(1.3)	34.2	(1.3)	14.9	(1.0)	3.2	(0.6)
Oman	3.1	(0.8)	9.0	(0.9)	20.9	(0.9)	28.7	(0.9)	38.2	(1.3)
Pakistan	U‡	(0.1)	U‡	(0.3)	6.6	(1.4)	19.6	(3.6)	72.9	(4.7)
Philippines	U‡	(0.1)	0.8	(0.2)	4.7	(0.6)	13.5	(1.3)	80.9	(1.8)
Poland	8.2	(0.8)	27.9	(1.2)	37.1	(0.9)	19.9	(1.1)	6.9	(0.6)
Portugal	8.9	(0.7)	30.3	(1.2)	34.6	(1.1)	20.9	(0.9)	5.3	(0.7)
Qatar	2.4	(0.4)	11.9	(0.9)	25.6	(1.1)	29.7	(1.0)	30.5	(1.4)
Russian Federation	19.6	(1.6)	41.8	(1.3)	29.5	(1.3)	7.9	(0.8)	1.3	(0.3)
Saudi Arabia	0.8	(0.2)	5.1	(0.6)	17.2	(1.0)	27.9	(1.0)	49.0	(1.4)
Serbia	7.2	(0.7)	25.0	(1.1)	35.8	(1.3)	21.2	(1.0)	10.9	(1.1)
Singapore	54.2	(2.2)	29.5	(1.5)	11.8	(1.1)	3.7	(0.5)	0.8	(0.3)
Slovak Republic	5.1	(0.7)	25.8	(1.5)	40.3	(1.3)	20.0	(1.2)	8.8	(1.2)
South Africa	1.0	(0.2)	4.2	(0.4)	11.0	(0.7)	21.1	(0.9)	62.7	(1.5)
Spain	3.8	(0.4)	23.2	(0.8)	38.4	(1.2)	26.0	(0.9)	8.6	(1.0)
Sweden	7.6	(0.8)	27.9	(1.4)	38.8	(1.2)	20.0	(1.0)	5.6	(0.7)
Turkey	15.0	(1.3)	27.5	(1.2)	27.9	(1.0)	17.4	(0.9)	12.2	(1.3)
United Arab Emirates	6.8	(0.3)	19.3	(0.5)	27.3	(0.5)	25.1	(0.5)	21.5	(0.7)
United States	13.9	(0.8)	32.1	(1.1)	30.6	(0.7)	16.6	(0.8)	6.8	(0.6)
International median	**7.0**		**26.4**		**33.6**		**20.6**		**7.8**	

‡ There are fewer than 30 observations.
U Too unreliable to be published.

TABLE B.1.1b Cumulative percentage of students reaching the international benchmarks: MATHEMATICS

Country or province	Advanced benchmark (625)		High benchmark or above (550)		Intermediate benchmark or above (475)		Low benchmark or above (400)	
	%	Standard error	%	Standard error	%	Standard error	%	Standard error
Canada	**6.4**	**(0.6)**	**31.7**	**(1.0)**	**68.7**	**(0.9)**	**92.4**	**(0.6)**
Newfoundland and Labrador	U‡	(0.4)	14.4	(1.7)	52.2	(2.7)	85.9	(1.8)
Quebec	7.8	(0.8)	40.6	(1.4)	80.0	(1.3)	97.3	(0.5)
Ontario	7.2	(1.0)	32.2	(1.8)	67.6	(1.6)	92.3	(0.9)
Manitoba	1.4	(0.4)	14.7	(1.2)	48.1	(1.9)	80.5	(1.8)
Alberta	3.6	(0.8)	20.8	(1.8)	59.1	(2.1)	88.1	(1.6)
Albania	5.3	(0.6)	25.8	(1.4)	61.8	(1.8)	86.4	(1.3)
Armenia	2.7	(0.5)	22.5	(1.4)	64.3	(1.6)	91.7	(0.7)
Australia	10.1	(0.9)	35.6	(1.2)	69.6	(1.3)	90.2	(1.0)
Austria	9.3	(0.7)	44.5	(1.4)	83.6	(1.1)	98.3	(0.4)
Azerbaijan, Republic of	7.8	(0.6)	35.6	(1.3)	71.7	(1.5)	91.9	(0.8)
Bahrain	4.3	(0.4)	21.0	(1.0)	54.2	(1.2)	81.4	(1.0)
Belgium (Flemish)	8.4	(0.5)	40.4	(1.2)	80.1	(1.2)	97.4	(0.4)
Bosnia and Herzegovina	0.6	(0.2)	8.8	(0.7)	39.6	(1.5)	76.3	(1.1)
Bulgaria	8.2	(0.6)	37.4	(1.7)	70.9	(1.9)	89.5	(1.5)
Chile	0.6	(0.1)	7.3	(0.6)	33.0	(1.4)	70.4	(1.5)
Chinese Taipei	36.7	(1.3)	78.3	(1.1)	95.8	(0.5)	99.7	(0.2)
Croatia	3.8	(0.6)	28.0	(1.3)	70.0	(1.5)	94.6	(0.7)
Cyprus	11.7	(0.9)	42.3	(1.6)	76.9	(1.3)	94.6	(0.6)
Czech Republic	10.2	(1.0)	42.3	(1.5)	78.4	(1.3)	95.7	(0.6)
Denmark	8.4	(0.9)	37.2	(1.3)	74.7	(1.0)	95.3	(0.5)
England	21.3	(1.4)	53.3	(1.5)	82.8	(1.2)	96.1	(0.5)
Finland	10.8	(0.8)	42.2	(1.3)	78.0	(1.2)	95.2	(0.6)
France	3.2	(0.5)	21.2	(1.2)	56.7	(1.6)	84.7	(1.2)
Georgia	2.8	(0.4)	20.1	(1.4)	55.8	(2.0)	83.8	(1.4)
Germany	6.0	(0.6)	35.5	(1.5)	74.6	(1.2)	95.6	(0.6)
Hong Kong, SAR	37.9	(1.9)	78.5	(1.6)	95.6	(0.7)	99.7	(0.2)
Hungary	9.0	(0.8)	38.6	(1.4)	73.6	(1.3)	93.2	(0.8)
Iran, Islamic Republic of	1.9	(0.3)	13.2	(1.0)	38.9	(1.6)	68.1	(1.5)
Ireland	15.3	(1.0)	51.7	(1.4)	83.6	(1.0)	96.6	(0.5)
Italy	4.3	(0.5)	30.3	(1.5)	73.0	(1.3)	95.5	(0.5)
Japan	33.1	(1.3)	74.2	(0.9)	94.8	(0.4)	99.4	(0.2)
Kazakhstan	4.5	(0.6)	29.1	(1.5)	70.8	(1.4)	95.2	(0.6)
Korea, Republic of	37.1	(1.4)	77.2	(1.2)	95.2	(0.5)	99.4	(0.2)
Kosovo	0.6	(0.2)	8.3	(0.8)	37.1	(1.5)	72.5	(1.4)
Kuwait	0.7	(0.2)	5.7	(0.9)	21.5	(1.6)	46.6	(1.8)
Latvia	11.3	(0.9)	50.5	(1.7)	84.5	(1.2)	97.7	(0.6)
Lithuania	13.4	(1.1)	47.7	(1.6)	81.4	(1.1)	96.2	(0.6)
Malta	5.0	(0.5)	31.7	(0.9)	69.1	(0.8)	90.8	(0.6)
Montenegro	1.2	(0.2)	11.0	(0.7)	43.0	(0.9)	75.7	(0.9)
Morocco	U	(0.8)	5.6	(1.1)	18.5	(1.4)	42.8	(1.7)
Netherlands	7.2	(0.9)	43.8	(1.7)	84.1	(1.1)	98.3	(0.4)
New Zealand	6.2	(0.5)	24.7	(1.2)	55.9	(1.3)	82.7	(0.9)
North Macedonia	4.6	(0.8)	21.4	(1.8)	51.5	(2.4)	78.2	(1.7)
Northern Ireland	25.9	(1.4)	59.8	(1.4)	84.7	(1.1)	96.0	(0.6)
Norway	13.2	(0.9)	47.7	(1.3)	81.9	(1.2)	96.8	(0.6)
Oman	3.1	(0.8)	12.2	(1.3)	33.1	(1.5)	61.8	(1.3)
Pakistan	U‡	(0.1)	U	(0.3)	7.5	(1.5)	27.1	(4.7)
Philippines	U‡	(0.1)	0.9	(0.2)	5.5	(0.8)	19.1	(1.8)
Poland	8.2	(0.8)	36.1	(1.4)	73.2	(1.4)	93.1	(0.6)
Portugal	8.9	(0.7)	39.2	(1.6)	73.8	(1.2)	94.7	(0.7)
Qatar	2.4	(0.4)	14.2	(1.2)	39.8	(1.6)	69.5	(1.4)
Russian Federation	19.6	(1.6)	61.4	(1.9)	90.9	(1.0)	98.7	(0.3)
Saudi Arabia	0.8	(0.2)	5.9	(0.6)	23.1	(1.2)	51.0	(1.4)
Serbia	7.2	(0.7)	32.2	(1.4)	67.9	(1.5)	89.1	(1.1)
Singapore	54.2	(2.2)	83.7	(1.5)	95.5	(0.7)	99.2	(0.3)
Slovak Republic	5.1	(0.7)	30.9	(1.7)	71.2	(1.7)	91.2	(1.2)
South Africa	1.0	(0.2)	5.2	(0.5)	16.2	(1.1)	37.3	(1.5)
Spain	3.8	(0.4)	27.0	(0.9)	65.4	(1.3)	91.4	(1.0)
Sweden	7.6	(0.8)	35.6	(1.7)	74.4	(1.4)	94.4	(0.7)
Turkey	15.0	(1.3)	42.5	(1.8)	70.4	(1.7)	87.8	(1.3)
United Arab Emirates	6.8	(0.3)	26.1	(0.6)	53.4	(0.8)	78.5	(0.7)
United States	13.9	(0.8)	46.0	(1.3)	76.6	(1.1)	93.2	(0.6)
International median	**7.0**		**33.8**		**70.8**		**92.2**	

‡ There are fewer than 30 observations.
U Too unreliable to be published.

TABLE B.1.2 Achievement scores: MATHEMATICS

Country or province	Average	Standard error	confidence interval – 95% lower limit	confidence interval – 95% upper limit
Canada	**512**	**(1.9)**	**508**	**515**
Newfoundland and Labrador	476	(4.0)	468	484
Quebec	532	(2.3)	528	537
Ontario	512	(3.3)	505	518
Manitoba	468	(3.6)	461	475
Alberta	490	(4.1)	482	498
Albania	494	(3.4)	487	501
Armenia	498	(2.5)	493	503
Australia	516	(2.8)	510	521
Austria	539	(2.0)	535	543
Azerbaijan, Republic of	515	(2.7)	510	521
Bahrain	480	(2.6)	475	485
Belgium (Flemish)	532	(1.9)	529	536
Bosnia and Herzegovina	452	(2.4)	447	456
Bulgaria	515	(4.3)	507	523
Chile	441	(2.7)	436	446
Chinese Taipei	599	(1.9)	595	603
Croatia	509	(2.2)	505	514
Cyprus	532	(2.9)	526	538
Czech Republic	533	(2.5)	528	538
Denmark	525	(1.9)	521	528
England	556	(3.0)	550	562
Finland	532	(2.3)	527	537
France	485	(3.0)	479	491
Georgia	482	(3.7)	475	489
Germany	521	(2.3)	517	525
Hong Kong, SAR	602	(3.3)	595	608
Hungary	523	(2.6)	518	529
Iran, Islamic Republic of	443	(3.9)	435	451
Ireland	548	(2.5)	544	553
Italy	515	(2.4)	510	520
Japan	593	(1.8)	590	596
Kazakhstan	512	(2.5)	507	517
Korea, Republic of	600	(2.2)	595	604
Kosovo	444	(3.0)	438	450
Kuwait	383	(4.7)	374	393
Latvia	546	(2.6)	541	551
Lithuania	542	(2.8)	537	548
Malta	509	(1.4)	506	512
Montenegro	453	(2.0)	449	457
Morocco	383	(4.3)	375	392
Netherlands	538	(2.2)	533	542
New Zealand	487	(2.6)	482	492
North Macedonia	472	(5.3)	461	482
Northern Ireland	566	(2.7)	560	571
Norway	543	(2.2)	538	547
Oman	431	(3.7)	424	438
Pakistan	328	(12.0)	304	351
Philippines	297	(6.4)	284	309
Poland	520	(2.7)	515	525
Portugal	525	(2.6)	520	530
Qatar	449	(3.4)	443	456
Russian Federation	567	(3.3)	560	573
Saudi Arabia	398	(3.6)	391	405
Serbia	508	(3.2)	502	514
Singapore	625	(3.9)	618	633
Slovak Republic	510	(3.5)	503	517
South Africa	374	(3.6)	367	381
Spain	502	(2.1)	498	507
Sweden	521	(2.8)	516	527
Turkey	523	(4.4)	514	532
United Arab Emirates	481	(1.7)	478	485
United States	535	(2.5)	530	540
International centrepoint	**500**	--	--	--

TABLE B.1.3 Achievement scores by content domain: MATHEMATICS

Canada and provinces	Overall mathematics		Number		Difference (number–overall mathematics)	
	Average	Standard error	Average	Standard error	Difference	Standard error
Canada	**512**	**(1.9)**	**505**	**(2.1)**	**-6 ***	**(0.8)**
Newfoundland and Labrador	476 **	(4.0)	474 **	(4.5)	-3	(2.5)
Quebec	532 **	(2.3)	530 **	(2.4)	-3	(1.4)
Ontario	512	(3.3)	501	(3.6)	-10 *	(1.8)
Manitoba	468 **	(3.6)	464 **	(4.4)	-4	(2.6)
Alberta	490 **	(4.1)	488 **	(4.4)	-2	(1.4)

Canada and provinces	Overall mathematics		Measurement and geometry		Difference (measurement and geometry–overall mathematics)	
	Average	Standard error	Average	Standard error	Difference	Standard error
Canada	**512**	**(1.9)**	**511**	**(1.8)**	**-1**	**(0.7)**
Newfoundland and Labrador	476 **	(4.0)	466 **	(4.0)	-11 *	(2.2)
Quebec	532 **	(2.3)	532 **	(2.6)	0	(1.6)
Ontario	512	(3.3)	516 **	(3.2)	5 *	(1.0)
Manitoba	468 **	(3.6)	454 **	(3.5)	-14 *	(1.5)
Alberta	490 **	(4.1)	476 **	(4.0)	-14 *	(1.4)

Canada and provinces	Overall mathematics		Data		Difference (data–overall mathematics)	
	Average	Standard error	Average	Standard error	Difference	Standard error
Canada	**512**	**(1.9)**	**523**	**(2.4)**	**11 ***	**(1.4)**
Newfoundland and Labrador	476 **	(4.0)	489 **	(4.7)	13 *	(2.7)
Quebec	532 **	(2.3)	535 **	(3.1)	3	(2.5)
Ontario	512	(3.3)	527	(4.0)	15 *	(2.0)
Manitoba	468 **	(3.6)	478 **	(3.6)	10 *	(1.9)
Alberta	490 **	(4.1)	504 **	(4.8)	14 *	(2.2)

* Significant difference.
** Significant difference compared to Canada.

TABLE B.1.4 Achievement scores by cognitive domain: MATHEMATICS

Canada and provinces	Overall mathematics		Knowing		Difference (knowing–overall mathematics)	
	Average	Standard error	Average	Standard error	Difference	Standard error
Canada	**512**	**(1.9)**	**506**	**(2.1)**	**-5 ***	**(0.7)**
Newfoundland and Labrador	476 **	(4.0)	467 **	(4.1)	-9 *	(3.5)
Quebec	532 **	(2.3)	535 **	(2.7)	3 *	(1.3)
Ontario	512	(3.3)	504	(3.7)	-8 *	(1.6)
Manitoba	468 **	(3.6)	458 **	(4.2)	-10 *	(2.6)
Alberta	490 **	(4.1)	480 **	(5.0)	-10 *	(2.8)

Canada and provinces	Overall mathematics		Applying		Difference (applying–overall mathematics)	
	Average	Standard error	Average	Standard error	Difference	Standard error
Canada	**512**	**(1.9)**	**513**	**(1.9)**	**1 ***	**(0.7)**
Newfoundland and Labrador	476 **	(4.0)	477 **	(3.5)	0	(2.5)
Quebec	532 **	(2.3)	533 **	(2.3)	1	(1.2)
Ontario	512	(3.3)	514	(3.4)	2	(1.1)
Manitoba	468 **	(3.6)	468 **	(3.4)	0	(1.3)
Alberta	490 **	(4.1)	490 **	(4.0)	0	(1.1)

Canada and provinces	Overall mathematics		Reasoning		Difference (reasoning–overall mathematics)	
	Average	Standard error	Average	Standard error	Difference	Standard error
Canada	**512**	**(1.9)**	**513**	**(2.0)**	**2**	**(1.1)**
Newfoundland and Labrador	476 **	(4.0)	486 **	(4.1)	10 *	(3.8)
Quebec	532 **	(2.3)	524 **	(2.8)	-8 *	(2.2)
Ontario	512	(3.3)	516	(3.5)	4 *	(1.8)
Manitoba	468 **	(3.6)	477 **	(3.4)	9 *	(2.4)
Alberta	490 **	(4.1)	500 **	(4.0)	10 *	(1.7)

* Significant difference.
** Significant difference compared to Canada.

TABLE B.1.5a Discrete percentage of students reaching the international benchmarks by language of the school system: MATHEMATICS

Canada and provinces	Language of the school system	Advanced benchmark (625)		High benchmark (550)		Intermediate benchmark (475)		Low benchmark (400)		Below low benchmark (under 400)	
		%	Standard error	%	Standard error	%	Standard error	%	Standard error	%	Standard error
Canada	**Anglophone**	**6.0**	**(0.8)**	**22.4**	**(1.2)**	**35.8**	**(1.0)**	**26.1**	**(1.0)**	**9.7**	**(0.8)**
	Francophone	**7.3**	**(0.8)**	**32.0**	**(1.4)**	**39.7**	**(1.2)**	**18.1**	**(1.2)**	**2.8**	**(0.5)**
Newfoundland and Labrador	Anglophone	U‡	(0.4)	13.6	(1.6)	37.8	(2.0)	33.7	(1.9)	14.1	(1.8)
	Francophone	--	--	--	--	--	--	--	--	--	--
Quebec	Anglophone	8.2	(2.0)	24.9	(3.4)	34.6	(2.9)	23.5	(3.1)	8.8	(2.1)
	Francophone	7.8	(0.9)	33.6	(1.5)	39.9	(1.2)	16.6	(1.2)	2.1	(0.5)
Ontario	Anglophone	7.4	(1.1)	25.4	(1.7)	35.3	(1.5)	24.3	(1.4)	7.7	(0.9)
	Francophone	U‡	(1.1)	19.4	(3.0)	38.2	(2.9)	30.5	(3.9)	8.7	(2.2)
Manitoba	Anglophone	1.4	(0.4)	13.3	(1.1)	33.3	(1.7)	32.4	(1.5)	19.6	(1.8)
	Francophone	U‡	(1.3)	13.5 ‡	(4.3)	37.7	(5.1)	33.3	(5.4)	U	(4.9)
Alberta	Anglophone	3.7	(0.8)	17.2	(1.5)	38.3	(1.4)	28.9	(1.8)	11.9	(1.6)
	Francophone	U‡	(0.9)	17.1	(3.9)	37.4	(5.0)	32.3	(3.2)	11.3	(2.6)

-- Not available.
‡ There are fewer than 30 observations.
U Too unreliable to be published.
Note: Because Newfoundland and Labrador did not oversample students by language of the school system, results for only anglophone schools are available.

TABLE B.1.5b Cumulative percentage of students reaching the international benchmarks by language of the school system: MATHEMATICS

Canada and provinces	Language of the school system	Advanced benchmark (625)		High benchmark or above (550)		Intermediate benchmark or above (475)		Low benchmark or above (400)	
		%	Standard error	%	Standard error	%	Standard error	%	Standard error
Canada	**Anglophone**	**6.0**	**(0.8)**	**28.4**	**(1.3)**	**64.3**	**(1.3)**	**90.3**	**(0.8)**
	Francophone	**7.3**	**(0.8)**	**39.3**	**(1.4)**	**79.0**	**(1.4)**	**97.2**	**(0.5)**
Newfoundland and Labrador	Anglophone	U‡	(0.4)	14.4	(1.7)	52.2	(2.7)	85.9	(1.8)
	Francophone	--	--	--	--	--	--	--	--
Quebec	Anglophone	8.2	(2.0)	33.1	(4.9)	67.7	(4.3)	91.2	(2.1)
	Francophone	7.8	(0.9)	41.4	(1.5)	81.3	(1.4)	97.9	(0.5)
Ontario	Anglophone	7.4	(1.1)	32.8	(1.9)	68.1	(1.7)	92.3	(0.9)
	Francophone	U‡	(1.1)	22.6	(3.4)	60.8	(4.6)	91.3	(2.2)
Manitoba	Anglophone	1.4	(0.4)	14.6	(1.3)	48.0	(2.0)	80.4	(1.8)
	Francophone	U‡	(1.3)	14.9	(4.1)	52.6	(6.8)	85.9	(4.9)
Alberta	Anglophone	3.7	(0.8)	20.8	(1.8)	59.1	(2.1)	88.1	(1.6)
	Francophone	U‡	(0.9)	18.9	(3.6)	56.3	(3.4)	88.7	(2.6)

-- Not available.
‡ There are fewer than 30 observations.
U Too unreliable to be published.
Note: Because Newfoundland and Labrador did not oversample students by language of the school system, results for only anglophone schools are available.

TABLE B.1.6 Achievement scores by language of the school system: MATHEMATICS

Canada and provinces	Anglophone school systems		Francophone school systems		Difference (A–F)	
	Average	Standard error	Average	Standard error	Difference	Standard error
Canada	**504**	**(2.5)**	**530**	**(2.3)**	**-26 ***	**(3.5)**
Newfoundland and Labrador	476 **	(4.0)	--	--	--	--
Quebec	513	(9.0)	534 **	(2.4)	-21 *	(9.4)
Ontario	513 **	(3.5)	495 **	(6.9)	18 *	(7.9)
Manitoba	468 **	(3.7)	479 **	(10.5)	-11	(11.1)
Alberta	490 **	(4.2)	486 **	(5.2)	4	(6.5)

-- Not available.
* Significant difference.
** Significant difference compared to Canada.
Note: Because Newfoundland and Labrador did not oversample students by language of the school system, results for only anglophone schools are available.

TABLE B.1.7 Achievement scores by language of the school system: MATHEMATICS BY CONTENT DOMAIN SUBSCALES

Content domain	Canada and provinces	Anglophone school systems		Francophone school systems		Difference (A–F)	
		Average	Standard error	Average	Standard error	Difference	Standard error
Number	**Canada**	**496**	**(2.8)**	**527**	**(2.3)**	**-31 ***	**(3.5)**
	Newfoundland and Labrador	474 **	(4.5)	--	--	--	--
	Quebec	511	(9.3)	531 **	(2.4)	-21 *	(9.5)
	Ontario	502 **	(3.8)	487 **	(7.0)	15	(8.0)
	Manitoba	463 **	(4.5)	479 **	(10.9)	-16	(11.5)
	Alberta	488	(4.5)	485 **	(7.2)	2	(7.8)
Measurement and geometry	**Canada**	**502**	**(2.5)**	**530**	**(2.5)**	**-28 ***	**(3.8)**
	Newfoundland and Labrador	466 **	(4.0)	--	--	--	--
	Quebec	513	(8.5)	534 **	(2.7)	-21 *	(8.7)
	Ontario	517 **	(3.4)	505 **	(6.3)	12	(7.3)
	Manitoba	454 **	(3.6)	472 **	(10.0)	-18	(10.7)
	Alberta	476 **	(4.1)	473 **	(5.4)	2	(6.9)
Data	**Canada**	**518**	**(3.0)**	**533**	**(3.1)**	**-15 ***	**(4.1)**
	Newfoundland and Labrador	489 **	(4.7)	--	--	--	--
	Quebec	517	(10.3)	537 **	(3.0)	-20	(10.3)
	Ontario	529 **	(4.2)	505 **	(8.8)	24 *	(9.8)
	Manitoba	477 **	(3.7)	489 **	(12.2)	-11	(12.9)
	Alberta	504 **	(4.9)	493 **	(7.3)	11	(7.4)

-- Not available.
* Significant difference.
** Significant difference compared to Canada.
Note: Because Newfoundland and Labrador did not oversample students by language of the school system, results for only anglophone schools are available.

TABLE B.1.8 Achievement scores by language of the school system: MATHEMATICS BY COGNITIVE DOMAIN SUBSCALES

Cognitive domain	Canada and provinces	Anglophone school systems		Francophone school systems		Difference (A–F)	
		Average	Standard error	Average	Standard error	Difference	Standard error
Knowing	**Canada**	**496**	**(2.7)**	**531**	**(2.7)**	**-36 ***	**(3.7)**
	Newfoundland and Labrador	467 **	(4.1)	--	--	--	--
	Quebec	516 **	(8.7)	537 **	(2.8)	-21 *	(9.2)
	Ontario	505 **	(4.0)	486 **	(7.3)	19 *	(8.4)
	Manitoba	458 **	(4.3)	470 **	(10.5)	-12	(11.1)
	Alberta	480 **	(5.1)	477 **	(5.8)	3	(7.4)
Applying	**Canada**	**505**	**(2.6)**	**531**	**(2.3)**	**-26 ***	**(3.4)**
	Newfoundland and Labrador	477 **	(3.5)	--	--	--	--
	Quebec	515	(8.9)	535 **	(2.4)	-20 *	(9.2)
	Ontario	515 **	(3.6)	498 **	(7.3)	17 *	(8.1)
	Manitoba	468 **	(3.5)	484 **	(11.4)	-16	(12.2)
	Alberta	490 **	(4.1)	487 **	(5.0)	3	(6.6)
Reasoning	**Canada**	**509**	**(2.6)**	**523**	**(2.6)**	**-13 ***	**(3.4)**
	Newfoundland and Labrador	486 **	(4.1)	--	--	--	--
	Quebec	510	(9.7)	525	(2.7)	-15	(9.5)
	Ontario	517 **	(3.7)	501 **	(6.8)	15 *	(7.5)
	Manitoba	477 **	(3.5)	489 **	(10.2)	-13	(10.8)
	Alberta	500 **	(4.0)	496 **	(5.2)	5	(6.5)

-- Not available.
* Significant difference.
** Significant difference compared to Canada.
Note: Because Newfoundland and Labrador did not oversample students by language of the school system, results for only anglophone schools are available.

TABLE B.1.9 Percentage of students by gender

Canada and provinces	Girls		Boys	
	%	Standard error	%	Standard error
Canada	**48.7**	**(0.8)**	**51.3**	**(0.8)**
Newfoundland and Labrador	47.8	(1.7)	52.2	(1.7)
Quebec	47.9	(0.8)	52.1	(0.8)
Ontario	48.6	(1.6)	51.4	(1.6)
Manitoba	50.3	(1.1)	49.7	(1.1)
Alberta	50.3	(0.8)	49.7	(0.8)
International average	**48.9**	**(0.2)**	**51.1**	**(0.2)**

TABLE B.1.10 Discrete percentage of students reaching the international benchmarks by gender: MATHEMATICS

Canada and provinces	Gender	Advanced benchmark (625)		High benchmark (550)		Intermediate benchmark (475)		Low benchmark (400)		Below low benchmark (under 400)	
		%	Standard error	%	Standard error	%	Standard error	%	Standard error	%	Standard error
Canada	**Girls**	**4.3**	**(0.7)**	**22.3**	**(1.1)**	**38.1**	**(1.3)**	**26.2**	**(1.1)**	**9.1**	**(0.8)**
	Boys	**8.4**	**(0.8)**	**28.2**	**(1.3)**	**35.9**	**(1.2)**	**21.3**	**(1.0)**	**6.2**	**(0.6)**
Newfoundland and Labrador	Girls	U‡	(0.3)	10.0	(1.6)	36.3	(3.5)	38.4	(3.3)	14.9	(2.5)
	Boys	U‡	(0.7)	17.0	(2.5)	39.2	(2.5)	29.4	(2.3)	13.4	(2.2)
Quebec	Girls	5.1	(0.8)	30.1	(1.9)	41.0	(2.0)	20.7	(2.2)	3.1	(0.7)
	Boys	10.3	(1.1)	35.4	(1.8)	37.9	(1.7)	14.1	(1.2)	2.3	(0.5)
Ontario	Girls	5.0	(1.3)	21.9	(2.0)	37.1	(1.9)	26.7	(2.1)	9.3	(1.3)
	Boys	9.2	(1.3)	28.0	(2.0)	33.9	(1.8)	22.7	(1.4)	6.3	(0.9)
Manitoba	Girls	U‡	(0.4)	11.8	(1.4)	32.7	(1.8)	33.1	(2.4)	21.6	(2.3)
	Boys	2.0‡	(0.6)	14.8	(1.5)	34.3	(2.5)	31.7	(2.5)	17.2	(2.0)
Alberta	Girls	2.4‡	(0.7)	13.9	(1.6)	38.2	(1.7)	31.1	(2.1)	14.4	(2.0)
	Boys	4.9	(1.1)	20.5	(1.9)	38.5	(2.3)	26.8	(2.2)	9.3	(1.5)

‡ There are fewer than 30 observations.
U Too unreliable to be published.

TABLE B.1.11 Achievement scores by gender: MATHEMATICS

Canada, provinces, and international average	Girls		Boys		Difference (G–B)	
	Average	Standard error	Average	Standard error	Difference	Standard error
Canada	**502**	**(2.5)**	**521**	**(2.0)**	**-19 ***	**(2.4)**
Newfoundland and Labrador	468 **	(4.8)	484 **	(4.5)	-15 *	(4.8)
Quebec	523 **	(3.0)	541 **	(2.4)	-18 *	(3.0)
Ontario	502	(4.9)	521	(3.2)	-18 *	(4.4)
Manitoba	462 **	(4.0)	475 **	(4.2)	-13 *	(4.0)
Alberta	480 **	(4.4)	501 **	(4.6)	-21 *	(3.8)
International average	**499**	**(0.5)**	**502 ****	**(0.5)**	**-4 ***	**(0.6)**

* Significant difference.
** Significant difference compared to Canada.

TABLE B.1.12 Achievement scores by gender: MATHEMATICS BY CONTENT DOMAIN SUBSCALES

Content domain	Canada, provinces, and nternational average	Girls		Boys		Difference (G-B)	
		Average	Standard error	Average	Standard error	Difference	Standard error
Number	**Canada**	**495**	**(2.7)**	**515**	**(2.4)**	**-21 ***	**(2.7)**
	Newfoundland and Labrador	465 **	(5.2)	482 **	(5.2)	-17 *	(5.3)
	Quebec	520 **	(2.9)	538 **	(2.6)	-18 *	(2.8)
	Ontario	491	(5.2)	512	(3.8)	-21 *	(5.2)
	Manitoba	457 **	(4.9)	471 **	(4.8)	-14 *	(4.3)
	Alberta	477 **	(4.5)	499 **	(5.2)	-22 *	(4.2)
	International average	**506 ****	**(0.5)**	**510 ****	**(0.5)**	**-5 ***	**(0.6)**
Measurement and geometry	**Canada**	**500**	**(2.7)**	**520**	**(2.1)**	**-20 ***	**(3.0)**
	Newfoundland and Labrador	457 **	(4.6)	473 **	(5.0)	-16 *	(5.6)
	Quebec	523 **	(3.0)	540 **	(3.0)	-18 *	(3.1)
	Ontario	506 **	(4.8)	526 **	(3.3)	-20 *	(4.7)
	Manitoba	448 **	(4.3)	462 **	(4.3)	-14 *	(5.0)
	Alberta	465 **	(4.2)	487 **	(4.7)	-21 *	(4.2)
	International average	**501**	**(0.6)**	**508 ****	**(0.6)**	**-7 ***	**(0.7)**
Data	**Canada**	**514**	**(3.0)**	**531**	**(2.4)**	**-17 ***	**(2.4)**
	Newfoundland and Labrador	480 **	(6.0)	497 **	(5.3)	-18 *	(6.3)
	Quebec	526 **	(3.7)	543 **	(3.2)	-18 *	(3.3)
	Ontario	520	(5.2)	534	(4.0)	-15 *	(4.3)
	Manitoba	472 **	(4.4)	483 **	(4.3)	-11 *	(4.8)
	Alberta	494 **	(5.3)	513 **	(5.2)	-19 *	(4.4)
	International average	**499 ****	**(0.7)**	**500 ****	**(0.6)**	**-1**	**(0.7)**

* Significant difference.
** Significant difference compared to Canada.

TABLE B.1.13 Achievement scores by gender: MATHEMATICS BY COGNITIVE DOMAIN SUBSCALES

Cognitive domain	Canada, provinces, and international average	Girls		Boys		Difference (G-B)	
		Average	Standard error	Average	Standard error	Difference	Standard error
Knowing	**Canada**	**495**	**(2.8)**	**517**	**(2.3)**	**-22 ***	**(2.6)**
	Newfoundland and Labrador	456 **	(4.3)	477 **	(5.5)	-21 *	(6.0)
	Quebec	525 **	(3.1)	545 **	(3.0)	-20 *	(2.8)
	Ontario	493	(5.6)	514	(3.4)	-22 *	(4.9)
	Manitoba	450 **	(4.7)	467 **	(4.7)	-16 *	(4.2)
	Alberta	468 **	(4.9)	493 **	(5.7)	-25 *	(3.9)
	International average	**500**	**(0.6)**	**507 ****	**(0.5)**	**-8 ***	**(0.6)**
Applying	**Canada**	**505**	**(2.6)**	**520**	**(2.0)**	**-15 ***	**(2.4)**
	Newfoundland and Labrador	470 **	(4.0)	482 **	(4.2)	-12 *	(4.6)
	Quebec	526 **	(2.9)	540 **	(2.7)	-14 *	(3.1)
	Ontario	506	(4.9)	521	(3.3)	-15 *	(4.4)
	Manitoba	463 **	(4.1)	473 **	(3.9)	-10 *	(4.0)
	Alberta	482 **	(4.3)	499 **	(4.6)	-18 *	(3.8)
	International average	**505**	**(0.6)**	**506 ****	**(0.5)**	**-2 ***	**(0.6)**
Reasoning	**Canada**	**503**	**(3.0)**	**523**	**(2.1)**	**-21 ***	**(3.1)**
	Newfoundland and Labrador	476 **	(4.8)	496 **	(5.4)	-20 *	(6.4)
	Quebec	514 **	(3.8)	533 **	(2.7)	-19 *	(3.6)
	Ontario	505	(5.4)	526	(3.5)	-21 *	(5.2)
	Manitoba	468 **	(4.1)	486 **	(4.0)	-18 *	(4.5)
	Alberta	489 **	(4.3)	511 **	(4.6)	-22 *	(4.0)
	International average	**500**	**(0.6)**	**507 ****	**(0.6)**	**-7 ***	**(0.6)**

* Significant difference.
** Significant difference compared to Canada.

TABLE B.1.14a Percentage of students reaching the international benchmarks: MATHEMATICS

Canada and provinces	2015									
	Advanced benchmark (625)		High benchmark (550)		Intermediate benchmark (475)		Low benchmark (400)		Below low benchmark (under 400)	
	%	Standard error	%	Standard error	%	Standard error	%	Standard error	%	Standard error
Canada	**5.6**	**(0.5)**	**24.9**	**(0.8)**	**38.9**	**(0.9)**	**22.9**	**(0.7)**	**7.6**	**(0.8)**
Newfoundland and Labrador	--	--	--	--	--	--	--	--	--	--
Quebec	8.7	(1.3)	32.9	(1.9)	40.6	(1.6)	15.6	(1.6)	2.2	(0.6)
Ontario	5.7	(0.6)	25.2	(1.1)	39.4	(1.2)	23.1	(1.0)	6.7	(0.6)
Manitoba	--	--	--	--	--	--	--	--	--	--
Alberta	2.4	(0.5)	16.5	(1.5)	36.4	(1.5)	31.5	(1.4)	13.2	(1.4)

Canada and provinces	2019									
	Advanced benchmark (625)		High benchmark (550)		Intermediate benchmark (475)		Low benchmark (400)		Below low benchmark (under 400)	
	%	Standard error	%	Standard error	%	Standard error	%	Standard error	%	Standard error
Canada	**6.4**	**(0.6)**	**25.3**	**(0.9)**	**37.0**	**(0.9)**	**23.7**	**(0.7)**	**7.6**	**(0.6)**
Newfoundland and Labrador	U‡	(0.4)	13.6	(1.6)	37.8	(2.0)	33.7	(1.9)	14.1	(1.8)
Quebec	7.8	(0.8)	32.8	(1.4)	39.4	(1.1)	17.3	(1.1)	2.7	(0.5)
Ontario	7.2	(1.0)	25.0	(1.6)	35.4	(1.4)	24.6	(1.3)	7.7	(0.9)
Manitoba	1.4	(0.4)	13.3	(1.1)	33.4	(1.7)	32.4	(1.5)	19.5	(1.8)
Alberta	3.6	(0.8)	17.2	(1.4)	38.3	(1.4)	29.0	(1.8)	11.9	(1.6)

Canada and provinces	Difference (2019–2015)									
	Advanced benchmark (625)		High benchmark (550)		Intermediate benchmark (475)		Low benchmark (400)		Below low benchmark (under 400)	
	Difference	Standard error	Difference	Standard error	Difference	Standard error	Difference	Standard error	Difference	Standard error
Canada	**0.8**	**(0.8)**	**0.4**	**(1.2)**	**-1.9**	**(1.3)**	**0.7**	**(1.0)**	**0.0**	**(1.0)**
Newfoundland and Labrador	--	--	--	--	--	--	--	--	--	--
Quebec	-0.9	(1.5)	-0.1	(2.3)	-1.2	(2.0)	1.7	(1.9)	0.5	(0.8)
Ontario	1.5	(1.2)	-0.2	(1.9)	-3.9	(1.9)	1.5	(1.7)	1.1	(1.1)
Manitoba	--	--	--	--	--	--	--	--	--	--
Alberta	1.2	(0.9)	0.7	(2.1)	1.9	(2.0)	-2.5	(2.3)	-1.3	(2.1)

-- Not available.
* Significant difference.
Note: Newfoundland and Labrador and Manitoba did not take part in the TIMSS 2015 assessment.

TABLE B.1.14b Achievement scores over time: MATHEMATICS

Canada and provinces	2015		2019		Difference (2019–2015)	
	Average	Standard error	Average	Standard error	Difference	Standard error
Canada	**511**	**(2.3)**	**512**	**(1.9)**	**1**	**(3.0)**
Newfoundland and Labrador	--	--	476	(4.0)	--	--
Quebec	536	(4.0)	532	(2.3)	-4	(4.6)
Ontario	512	(2.3)	512	(3.3)	-1	(4.1)
Manitoba	--	--	468	(3.6)	--	--
Alberta	484	(3.7)	490	(4.1)	6	(5.5)

-- Not available.
* Significant difference.
Note: Newfoundland and Labrador and Manitoba did not take part in the TIMSS 2015 assessment.

TABLE B.1.14c Achievement scores by language of the school system over time: MATHEMATICS

School systems	Canada and provinces	2015		2019		Difference (2019–2015)	
		Average	Standard error	Average	Standard error	Difference	Standard error
Anglophone school systems	**Canada**	**503**	**(2.8)**	**504**	**(2.5)**	**1**	**(3.8)**
	Newfoundland and Labrador	--	--	476	(4.0)	--	--
	Quebec	521	(4.7)	513	(9.0)	-8	(10.1)
	Ontario	513	(2.4)	513	(3.5)	-1	(4.3)
	Manitoba	--	--	468	(3.7)	--	--
	Alberta	484	(3.7)	490	(4.2)	6	(5.6)
Francophone school systems	**Canada**	**533**	**(4.1)**	**530**	**(2.3)**	**-3**	**(4.6)**
	Newfoundland and Labrador	--	--	--	--	--	--
	Quebec	538	(4.4)	534	(2.4)	-3	(5.0)
	Ontario	494	(9.4)	495	(6.9)	2	(11.7)
	Manitoba	--	--	479	(10.5)	--	--
	Alberta	478	(3.2)	486	(5.2)	8	(6.1)

-- Not available.
* Significant difference.
Note: Newfoundland and Labrador and Manitoba did not take part in the TIMSS 2015 assessment.

TABLE B.1.14d Achievement scores by gender over time: MATHEMATICS

Gender	Canada and provinces	2015		2019		Difference (2019–2015)	
		Average	Standard error	Average	Standard error	Difference	Standard error
Girls	**Canada**	**506**	**(2.5)**	**502**	**(2.5)**	**-4**	**(3.6)**
	Newfoundland and Labrador	--	--	468	(4.8)	--	--
	Quebec	531	(3.9)	523	(3.0)	-8	(4.9)
	Ontario	509	(2.6)	502	(4.9)	-7	(5.5)
	Manitoba	--	--	462	(4.0)	--	--
	Alberta	476	(4.2)	480	(4.4)	4	(6.1)
Boys	**Canada**	**515**	**(2.6)**	**521**	**(2.0)**	**6**	**(3.2)**
	Newfoundland and Labrador	--	--	484	(4.5)	--	--
	Quebec	541	(4.8)	541	(2.4)	0	(5.4)
	Ontario	516	(2.8)	521	(3.2)	5	(4.3)
	Manitoba	--	--	475	(4.2)	--	--
	Alberta	492	(3.9)	501	(4.6)	9	(6.0)

-- Not available.
* Significant difference.
Note: Newfoundland and Labrador and Manitoba did not take part in the TIMSS 2015 assessment.

TABLE B.1.14e Achievement scores by content domain over time: MATHEMATICS

Content domain	Canada and provinces	2015		2019		Difference (2019–2015)	
		Average	Standard error	Average	Standard error	Difference	Standard error
Number	**Canada**	**503**	**(2.4)**	**505**	**(2.1)**	**2**	**(3.2)**
	Newfoundland and Labrador	--	--	474	(4.5)	--	--
	Quebec	533	(4.2)	530	(2.4)	-3	(4.8)
	Ontario	500	(2.6)	501	(3.6)	2	(4.4)
	Manitoba	--	--	464	(4.4)	--	--
	Alberta	481	(3.9)	488	(4.4)	6	(5.9)
Measurement and geometry	**Canada**	**517**	**(2.5)**	**511**	**(1.8)**	**-6 ***	**(3.1)**
	Newfoundland and Labrador	--	--	466	(4.0)	--	--
	Quebec	542	(4.6)	532	(2.6)	-11 *	(5.3)
	Ontario	526	(2.9)	516	(3.2)	-10 *	(4.4)
	Manitoba	--	--	454	(3.5)	--	--
	Alberta	474	(3.9)	476	(4.0)	2	(5.5)
Data	**Canada**	**528**	**(2.7)**	**523**	**(2.4)**	**-6**	**(3.6)**
	Newfoundland and Labrador	--	--	489	(4.7)	--	--
	Quebec	541	(5.0)	535	(3.1)	-6	(5.9)
	Ontario	536	(2.6)	527	(4.0)	-9	(4.7)
	Manitoba	--	--	478	(3.6)	--	--
	Alberta	505	(4.7)	504	(4.8)	-1	(6.7)

-- Not available.
* Significant difference.
Note: Newfoundland and Labrador and Manitoba did not take part in the TIMSS 2015 assessment.

TABLE B.1.14f Achievement scores by cognitive domain over time: MATHEMATICS

Cognitive domain	Canada and provinces	2015		2019		Difference (2019–2015)	
		Average	Standard error	Average	Standard error	Difference	Standard error
Knowing	**Canada**	**505**	**(2.4)**	**506**	**(2.1)**	**1**	**(3.2)**
	Newfoundland and Labrador	--	--	467	(4.1)	--	--
	Quebec	542	(4.3)	535	(2.7)	-7	(5.1)
	Ontario	505	(2.5)	504	(3.7)	-1	(4.5)
	Manitoba	--	--	458	(4.2)	--	--
	Alberta	472	(3.9)	480	(5.0)	8	(6.3)
Applying	**Canada**	**510**	**(2.3)**	**513**	**(1.9)**	**3**	**(3.0)**
	Newfoundland and Labrador	--	--	477	(3.5)	--	--
	Quebec	533	(4.1)	533	(2.3)	1	(4.7)
	Ontario	513	(2.3)	514	(3.4)	1	(4.1)
	Manitoba	--	--	468	(3.4)	--	--
	Alberta	484	(3.9)	490	(4.0)	6	(5.6)
Reasoning	**Canada**	**521**	**(2.4)**	**513**	**(2.0)**	**-8 ***	**(3.1)**
	Newfoundland and Labrador	--	--	486	(4.1)	--	--
	Quebec	536	(4.9)	524	(2.8)	-13 *	(5.7)
	Ontario	524	(2.6)	516	(3.5)	-9 *	(4.4)
	Manitoba	--	--	477	(3.4)	--	--
	Alberta	502	(4.0)	500	(4.0)	-1	(5.6)

-- Not available.
* Significant difference.
Note: Newfoundland and Labrador and Manitoba did not take part in the TIMSS 2015 assessment.

TABLE B.1.15a Discrete percentage of students reaching the international benchmarks: SCIENCE

Country or province	Advanced benchmark (625)		High benchmark (550)		Intermediate benchmark (475)		Low benchmark (400)		Below low benchmark (under 400)	
	%	Standard error	%	Standard error	%	Standard error	%	Standard error	%	Standard error
Canada	**7.2**	**(0.6)**	**29.7**	**(0.8)**	**38.4**	**(0.8)**	**19.9**	**(1.0)**	**4.9**	**(0.4)**
Newfoundland and Labrador	4.9	(1.1)	28.3	(1.8)	41.8	(2.2)	20.3	(1.8)	4.7	(1.0)
Quebec	5.3	(0.7)	29.0	(1.3)	42.6	(1.6)	19.8	(1.5)	3.4	(0.5)
Ontario	7.9	(1.0)	30.1	(1.3)	36.7	(1.5)	19.9	(1.6)	5.3	(0.8)
Manitoba	4.4	(0.8)	23.9	(1.4)	36.9	(1.6)	24.5	(2.0)	10.3	(1.5)
Alberta	9.5	(1.2)	31.6	(2.0)	36.0	(1.6)	18.3	(1.4)	4.7	(0.9)
Albania	4.1	(0.5)	20.4	(1.4)	34.9	(1.3)	26.3	(1.3)	14.3	(1.4)
Armenia	1.6	(0.4)	12.3	(1.0)	33.1	(1.3)	33.2	(1.2)	19.9	(1.5)
Australia	11.1	(0.9)	32.8	(1.3)	34.4	(1.3)	15.5	(1.0)	6.2	(0.7)
Austria	7.2	(0.7)	30.3	(1.1)	37.1	(1.1)	19.4	(1.0)	5.9	(0.8)
Azerbaijan, Republic of	0.6	(0.2)	7.8	(0.6)	23.8	(1.1)	32.4	(1.0)	35.5	(1.5)
Bahrain	6.5	(0.7)	21.1	(0.9)	32.2	(1.1)	24.0	(0.9)	16.2	(1.1)
Belgium (Flemish)	2.4	(0.3)	21.7	(1.1)	42.3	(1.1)	25.9	(1.2)	7.6	(0.6)
Bosnia and Herzegovina	1.0	(0.2)	10.7	(0.9)	31.9	(1.1)	34.1	(1.0)	22.2	(1.4)
Bulgaria	14.5	(1.0)	29.4	(1.4)	27.2	(1.1)	16.0	(1.2)	12.8	(1.4)
Chile	1.4	(0.2)	12.7	(0.9)	33.6	(1.8)	34.1	(1.3)	18.2	(1.3)
Chinese Taipei	15.0	(0.9)	42.4	(1.1)	31.8	(1.1)	9.3	(0.9)	1.4	(0.3)
Croatia	3.6	(0.5)	30.3	(1.4)	46.3	(1.3)	17.6	(1.2)	2.2	(0.4)
Cyprus	5.8	(0.8)	25.5	(1.3)	38.4	(0.9)	22.4	(1.1)	7.9	(0.8)
Czech Republic	8.3	(0.9)	34.5	(1.9)	37.9	(1.9)	15.9	(0.9)	3.4	(0.5)
Denmark	5.7	(0.7)	29.9	(1.0)	40.8	(1.1)	19.2	(1.1)	4.5	(0.5)
England	10.3	(1.1)	33.9	(1.6)	37.2	(1.3)	14.9	(0.9)	3.7	(0.6)
Finland	15.1	(1.1)	40.6	(1.1)	31.6	(0.9)	10.1	(0.7)	2.6	(0.5)
France	2.8	(0.4)	19.3	(1.2)	36.9	(1.2)	26.9	(1.3)	14.2	(1.0)
Georgia	1.4	(0.4)	10.3	(1.1)	30.9	(1.7)	32.2	(1.1)	25.1	(1.8)
Germany	6.9	(0.9)	29.6	(1.3)	35.9	(1.0)	20.5	(1.0)	7.2	(0.7)
Hong Kong, SAR	8.5	(0.9)	32.5	(1.6)	38.3	(1.3)	16.8	(1.4)	3.9	(0.6)
Hungary	9.8	(0.6)	32.2	(1.0)	34.5	(1.1)	17.9	(1.0)	5.7	(0.7)
Iran, Islamic Republic of	1.3	(0.3)	11.5	(0.9)	26.8	(1.1)	28.5	(1.1)	31.8	(1.8)
Ireland	8.6	(0.6)	32.3	(1.3)	36.5	(1.3)	16.8	(1.1)	5.8	(0.8)
Italy	3.3	(0.7)	24.2	(1.7)	43.6	(1.1)	23.9	(1.1)	5.0	(0.8)
Japan	17.4	(0.8)	42.0	(1.1)	30.3	(1.0)	8.5	(0.7)	1.8	(0.4)
Kazakhstan	4.9	(0.8)	17.9	(1.1)	36.1	(1.5)	30.3	(1.2)	10.8	(1.0)
Korea, Republic of	29.2	(1.2)	43.4	(1.1)	22.4	(1.1)	4.2	(0.6)	0.8‡	(0.2)
Kosovo	U‡	(0.1)	4.1	(0.5)	20.4	(1.2)	33.8	(0.9)	41.5	(1.7)
Kuwait	1.7	(0.4)	8.0	(1.0)	17.3	(1.2)	22.4	(1.1)	50.5	(2.1)
Latvia	8.2	(0.9)	39.3	(1.2)	37.6	(1.3)	12.8	(0.9)	2.1	(0.5)
Lithuania	10.9	(0.9)	34.6	(1.3)	36.0	(1.2)	15.1	(1.2)	3.5	(0.4)
Malta	4.7	(0.4)	22.6	(0.9)	35.3	(0.9)	23.9	(0.9)	13.6	(0.7)
Montenegro	1.2	(0.2)	11.3	(0.8)	31.1	(1.2)	31.6	(1.2)	24.7	(0.9)
Morocco	U	(0.7)	5.8	(0.7)	13.4	(1.0)	21.2	(1.2)	58.0	(2.0)
Netherlands	3.9	(0.9)	28.8	(1.8)	43.0	(1.3)	20.1	(1.4)	4.2	(0.6)
New Zealand	5.6	(0.5)	24.3	(1.1)	34.5	(1.4)	24.0	(0.9)	11.6	(0.8)
North Macedonia	1.3	(0.4)	9.5	(1.0)	23.3	(1.6)	27.7	(1.2)	38.2	(2.6)
Northern Ireland	5.3	(0.7)	29.4	(1.3)	39.3	(1.4)	20.0	(1.1)	6.0	(0.7)
Norway	9.0	(0.7)	37.0	(1.4)	37.5	(1.5)	13.9	(1.0)	2.6	(0.5)
Oman	4.5	(0.8)	12.1	(0.9)	21.8	(0.8)	24.1	(0.9)	37.5	(1.2)
Pakistan	U‡	(0.1)	1.3	(0.4)	5.9	(1.2)	14.1	(2.3)	78.6	(3.2)
Philippines	U‡	(0.0)	1.0	(0.3)	3.6	(0.5)	8.0	(0.8)	87.4	(1.4)
Poland	8.8	(0.8)	33.4	(1.3)	36.3	(1.2)	16.5	(1.1)	4.9	(0.5)
Portugal	2.5	(0.4)	23.2	(1.4)	41.6	(1.1)	26.0	(1.1)	6.6	(0.6)
Qatar	3.4	(0.6)	14.6	(0.9)	24.9	(1.0)	25.3	(1.0)	31.8	(1.5)
Russian Federation	18.0	(1.3)	44.7	(1.3)	29.5	(1.4)	7.1	(0.8)	U‡	(0.3)
Saudi Arabia	1.1	(0.2)	7.1	(0.6)	19.9	(0.8)	25.5	(1.0)	46.4	(1.5)
Serbia	7.0	(0.7)	28.8	(1.4)	37.6	(1.2)	18.3	(1.1)	8.2	(1.0)
Singapore	37.6	(1.9)	36.7	(1.3)	18.3	(1.2)	5.6	(0.6)	1.8	(0.4)
Slovak Republic	6.9	(0.8)	31.7	(1.2)	37.9	(1.1)	15.5	(1.1)	8.0	(1.2)
South Africa	1.7	(0.3)	4.4	(0.5)	8.4	(0.7)	13.4	(0.7)	72.1	(1.5)
Spain	3.3	(0.5)	26.5	(1.0)	41.4	(1.0)	22.8	(1.1)	6.0	(0.7)
Sweden	11.2	(1.0)	33.9	(1.4)	35.2	(1.1)	15.7	(1.2)	4.0	(0.6)
Turkey	11.7	(1.0)	32.5	(1.4)	30.8	(1.3)	15.1	(0.9)	9.9	(1.1)
United Arab Emirates	7.3	(0.4)	20.0	(0.6)	25.1	(0.4)	21.3	(0.5)	26.2	(0.7)
United States	14.7	(0.8)	33.3	(1.0)	30.6	(0.8)	15.0	(0.7)	6.5	(0.6)
International median	**5.7**		**27.7**		**34.5**		**19.9**		**7.7**	

‡ There are fewer than 30 observations.
U Too unreliable to be published.

TABLE B.1.15b Cumulative percentage of students reaching the international benchmarks: SCIENCE

Country or province	Advanced benchmark (625)		High benchmark or above (550)		Intermediate benchmark or above (475)		Low benchmark or above (400)	
	%	Standard error	%	Standard error	%	Standard error	%	Standard error
Canada	**7.2**	**(0.6)**	**36.8**	**(1.1)**	**75.2**	**(1.0)**	**95.1**	**(0.4)**
Newfoundland and Labrador	4.9	(1.1)	33.2	(2.2)	75.0	(2.1)	95.3	(1.0)
Quebec	5.3	(0.7)	34.2	(1.5)	76.8	(1.7)	96.6	(0.5)
Ontario	7.9	(1.0)	38.1	(1.8)	74.8	(1.7)	94.7	(0.8)
Manitoba	4.4	(0.8)	28.3	(1.5)	65.2	(2.0)	89.7	(1.5)
Alberta	9.5	(1.2)	41.1	(2.3)	77.0	(1.7)	95.3	(0.9)
Albania	4.1	(0.5)	24.5	(1.5)	59.4	(1.8)	85.7	(1.4)
Armenia	1.6	(0.4)	13.9	(1.2)	46.9	(1.7)	80.1	(1.5)
Australia	11.1	(0.9)	43.8	(1.5)	78.3	(1.2)	93.8	(0.7)
Austria	7.2	(0.7)	37.5	(1.4)	74.6	(1.4)	94.1	(0.8)
Azerbaijan, Republic of	0.6	(0.2)	8.4	(0.6)	32.1	(1.3)	64.5	(1.5)
Bahrain	6.5	(0.7)	27.6	(1.3)	59.8	(1.5)	83.8	(1.1)
Belgium (Flemish)	2.4	(0.3)	24.1	(1.1)	66.5	(1.5)	92.4	(0.6)
Bosnia and Herzegovina	1.0	(0.2)	11.8	(0.9)	43.7	(1.5)	77.8	(1.4)
Bulgaria	14.5	(1.0)	44.0	(2.0)	71.2	(2.1)	87.2	(1.4)
Chile	1.4	(0.2)	14.1	(0.9)	47.7	(1.8)	81.8	(1.3)
Chinese Taipei	15.0	(0.9)	57.5	(1.1)	89.2	(0.9)	98.6	(0.3)
Croatia	3.6	(0.5)	33.9	(1.4)	80.2	(1.3)	97.8	(0.4)
Cyprus	5.8	(0.8)	31.3	(1.6)	69.7	(1.5)	92.1	(0.8)
Czech Republic	8.3	(0.9)	42.8	(2.2)	80.7	(1.2)	96.6	(0.5)
Denmark	5.7	(0.7)	35.6	(1.3)	76.4	(1.3)	95.5	(0.5)
England	10.3	(1.1)	44.2	(1.7)	81.4	(1.2)	96.3	(0.6)
Finland	15.1	(1.1)	55.7	(1.4)	87.3	(1.0)	97.4	(0.5)
France	2.8	(0.4)	22.1	(1.3)	59.0	(1.6)	85.8	(1.0)
Georgia	1.4	(0.4)	11.7	(1.1)	42.6	(2.1)	74.9	(1.8)
Germany	6.9	(0.9)	36.5	(1.3)	72.4	(1.2)	92.8	(0.7)
Hong Kong, SAR	8.5	(0.9)	41.0	(1.8)	79.3	(1.6)	96.1	(0.6)
Hungary	9.8	(0.6)	41.9	(1.3)	76.5	(1.4)	94.3	(0.7)
Iran, Islamic Republic of	1.3	(0.3)	12.9	(1.0)	39.6	(1.7)	68.2	(1.8)
Ireland	8.6	(0.6)	40.9	(1.6)	77.4	(1.7)	94.2	(0.8)
Italy	3.3	(0.7)	27.4	(1.8)	71.1	(1.6)	95.0	(0.8)
Japan	17.4	(0.8)	59.4	(1.2)	89.6	(0.7)	98.2	(0.4)
Kazakhstan	4.9	(0.8)	22.8	(1.5)	58.9	(1.7)	89.2	(1.0)
Korea, Republic of	29.2	(1.2)	72.6	(1.3)	95.0	(0.6)	99.2	(0.2)
Kosovo	U‡	(0.1)	4.3	(0.6)	24.7	(1.6)	58.5	(1.7)
Kuwait	1.7	(0.4)	9.7	(1.3)	27.0	(2.0)	49.5	(2.1)
Latvia	8.2	(0.9)	47.5	(1.6)	85.1	(1.2)	97.9	(0.5)
Lithuania	10.9	(0.9)	45.5	(1.5)	81.4	(1.4)	96.5	(0.4)
Malta	4.7	(0.4)	27.2	(0.8)	62.5	(0.8)	86.4	(0.7)
Montenegro	1.2	(0.2)	12.5	(0.9)	43.6	(1.6)	75.3	(0.9)
Morocco	U	(0.7)	7.4	(1.1)	20.8	(1.6)	42.0	(2.0)
Netherlands	3.9	(0.9)	32.7	(1.7)	75.7	(1.7)	95.8	(0.6)
New Zealand	5.6	(0.5)	29.9	(1.3)	64.4	(1.2)	88.4	(0.8)
North Macedonia	1.3	(0.4)	10.8	(1.3)	34.1	(2.5)	61.8	(2.6)
Northern Ireland	5.3	(0.7)	34.7	(1.4)	74.0	(1.5)	94.0	(0.7)
Norway	9.0	(0.7)	45.9	(1.6)	83.4	(1.2)	97.4	(0.5)
Oman	4.5	(0.8)	16.5	(1.3)	38.4	(1.4)	62.5	(1.2)
Pakistan	U‡	(0.1)	1.4	(0.4)	7.3	(1.4)	21.4	(3.2)
Philippines	U‡	(0.0)	1.0	(0.3)	4.6	(0.7)	12.6	(1.4)
Poland	8.8	(0.8)	42.2	(1.6)	78.5	(1.3)	95.1	(0.5)
Portugal	2.5	(0.4)	25.7	(1.4)	67.4	(1.5)	93.4	(0.6)
Qatar	3.4	(0.6)	18.0	(1.2)	42.9	(1.7)	68.2	(1.5)
Russian Federation	18.0	(1.3)	62.7	(1.9)	92.1	(1.0)	99.2	(0.3)
Saudi Arabia	1.1	(0.2)	8.2	(0.6)	28.1	(1.1)	53.6	(1.5)
Serbia	7.0	(0.7)	35.8	(1.7)	73.4	(1.5)	91.8	(1.0)
Singapore	37.6	(1.9)	74.3	(1.7)	92.6	(0.9)	98.2	(0.4)
Slovak Republic	6.9	(0.8)	38.6	(1.5)	76.5	(1.6)	92.0	(1.2)
South Africa	1.7	(0.3)	6.0	(0.6)	14.5	(1.2)	27.9	(1.5)
Spain	3.3	(0.5)	29.8	(1.1)	71.3	(1.3)	94.0	(0.7)
Sweden	11.2	(1.0)	45.1	(1.8)	80.3	(1.5)	96.0	(0.6)
Turkey	11.7	(1.0)	44.2	(1.9)	75.1	(1.7)	90.1	(1.1)
United Arab Emirates	7.3	(0.4)	27.4	(0.7)	52.5	(0.9)	73.8	(0.7)
United States	14.7	(0.8)	48.0	(1.3)	78.6	(1.1)	93.5	(0.6)
International median	**5.7**		**32.0**		**71.2**		**92.3**	

‡ There are fewer than 30 observations.
U Too unreliable to be published.

TABLE B.1.16 Achievement scores: SCIENCE

Country or province	Average	Standard error	confidence interval – 95% lower limit	confidence interval – 95% upper limit
Canada	**523**	**(1.9)**	**519**	**527**
Newfoundland and Labrador	519	(3.5)	512	526
Quebec	522	(2.5)	517	527
Ontario	524	(3.2)	518	530
Manitoba	502	(3.5)	495	509
Alberta	530	(3.9)	522	537
Albania	489	(3.5)	483	496
Armenia	466	(3.4)	460	473
Australia	533	(2.4)	528	537
Austria	522	(2.6)	517	527
Azerbaijan, Republic of	427	(3.3)	420	433
Bahrain	493	(3.4)	486	499
Belgium (Flemish)	501	(2.1)	497	505
Bosnia and Herzegovina	459	(2.9)	453	464
Bulgaria	521	(4.9)	512	531
Chile	469	(2.6)	464	474
Chinese Taipei	558	(1.8)	555	562
Croatia	524	(2.2)	520	528
Cyprus	511	(3.0)	505	517
Czech Republic	534	(2.6)	529	539
Denmark	522	(2.4)	518	527
England	537	(2.7)	532	542
Finland	555	(2.6)	550	560
France	488	(3.0)	482	494
Georgia	454	(3.9)	447	462
Germany	518	(2.2)	514	523
Hong Kong, SAR	531	(3.3)	525	538
Hungary	529	(2.7)	524	535
Iran, Islamic Republic of	441	(4.1)	433	449
Ireland	528	(3.2)	522	534
Italy	510	(3.0)	504	516
Japan	562	(1.8)	558	565
Kazakhstan	494	(3.1)	488	500
Korea, Republic of	588	(2.1)	583	592
Kosovo	413	(3.7)	406	420
Kuwait	392	(6.1)	380	404
Latvia	542	(2.4)	537	547
Lithuania	538	(2.5)	533	543
Malta	496	(1.3)	493	498
Montenegro	453	(2.5)	448	458
Morocco	374	(5.8)	363	385
Netherlands	518	(2.9)	513	524
New Zealand	503	(2.3)	498	507
North Macedonia	426	(6.2)	414	438
Northern Ireland	518	(2.3)	514	523
Norway	539	(2.2)	535	544
Oman	435	(4.1)	427	443
Pakistan	290	(13.4)	264	316
Philippines	249	(7.5)	234	264
Poland	531	(2.6)	526	536
Portugal	504	(2.6)	499	509
Qatar	449	(3.9)	442	457
Russian Federation	567	(3.0)	561	573
Saudi Arabia	402	(4.1)	394	410
Serbia	517	(3.5)	510	524
Singapore	595	(3.4)	588	601
Slovak Republic	521	(3.7)	513	528
South Africa	324	(4.9)	315	334
Spain	511	(2.0)	507	515
Sweden	537	(3.3)	531	544
Turkey	526	(4.2)	518	535
United Arab Emirates	473	(2.1)	469	477
United States	539	(2.7)	533	544
International centrepoint	**500**	--	--	--

TABLE B.1.17 Achievement scores by content domain: SCIENCE

Canada and provinces	Overall science		Life science		Difference (life science–overall science)	
	Average	Standard error	Average	Standard error	Difference	Standard error
Canada	**523**	**(1.9)**	**532**	**(1.9)**	**9 ***	**(0.8)**
Newfoundland and Labrador	519	(3.5)	526	(4.0)	7 *	(2.0)
Quebec	522	(2.5)	530	(2.4)	8 *	(1.3)
Ontario	524	(3.2)	535	(2.9)	11 *	(1.3)
Manitoba	502 **	(3.5)	509 **	(3.6)	7 *	(1.7)
Alberta	530	(3.9)	535	(4.0)	6 *	(1.4)

Canada and provinces	Overall science		Physical science		Difference (physical science–overall science)	
	Average	Standard error	Average	Standard error	Difference	Standard error
Canada	**523**	**(1.9)**	**513**	**(1.8)**	**-10 ***	**(0.9)**
Newfoundland and Labrador	519	(3.5)	508	(4.1)	-10 *	(2.1)
Quebec	522	(2.5)	514	(2.8)	-8 *	(1.6)
Ontario	524	(3.2)	512	(2.9)	-12 *	(1.4)
Manitoba	502 **	(3.5)	491 **	(3.8)	-11 *	(1.8)
Alberta	530	(3.9)	521	(4.4)	-9 *	(1.5)

Canada and provinces	Overall science		Earth science		Difference (Earth science–overall science)	
	Average	Standard error	Average	Standard error	Difference	Standard error
Canada	**523**	**(1.9)**	**519**	**(2.2)**	**-4 ***	**(0.9)**
Newfoundland and Labrador	519	(3.5)	517	(3.8)	-2	(2.0)
Quebec	522	(2.5)	519	(3.2)	-3	(1.7)
Ontario	524	(3.2)	518	(3.4)	-6 *	(1.2)
Manitoba	502 **	(3.5)	499 **	(4.2)	-3	(2.1)
Alberta	530	(3.9)	527 **	(4.5)	-3	(1.7)

* Significant difference.
** Significant difference compared to Canada.

TABLE B.1.18 Achievement scores by cognitive domain: SCIENCE

Canada and provinces	Overall science		Knowing		Difference (knowing–overall science)	
	Average	Standard error	Average	Standard error	Difference	Standard error
Canada	**523**	**(1.9)**	**524**	**(1.9)**	**1**	**(1.5)**
Newfoundland and Labrador	519	(3.5)	521	(4.5)	2	(3.1)
Quebec	522	(2.5)	523	(2.8)	1	(1.9)
Ontario	524	(3.2)	525	(3.1)	1	(2.3)
Manitoba	502 **	(3.5)	505 **	(3.9)	2	(1.9)
Alberta	530	(3.9)	532	(4.3)	3	(1.7)

Canada and provinces	Overall science		Applying		Difference (applying–overall science)	
	Average	Standard error	Average	Standard error	Difference	Standard error
Canada	**523**	**(1.9)**	**520**	**(2.0)**	**-3 ***	**(1.0)**
Newfoundland and Labrador	519	(3.5)	514	(3.9)	-5 *	(2.4)
Quebec	522	(2.5)	520	(3.6)	-2	(2.6)
Ontario	524	(3.2)	520	(3.1)	-4 *	(1.2)
Manitoba	502 **	(3.5)	499 **	(3.6)	-3	(2.1)
Alberta	530	(3.9)	526	(4.0)	-3	(2.2)

Canada and provinces	Overall science		Reasoning		Difference (reasoning–overall science)	
	Average	Standard error	Average	Standard error	Difference	Standard error
Canada	**523**	**(1.9)**	**525**	**(1.8)**	**2**	**(1.8)**
Newfoundland and Labrador	519	(3.5)	518	(3.7)	-1	(1.9)
Quebec	522	(2.5)	525	(3.0)	3	(3.2)
Ontario	524	(3.2)	528	(3.0)	4	(2.3)
Manitoba	502 **	(3.5)	501 **	(4.3)	-1	(2.7)
Alberta	530	(3.9)	529	(4.3)	-1	(2.5)

* Significant difference.
** Significant difference compared to Canada.

TABLE B.1.19a Discrete percentage of students reaching the international benchmarks by language of the school system: SCIENCE

Canada and provinces	Language of the school system	Advanced benchmark (625)		High benchmark (550)		Intermediate benchmark (475)		Low benchmark (400)		Below low benchmark (under 400)	
		%	Standard error	%	Standard error	%	Standard error	%	Standard error	%	Standard error
Canada	**Anglophone**	**8.3**	**(0.8)**	**30.5**	**(1.0)**	**36.6**	**(1.0)**	**19.4**	**(1.2)**	**5.2**	**(0.5)**
	Francophone	**4.6**	**(0.6)**	**27.7**	**(1.2)**	**42.6**	**(1.5)**	**21.1**	**(1.5)**	**4.1**	**(0.5)**
Newfoundland and Labrador	Anglophone	4.9	(1.1)	28.3	(1.8)	41.8	(2.2)	20.3	(1.8)	4.7	(1.0)
	Francophone	--	--	--	--	--	--	--	--	--	--
Quebec	Anglophone	8.7	(2.4)	25.9	(3.1)	36.7	(2.9)	22.6	(3.5)	6.0	(1.9)
	Francophone	4.9	(0.7)	29.3	(1.4)	43.2	(1.7)	19.6	(1.5)	3.1	(0.5)
Ontario	Anglophone	8.3	(1.1)	31.1	(1.4)	36.6	(1.5)	19.0	(1.7)	4.9	(0.8)
	Francophone	U‡	(0.7)	13.9	(2.2)	37.4	(3.1)	34.0	(3.5)	13.1	(2.9)
Manitoba	Anglophone	4.5	(0.9)	24.1	(1.5)	36.8	(1.6)	24.3	(2.0)	10.3	(1.5)
	Francophone	U‡	(1.2)	14.9 ‡	(4.4)	39.8	(4.2)	33.6	(4.0)	U ‡	(3.2)
Alberta	Anglophone	9.6	(1.2)	31.8	(2.0)	36.0	(1.6)	18.1	(1.4)	4.6	(0.9)
	Francophone	U‡	(1.0)	19.9	(2.6)	37.4	(3.0)	29.4	(2.2)	11.3	(2.2)

-- Not available.
‡ There are fewer than 30 observations.
U Too unreliable to be published.
Note: Because Newfoundland and Labrador did not oversample students by language of the school system, results for only anglophone schools are available.

TABLE B.1.19b Cumulative percentage of students reaching the international benchmarks by language of the school system: SCIENCE

Canada and provinces	Language of the school system	Advanced benchmark (625)		High benchmark or above (550)		Intermediate benchmark or above (475)		Low benchmark or above (400)	
		%	Standard error	%	Standard error	%	Standard error	%	Standard error
Canada	**Anglophone**	**8.3**	**(0.8)**	**38.8**	**(1.3)**	**75.4**	**(1.3)**	**94.8**	**(0.5)**
	Francophone	**4.6**	**(0.6)**	**32.3**	**(1.5)**	**74.8**	**(1.7)**	**95.9**	**(0.5)**
Newfoundland and Labrador	Anglophone	4.9	(1.1)	33.2	(2.2)	75.0	(2.1)	95.3	(1.0)
	Francophone	--	--	--	--	--	--	--	--
Quebec	Anglophone	8.7	(2.4)	34.7	(4.3)	71.4	(3.6)	94.0	(1.9)
	Francophone	4.9	(0.7)	34.2	(1.6)	77.4	(1.7)	96.9	(0.5)
Ontario	Anglophone	8.3	(1.1)	39.5	(1.9)	76.1	(1.7)	95.1	(0.8)
	Francophone	U‡	(0.7)	15.6	(2.4)	52.9	(4.0)	86.9	(2.9)
Manitoba	Anglophone	4.5	(0.9)	28.6	(1.6)	65.4	(2.1)	89.7	(1.5)
	Francophone	U‡	(1.2)	17.2	(4.7)	57.1	(5.7)	90.6	(3.2)
Alberta	Anglophone	9.6	(1.2)	41.4	(2.3)	77.4	(1.8)	95.4	(0.9)
	Francophone	U‡	(1.0)	21.9	(2.5)	59.4	(2.8)	88.7	(2.2)

-- Not available.
‡ There are fewer than 30 observations.
U Too unreliable to be published.
Note: Because Newfoundland and Labrador did not oversample students by language of the school system, results for only anglophone schools are available.

TABLE B.1.20 Achievement scores by language of the school system: SCIENCE

Canada and provinces	Anglophone school systems		Francophone school systems		Difference (A–F)	
	Average	Standard error	Average	Standard error	Difference	Standard error
Canada	**525**	**(2.4)**	**518**	**(2.4)**	**7 ***	**(3.1)**
Newfoundland and Labrador	519	(3.5)	--	--	--	--
Quebec	518	(7.9)	522 **	(2.5)	-4	(7.8)
Ontario	527	(3.3)	480 **	(6.3)	47 *	(7.0)
Manitoba	503 **	(3.6)	486 **	(9.4)	16	(10.3)
Alberta	530	(3.9)	491 **	(4.9)	39 *	(6.3)

-- Not available.
* Significant difference.
** Significant difference compared to Canada.
Note: Because Newfoundland and Labrador did not oversample students by language of the school system, results for only anglophone schools are available.

TABLE B.1.21 Achievement scores by language of the school system: SCIENCE BY CONTENT DOMAIN SUBSCALES

Content domain	Canada and provinces	Anglophone school systems		Francophone school systems		Difference (A–F)	
		Average	Standard error	Average	Standard error	Difference	Standard error
Life science	**Canada**	**534**	**(2.3)**	**526**	**(2.5)**	**8 ***	**(3.0)**
	Newfoundland and Labrador	526 **	(4.0)	--	--	--	--
	Quebec	528	(7.3)	530 **	(2.5)	-2	(7.5)
	Ontario	537 **	(3.0)	494 **	(7.9)	44 *	(8.2)
	Manitoba	509 **	(3.7)	493 **	(9.4)	16	(10.1)
	Alberta	536	(4.1)	501 **	(6.5)	35 *	(7.4)
Physical science	**Canada**	**514**	**(2.2)**	**510**	**(2.9)**	**5**	**(3.6)**
	Newfoundland and Labrador	508	(4.1)	--	--	--	--
	Quebec	505	(8.2)	514 **	(3.0)	-10	(8.7)
	Ontario	515	(3.1)	468 **	(6.6)	48 *	(7.4)
	Manitoba	492 **	(3.9)	474 **	(11.3)	18	(12.2)
	Alberta	521	(4.4)	482 **	(5.1)	40 *	(7.0)
Earth science	**Canada**	**521**	**(2.6)**	**512**	**(2.9)**	**9 ***	**(3.5)**
	Newfoundland and Labrador	517	(3.8)	--	--	--	--
	Quebec	522	(9.8)	518 **	(3.1)	4	(9.5)
	Ontario	522	(3.6)	459 **	(6.7)	62 *	(7.6)
	Manitoba	499 **	(4.3)	474 **	(11.6)	26 *	(12.7)
	Alberta	528	(4.5)	478 **	(5.2)	50 *	(6.8)

-- Not available.
* Significant difference.
** Significant difference compared to Canada.
Note: Because Newfoundland and Labrador did not oversample students by language of the school system, results for only anglophone schools are available.

TABLE B.1.22 Achievement scores by language of the school system: SCIENCE BY COGNITIVE DOMAIN SUBSCALES

Cognitive domain	Canada and provinces	Anglophone school systems		Francophone school systems		Difference (A–F)	
		Average	Standard error	Average	Standard error	Difference	Standard error
Knowing	**Canada**	**527**	**(2.3)**	**519**	**(2.8)**	**8 ***	**(3.5)**
	Newfoundland and Labrador	521	(4.5)	--	--	--	--
	Quebec	521	(7.5)	523 **	(2.9)	-3	(7.7)
	Ontario	528	(3.3)	479 **	(7.0)	49 *	(7.9)
	Manitoba	505 **	(4.0)	487 **	(9.9)	18	(10.7)
	Alberta	533	(4.3)	492 **	(5.9)	41 *	(6.9)
Applying	**Canada**	**521**	**(2.2)**	**516**	**(3.4)**	**6**	**(3.7)**
	Newfoundland and Labrador	514	(3.9)	--	--	--	--
	Quebec	515	(8.4)	520 **	(3.6)	-5	(7.9)
	Ontario	522	(3.2)	476 **	(6.2)	46 *	(7.0)
	Manitoba	499 **	(3.7)	483 **	(9.8)	16	(10.6)
	Alberta	527	(4.0)	487 **	(5.5)	40 *	(6.7)
Reasoning	**Canada**	**527**	**(2.1)**	**521**	**(3.1)**	**7**	**(3.7)**
	Newfoundland and Labrador	518 **	(3.7)	--	--	--	--
	Quebec	519	(7.4)	525 **	(3.2)	-6	(7.8)
	Ontario	530	(3.1)	483 **	(6.8)	47 *	(7.6)
	Manitoba	502 **	(4.3)	482 **	(10.1)	20	(10.5)
	Alberta	530	(4.4)	492 **	(4.6)	37 *	(6.8)

-- Not available.
* Significant difference.
** Significant difference compared to Canada.
Note: Because Newfoundland and Labrador did not oversample students by language of the school system, results for only anglophone schools are available.

TABLE B.1.23 Discrete Percentage of students reaching the international benchmarks by gender: SCIENCE

Canada and provinces	Gender	Advanced benchmark (625)		High benchmark (550)		Intermediate benchmark (475)		Low benchmark (400)		Below low benchmark (under 400)	
		%	Standard error	%	Standard error	%	Standard error	%	Standard error	%	Standard error
Canada	**Girls**	**6.3**	**(0.7)**	**29.1**	**(1.1)**	**38.9**	**(1.0)**	**20.8**	**(0.9)**	**4.9**	**(0.5)**
	Boys	**8.0**	**(0.7)**	**30.2**	**(1.3)**	**38.0**	**(1.2)**	**19.0**	**(1.5)**	**4.9**	**(0.5)**
Newfoundland and Labrador	Girls	U‡	(1.6)	26.8	(3.1)	43.2	(3.6)	21.3	(2.8)	4.5 ‡	(1.5)
	Boys	5.5	(1.3)	29.7	(2.5)	40.4	(2.6)	19.4	(2.2)	4.9	(1.3)
Quebec	Girls	4.5	(0.7)	27.9	(1.6)	42.6	(2.0)	21.8	(1.6)	3.2	(0.6)
	Boys	6.0	(1.0)	30.0	(1.9)	42.5	(1.8)	18.1	(1.8)	3.5	(0.7)
Ontario	Girls	6.9	(1.3)	30.2	(1.7)	37.3	(1.7)	20.4	(1.6)	5.2	(0.9)
	Boys	8.9	(1.1)	30.1	(1.8)	36.1	(2.2)	19.4	(2.4)	5.4	(1.0)
Manitoba	Girls	3.9	(0.7)	23.9	(1.9)	36.6	(2.2)	24.7	(2.3)	10.8	(1.8)
	Boys	5.0	(1.2)	24.0	(1.9)	37.0	(1.8)	24.3	(2.6)	9.6	(1.7)
Alberta	Girls	8.7	(1.3)	30.2	(1.9)	37.2	(1.7)	18.9	(2.0)	5.1	(1.3)
	Boys	10.3	(1.6)	33.0	(2.9)	34.8	(2.3)	17.6	(2.1)	4.3	(1.0)

‡ There are fewer than 30 observations.
U Too unreliable to be published.

TABLE B.1.24 Achievement scores by gender: SCIENCE

Canada, provinces, and international average	Girls		Boys		Difference (G–B)	
	Average	Standard error	Average	Standard error	Difference	Standard error
Canada	**520**	**(2.1)**	**526**	**(2.2)**	**-5 ***	**(2.1)**
Newfoundland and Labrador	516	(4.4)	521	(4.1)	-4	(5.0)
Quebec	519	(2.7)	525	(3.0)	-6 *	(2.5)
Ontario	522	(4.0)	526	(3.3)	-4	(3.7)
Manitoba	500 **	(4.0)	505 **	(4.1)	-4	(4.2)
Alberta	526	(4.2)	534	(4.3)	-8 *	(3.6)
International average	**493 ** **	**(0.6)**	**489 ** **	**(0.6)**	**5 ***	**(0.6)**

* Significant difference.
** Significant difference compared to Canada.

TABLE B.1.25 Achievement scores by gender: SCIENCE BY CONTENT DOMAIN SUBSCALES

Content domain	Canada, provinces, and international average	Girls		Boys		Difference (G-B)	
		Average	Standard error	Average	Standard error	Difference	Standard error
Life science	**Canada**	**533**	**(2.4)**	**531**	**(2.0)**	**2**	**(2.3)**
	Newfoundland and Labrador	527	(4.4)	525	(5.1)	2	(5.4)
	Quebec	530	(2.9)	529	(2.9)	1	(3.1)
	Ontario	537	(4.0)	533	(3.0)	4	(4.0)
	Manitoba	511 **	(4.1)	508 **	(4.1)	3	(3.8)
	Alberta	535	(4.4)	536	(4.4)	0	(3.7)
	International average	**510 ****	**(0.5)**	**503 ****	**(0.5)**	**7 ***	**(0.6)**
Physical science	**Canada**	**508**	**(2.2)**	**518**	**(2.2)**	**-10 ***	**(2.5)**
	Newfoundland and Labrador	503	(5.1)	513	(5.3)	-9	(6.7)
	Quebec	508	(3.0)	519	(3.5)	-11 *	(3.5)
	Ontario	508	(4.0)	516	(3.0)	-8 *	(3.8)
	Manitoba	487 **	(4.3)	496 **	(4.5)	-10 *	(4.7)
	Alberta	513	(4.8)	528 **	(5.0)	-15 *	(4.6)
	International average	**504**	**(0.6)**	**506 ****	**(0.6)**	**-2 ***	**(0.6)**
Earth science	**Canada**	**513**	**(2.5)**	**524**	**(2.9)**	**-11 ***	**(3.1)**
	Newfoundland and Labrador	510	(4.8)	523	(4.6)	-13 *	(5.7)
	Quebec	513	(3.3)	524	(3.9)	-12 *	(3.7)
	Ontario	514	(4.6)	522	(3.6)	-9 *	(4.4)
	Manitoba	494 **	(4.5)	504 **	(5.5)	-9	(5.3)
	Alberta	519	(4.7)	536 **	(5.6)	-17 *	(5.2)
	International average	**499 ****	**(0.6)**	**503 ****	**(0.6)**	**-3 ***	**(0.7)**

* Significant difference.
** Significant difference compared to Canada.

TABLE B.1.26 Achievement scores by gender: SCIENCE BY COGNITIVE DOMAIN SUBSCALES

Cognitive domain	Canada, provinces, and international average	Girls		Boys		Difference (G-B)	
		Average	Standard error	Average	Standard error	Difference	Standard error
Knowing	**Canada**	**519**	**(2.4)**	**529**	**(2.0)**	**-10 ***	**(2.2)**
	Newfoundland and Labrador	516	(6.0)	524	(4.6)	-8	(5.8)
	Quebec	517	(3.1)	529	(3.4)	-12 *	(3.5)
	Ontario	521	(4.1)	528	(3.2)	-7	(3.7)
	Manitoba	500 **	(4.6)	509 **	(4.2)	-10 *	(4.0)
	Alberta	526	(4.7)	539 **	(4.7)	-13 *	(4.1)
	International average	**507 ** **	**(0.6)**	**510 ** **	**(0.5)**	**-4 ***	**(0.6)**
Applying	**Canada**	**517**	**(2.3)**	**522**	**(2.2)**	**-4 ***	**(2.1)**
	Newfoundland and Labrador	512	(4.8)	515	(4.4)	-2	(5.1)
	Quebec	516	(4.1)	523	(3.7)	-7 *	(2.7)
	Ontario	519	(3.9)	521	(3.2)	-2	(3.6)
	Manitoba	498 **	(4.5)	500 **	(3.9)	-2	(4.4)
	Alberta	523	(4.4)	530	(4.4)	-7	(3.7)
	International average	**509 ** **	**(0.5)**	**506 ** **	**(0.5)**	**3 ***	**(0.6)**
Reasoning	**Canada**	**527**	**(2.2)**	**524**	**(2.4)**	**3**	**(3.0)**
	Newfoundland and Labrador	521	(5.0)	515	(4.3)	6	(5.7)
	Quebec	526	(3.6)	524	(3.3)	2	(3.3)
	Ontario	530	(3.9)	526	(3.5)	4	(4.5)
	Manitoba	504 **	(4.7)	499 **	(4.8)	5	(4.2)
	Alberta	530	(4.9)	528	(4.7)	1	(4.4)
	International average	**512 ** **	**(0.6)**	**506 ** **	**(0.6)**	**6 ***	**(0.7)**

* Significant difference.
** Significant difference compared to Canada.

TABLE B.1.27a Percentage of students reaching the international benchmarks: SCIENCE

Canada and provinces	2015									
	Advanced benchmark (625)		High benchmark (550)		Intermediate benchmark (475)		Low benchmark (400)		Below low benchmark (under 400)	
	%	Standard error	%	Standard error	%	Standard error	%	Standard error	%	Standard error
Canada	**7.4**	**(0.5)**	**30.8**	**(0.9)**	**38.3**	**(1.0)**	**18.2**	**(0.9)**	**5.3**	**(0.7)**
Newfoundland and Labrador	--	--	--	--	--	--	--	--	--	--
Quebec	5.8	(0.9)	29.5	(1.9)	42.6	(1.3)	19.1	(1.7)	3.0	(0.6)
Ontario	8.5	(0.9)	32.7	(1.1)	37.3	(1.3)	17.0	(1.0)	4.4	(0.6)
Manitoba	--	--	--	--	--	--	--	--	--	--
Alberta	7.4	(1.0)	29.4	(1.6)	36.0	(1.4)	19.4	(1.3)	7.7	(1.3)

Canada and provinces	2019									
	Advanced benchmark (625)		High benchmark (550)		Intermediate benchmark (475)		Low benchmark (400)		Below low benchmark (under 400)	
	%	Standard error	%	Standard error	%	Standard error	%	Standard error	%	Standard error
Canada	**7.2**	**(0.6)**	**29.7**	**(0.8)**	**38.4**	**(0.8)**	**19.9**	**(1.0)**	**4.9**	**(0.4)**
Newfoundland and Labrador	4.9	(1.1)	28.3	(1.8)	41.8	(2.2)	20.3	(1.8)	4.7	(1.0)
Quebec	5.3	(0.7)	29.0	(1.3)	42.6	(1.6)	19.8	(1.5)	3.4	(0.5)
Ontario	7.9	(1.0)	30.1	(1.3)	36.7	(1.5)	19.9	(1.6)	5.3	(0.8)
Manitoba	4.4	(0.8)	23.9	(1.4)	36.9	(1.6)	24.5	(2.0)	10.3	(1.5)
Alberta	9.5	(1.2)	31.6	(2.0)	36.0	(1.6)	18.3	(1.4)	4.7	(0.9)

Canada and provinces	Difference (2019–2015)									
	Advanced benchmark (625)		High benchmark (550)		Intermediate benchmark (475)		Low benchmark (400)		Below low benchmark (under 400)	
	Difference	Standard error	Difference	Standard error	Difference	Standard error	Difference	Standard error	Difference	Standard error
Canada	**-0.3**	**(0.8)**	**-1.2**	**(1.2)**	**0.1**	**(1.3)**	**1.7**	**(1.3)**	**-0.4**	**(0.8)**
Newfoundland and Labrador	--	--	--	--	--	--	--	--	--	--
Quebec	-0.5	(1.1)	-0.5	(2.3)	0.0	(2.1)	0.7	(2.3)	0.3	(0.8)
Ontario	-0.6	(1.3)	-2.6	(1.7)	-0.6	(1.9)	2.9	(1.9)	0.9	(1.0)
Manitoba	--	--	--	--	--	--	--	--	--	--
Alberta	2.1	(1.5)	2.1	(2.5)	0.0	(2.1)	-1.1	(1.9)	-3.1	(1.6)

-- Not available.
* Significant difference.
Note: Newfoundland and Labrador and Manitoba did not take part in the TIMSS 2015 assessment.

TABLE B.1.27b Achievement scores over time: SCIENCE

Canada and provinces	2015		2019		Difference (2019–2015)	
	Average	Standard error	Average	Standard error	Difference	Standard error
Canada	**525**	**(2.6)**	**523**	**(1.9)**	**-2**	**(3.2)**
Newfoundland and Labrador	--	--	519	(3.5)	--	--
Quebec	525	(4.1)	522	(2.5)	-3	(4.8)
Ontario	530	(2.5)	524	(3.2)	-6	(4.1)
Manitoba	--	--	502	(3.5)	--	--
Alberta	519	(4.6)	530	(3.9)	11	(6.0)

-- Not available.
* Significant difference.
Note: Newfoundland and Labrador and Manitoba did not take part in the TIMSS 2015 assessment.

TABLE B.1.27c Achievement scores by language of the school system over time: SCIENCE

School systems	Canada and provinces	2015		2019		Difference (2019–2015)	
		Average	Standard error	Average	Standard error	Difference	Standard error
Anglophone school systems	**Canada**	**526**	**(3.1)**	**525**	**(2.4)**	**-1**	**(3.9)**
	Newfoundland and Labrador	--	--	519	(3.5)	--	--
	Quebec	523	(5.0)	518	(7.9)	-4	(9.3)
	Ontario	533	(2.6)	527	(3.3)	-6	(4.2)
	Manitoba	--	--	503	(3.6)	--	--
	Alberta	519	(4.7)	530	(3.9)	11	(6.1)
Francophone school systems	**Canada**	**520**	**(4.1)**	**518**	**(2.4)**	**-3**	**(4.8)**
	Newfoundland and Labrador	--	--	--	--	--	--
	Quebec	525	(4.5)	522	(2.5)	-2	(5.1)
	Ontario	479	(7.4)	480	(6.3)	0	(9.8)
	Manitoba	--	--	486	(9.4)	--	--
	Alberta	485	(3.8)	491	(4.9)	6	(6.2)

-- Not available.
* Significant difference.
Note: Newfoundland and Labrador and Manitoba did not take part in the TIMSS 2015 assessment.

TABLE B.1.27d Achievement scores by gender over time: SCIENCE

Gender	Canada and provinces	2015		2019		Difference (2019–2015)	
		Average	Standard error	Average	Standard error	Difference	Standard error
Girls	**Canada**	**526**	**(2.8)**	**520**	**(2.1)**	**-6**	**(3.5)**
	Newfoundland and Labrador	--	--	516	(4.4)	--	--
	Quebec	525	(3.6)	519	(2.7)	-6	(4.5)
	Ontario	533	(2.9)	522	(4.0)	-11 *	(5.0)
	Manitoba	--	--	500	(4.0)	--	--
	Alberta	517	(5.6)	526	(4.2)	9	(7.0)
Boys	**Canada**	**524**	**(3.0)**	**526**	**(2.2)**	**2**	**(3.7)**
	Newfoundland and Labrador	--	--	521	(4.1)	--	--
	Quebec	524	(5.3)	525	(3.0)	1	(6.1)
	Ontario	528	(3.1)	526	(3.3)	-2	(4.5)
	Manitoba	--	--	505	(4.1)	--	--
	Alberta	521	(4.3)	534	(4.3)	12 *	(6.1)

-- Not available.
* Significant difference.
Note: Newfoundland and Labrador and Manitoba did not take part in the TIMSS 2015 assessment.

TABLE B.1.27e Achievement scores by content domain over time: SCIENCE

Content domain	Canada and provinces	2015		2019		Difference (2019–2015)	
		Average	Standard error	Average	Standard error	Difference	Standard error
Life science	**Canada**	**536**	**(2.8)**	**532**	**(1.9)**	**-4**	**(3.4)**
	Newfoundland and Labrador	--	--	526	(4.0)	--	--
	Quebec	533	(4.3)	530	(2.4)	-3	(4.9)
	Ontario	544	(2.6)	535	(2.9)	-9 *	(3.9)
	Manitoba	--	--	509	(3.6)	--	--
	Alberta	527	(4.8)	535	(4.0)	9	(6.3)
Physical science	**Canada**	**518**	**(2.7)**	**513**	**(1.8)**	**-5**	**(3.2)**
	Newfoundland and Labrador	--	--	508	(4.1)	--	--
	Quebec	519	(4.9)	514	(2.8)	-6	(5.6)
	Ontario	522	(2.5)	512	(2.9)	-10 *	(3.9)
	Manitoba	--	--	491	(3.8)	--	--
	Alberta	512	(4.6)	521	(4.4)	8	(6.3)
Earth science	**Canada**	**513**	**(3.1)**	**519**	**(2.2)**	**6**	**(3.8)**
	Newfoundland and Labrador	--	--	517	(3.8)	--	--
	Quebec	515	(4.4)	519	(3.2)	4	(5.4)
	Ontario	515	(3.7)	518	(3.4)	3	(5.0)
	Manitoba	--	--	499	(4.2)	--	--
	Alberta	513	(4.8)	527	(4.5)	14 *	(6.5)

-- Not available.
* Significant difference.
Note: Newfoundland and Labrador and Manitoba did not take part in the TIMSS 2015 assessment.

TABLE B.1.27f Achievement scores by cognitive domain over time: SCIENCE

Cognitive domain	Canada and provinces	2015		2019		Difference (2019–2015)	
		Average	Standard error	Average	Standard error	Difference	Standard error
Knowing	**Canada**	**523**	**(3.1)**	**524**	**(1.9)**	**2**	**(3.6)**
	Newfoundland and Labrador	--	--	521	(4.5)	--	--
	Quebec	524	(4.3)	523	(2.8)	-1	(5.1)
	Ontario	527	(2.8)	525	(3.1)	-3	(4.2)
	Manitoba	--	--	505	(3.9)	--	--
	Alberta	517	(5.3)	532	(4.3)	15 *	(6.8)
Applying	**Canada**	**528**	**(2.6)**	**520**	**(2.0)**	**-8 ***	**(3.2)**
	Newfoundland and Labrador	--	--	514	(3.9)	--	--
	Quebec	525	(4.5)	520	(3.6)	-6	(5.8)
	Ontario	534	(2.5)	520	(3.1)	-15 *	(3.9)
	Manitoba	--	--	499	(3.6)	--	--
	Alberta	522	(4.4)	526	(4.0)	4	(5.9)
Reasoning	**Canada**	**524**	**(2.6)**	**525**	**(1.8)**	**1**	**(3.2)**
	Newfoundland and Labrador	--	--	518	(3.7)	--	--
	Quebec	526	(4.6)	525	(3.0)	-1	(5.5)
	Ontario	529	(2.8)	528	(3.0)	-1	(4.0)
	Manitoba	--	--	501	(4.3)	--	--
	Alberta	518	(4.4)	529	(4.3)	11	(6.2)

-- Not available.
* Significant difference.
Note: Newfoundland and Labrador and Manitoba did not take part in the TIMSS 2015 assessment.

TABLE B.2.1 Percentage of students and achievement scores by parents' expectation of child's highest attained education: MATHEMATICS and SCIENCE

Parents' expectation	Canada, provinces, and international average	Mathematics				Science			
		%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
Complete high school or less	**Canada**	**3.1**	**(0.2)**	**457***	**(5.4)**	**3.1**	**(0.2)**	**485 ***	**(5.9)**
	Newfoundland and Labrador	2.1	(0.5)	452‡*	(18.5)	2.1	(0.5)	492 ‡*	(14.8)
	Quebec	4.5	(0.6)	465*	(7.7)	4.5	(0.6)	472 *	(8.2)
	Ontario	1.6	(0.3)	439*	(14.8)	1.6	(0.3)	474 *	(14.5)
	Manitoba	5.4	(0.9)	443*	(12.4)	5.4	(0.9)	486 *	(13.4)
	Alberta	3.9	(0.6)	468*	(10.3)	3.9	(0.6)	532	(10.9)
	International average	**13.2**	**(0.1)**	**446***	**(1.1)**	**13.2**	**(0.1)**	**434 ***	**(1.1)**
Complete college/cegep	**Canada**	**25.7**	**(1.0)**	**494***	**(2.8)**	**25.7**	**(1.0)**	**510 ***	**(2.5)**
	Newfoundland and Labrador	32.5	(2.4)	457*	(5.3)	32.5	(2.4)	505 *	(5.7)
	Quebec	31.8	(1.6)	518*	(3.8)	31.8	(1.6)	510 *	(3.6)
	Ontario	21.5	(1.5)	480*	(4.4)	21.5	(1.5)	506 *	(4.3)
	Manitoba	24.7	(1.5)	458*	(4.9)	24.7	(1.5)	499 *	(4.6)
	Alberta	25.2	(1.7)	480*	(5.5)	25.2	(1.7)	527 *	(5.0)
	International average	**14.1**	**(0.1)**	**469***	**(0.8)**	**14.1**	**(0.1)**	**459 ***	**(0.9)**
Complete bachelor's degree	**Canada**	**40.5**	**(1.1)**	**531**	**(2.1)**	**40.5**	**(1.1)**	**541**	**(2.2)**
	Newfoundland and Labrador	42.9	(2.0)	493	(5.1)	42.9	(2.0)	535	(4.2)
	Quebec	44.0	(1.4)	551	(2.6)	44.0	(1.4)	540	(3.2)
	Ontario	36.7	(1.9)	527	(4.1)	36.7	(1.9)	541	(3.8)
	Manitoba	41.1	(1.8)	493	(4.2)	41.1	(1.8)	525	(4.3)
	Alberta	44.3	(1.9)	510	(4.4)	44.3	(1.9)	549	(4.3)
	International average	**33.5**	**(0.1)**	**505**	**(0.6)**	**33.5**	**(0.1)**	**494**	**(0.7)**
Complete master's/ doctoral degree	**Canada**	**30.7**	**(1.3)**	**545***	**(3.4)**	**30.7**	**(1.3)**	**545**	**(3.1)**
	Newfoundland and Labrador	22.5	(2.0)	511	(8.0)	22.5	(2.0)	550	(6.8)
	Quebec	19.7	(1.6)	560*	(4.0)	19.7	(1.6)	541	(4.0)
	Ontario	40.2	(2.4)	549*	(5.0)	40.2	(2.4)	547	(4.5)
	Manitoba	28.9	(1.7)	508*	(5.0)	28.9	(1.7)	528	(5.5)
	Alberta	26.6	(1.8)	520	(6.6)	26.6	(1.8)	550	(5.8)
	International average	**39.2**	**(0.2)**	**528***	**(0.6)**	**39.2**	**(0.2)**	**516 ***	**(0.7)**

‡ There are fewer than 30 observations.
* Significant difference compared to the average score in the "Complete bachelor's degree" category.

TABLE B.2.2 Percentage of students and achievement scores by extra lessons: MATHEMATICS

Canada, provinces, and international average	Mathematics											
	Yes, to excel in class				Yes, to keep up in class				No			
	%	Standard error	Average	Standard error	%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
Canada	**7.4**	**(0.6)**	**548***	**(5.0)**	**6.7**	**(0.4)**	**480 ***	**(4.4)**	**85.9**	**(0.7)**	**525**	**(2.2)**
Newfoundland and Labrador	U	(0.7)	502‡	(15.3)	4.3	(1.2)	424 *	(16.3)	93.8	(1.5)	487	(3.9)
Quebec	4.2	(0.6)	527	(8.9)	5.8	(0.6)	479 *	(5.0)	90.0	(0.8)	544	(2.5)
Ontario	10.6	(1.1)	556*	(6.1)	8.3	(0.8)	485 *	(7.0)	81.1	(1.4)	524	(4.5)
Manitoba	4.0	(0.5)	513*	(13.0)	3.0	(0.5)	430 *	(11.8)	93.0	(0.7)	487	(3.4)
Alberta	5.7	(0.8)	538*	(12.7)	4.9	(0.7)	471 *	(8.2)	89.4	(1.0)	504	(3.9)
International average	**10.9**	**(0.1)**	**495***	**(1.1)**	**11.1**	**(0.1)**	**455 ***	**(1.0)**	**78.0**	**(0.2)**	**509**	**(0.5)**

‡ There are fewer than 30 observations.
U Too unreliable to be published.
* Significant difference compared to the average score in the "No" category.

TABLE B.2.3 Percentage of students and achievement scores by students' gender identity: MATHEMATICS and SCIENCE

Gender	Canada, provinces, and international average	Mathematics				Science			
		%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
Girls	**Canada**	**45.7**	**(0.8)**	**505***	**(2.8)**	**45.7**	**(0.8)**	**524***	**(2.2)**
	Newfoundland and Labrador	44.0	(2.0)	468	(5.8)	44.0	(2.0)	517	(5.4)
	Quebec	45.4	(1.1)	524	(3.2)	45.4	(1.1)	520	(2.8)
	Ontario	45.5	(1.6)	506*	(5.1)	45.5	(1.6)	525*	(4.1)
	Manitoba	44.9	(1.2)	469	(3.9)	44.9	(1.2)	507	(3.6)
	Alberta	47.1	(0.9)	484	(4.3)	47.1	(0.9)	529	(4.1)
Boys	**Canada**	**46.2**	**(0.8)**	**522**	**(2.0)**	**46.2**	**(0.8)**	**528**	**(2.3)**
	Newfoundland and Labrador	49.3	(2.0)	487	(4.3)	49.3	(2.0)	525	(4.1)
	Quebec	46.7	(1.0)	541	(2.8)	46.7	(1.0)	525	(3.7)
	Ontario	46.3	(1.4)	522*	(3.3)	46.3	(1.4)	528*	(3.3)
	Manitoba	46.1	(1.3)	477	(4.3)	46.1	(1.3)	506	(4.1)
	Alberta	44.3	(1.0)	506*	(4.8)	44.3	(1.0)	538	(4.5)
I identify myself in another way	**Canada**	**3.2**	**(0.2)**	**524**	**(5.6)**	**3.2**	**(0.2)**	**540**	**(6.6)**
	Newfoundland and Labrador	3.2	(0.6)	486	(18.6)	3.2	(0.6)	535	(17.3)
	Quebec	2.1	(0.3)	541	(12.8)	2.1	(0.3)	526	(11.4)
	Ontario	3.7	(0.4)	541	(8.1)	3.7	(0.4)	551	(9.7)
	Manitoba	3.1	(0.5)	474	(15.9)	3.1	(0.5)	514	(13.9)
	Alberta	3.3	(0.4)	467	(10.8)	3.3	(0.4)	521	(10.4)
I prefer not to say	**Canada**	**5.0**	**(0.3)**	**505***	**(4.5)**	**5.0**	**(0.3)**	**515***	**(4.3)**
	Newfoundland and Labrador	3.5	(0.5)	477	(11.6)	3.5	(0.5)	526	(16.7)
	Quebec	5.8	(0.6)	525	(5.6)	5.8	(0.6)	514	(6.1)
	Ontario	4.4	(0.5)	504*	(9.3)	4.4	(0.5)	513*	(7.7)
	Manitoba	5.8	(0.5)	474	(7.8)	5.8	(0.5)	510	(7.3)
	Alberta	5.3	(0.6)	483	(7.9)	5.3	(0.6)	524	(6.9)

* Significant difference compared to the average score in the "I identify myself in another way" category.

TABLE B.2.4 Percentage of students and achievement scores by home resources for learning: MATHEMATICS and SCIENCE

Home resources for learning	Canada, provinces, and international average	Mathematics				Science			
		%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
Many resources	**Canada**	**36.1**	**(1.7)**	**546**	**(2.1)**	**36.1**	**(1.7)**	**558**	**(2.2)**
	Newfoundland and Labrador	43.1	(3.1)	502	(5.3)	43.1	(3.1)	544	(4.9)
	Quebec	34.5	(2.0)	562	(3.1)	34.5	(2.0)	554	(3.1)
	Ontario	36.1	(3.1)	548	(3.9)	36.1	(3.1)	560	(3.9)
	Manitoba	33.5	(2.4)	516	(4.3)	33.5	(2.4)	550	(4.7)
	Alberta	39.7	(2.1)	523	(5.4)	39.7	(2.1)	563	(4.9)
	International average	**17.4**	**(0.1)**	**562**	**(0.7)**	**17.4**	**(0.1)**	**557**	**(0.8)**
Some and few resources	**Canada**	**63.9**	**(1.7)**	**511 ***	**(3.8)**	**63.9**	**(1.7)**	**520 ***	**(3.1)**
	Newfoundland and Labrador	56.9	(3.1)	474 *	(5.2)	56.9	(3.1)	520 *	(3.5)
	Quebec	65.5	(2.0)	525 *	(3.2)	65.5	(2.0)	513 *	(3.3)
	Ontario	63.9	(3.1)	512 *	(7.4)	63.9	(3.1)	523 *	(5.4)
	Manitoba	66.5	(2.4)	472 *	(3.5)	66.5	(2.4)	502 *	(3.4)
	Alberta	60.3	(2.1)	492 *	(4.1)	60.3	(2.1)	531 *	(3.6)
	International average	**82.6**	**(0.1)**	**494 ***	**(0.5)**	**82.6**	**(0.1)**	**483 ***	**(0.5)**

* Significant difference compared to the average score in the "Many resources" category.

TABLE B.2.5 Percentage of students and achievement scores by immigration status: MATHEMATICS and SCIENCE

Immigration status	Canada, provinces, and international average	Mathematics				Science			
		%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
Non-immigrant students	**Canada**	**88.8**	**(0.7)**	**522**	**(2.1)**	**88.8**	**(0.7)**	**533**	**(2.1)**
	Newfoundland and Labrador	94.2	(2.2)	483	(4.1)	94.2	(2.2)	528	(3.4)
	Quebec	91.7	(0.9)	538	(2.6)	91.7	(0.9)	529	(2.7)
	Ontario	87.7	(1.2)	521	(3.8)	87.7	(1.2)	534	(3.6)
	Manitoba	81.7	(2.0)	485	(3.8)	81.7	(2.0)	520	(3.9)
	Alberta	87.4	(1.3)	503	(4.1)	87.4	(1.3)	544	(3.6)
	International average	**92.5**	**(0.1)**	**502**	**(0.5)**	**92.5**	**(0.1)**	**491**	**(0.5)**
Immigrant students	**Canada**	**11.2**	**(0.7)**	**529**	**(4.6)**	**11.2**	**(0.7)**	**527**	**(4.1)**
	Newfoundland and Labrador	U	(2.2)	510	(16.0)	U	(2.2)	531	(13.9)
	Quebec	8.3	(0.9)	539	(6.0)	8.3	(0.9)	517 *	(5.7)
	Ontario	12.3	(1.2)	537 *	(7.9)	12.3	(1.2)	534	(6.4)
	Manitoba	18.3	(2.0)	490	(6.8)	18.3	(2.0)	502 *	(6.7)
	Alberta	12.6	(1.3)	508	(8.9)	12.6	(1.3)	533	(9.0)
	International average	**7.5**	**(0.1)**	**498 ***	**(1.4)**	**7.5**	**(0.1)**	**485 ***	**(1.5)**

U Too unreliable to be published.
* Significant difference compared to the average score in the "Non-immigrant students" category.

TABLE B.2.6 Percentage of students and achievement scores by students speaking the language of the test at home: MATHEMATICS and SCIENCE

Speaking the language of the test at home	Canada, provinces, and international average	Mathematics				Science			
		%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
Always or almost always	**Canada**	**75.9**	**(1.3)**	**509**	**(1.8)**	**75.9**	**(1.3)**	**527**	**(2.0)**
	Newfoundland and Labrador	92.2	(1.8)	476	(4.1)	92.2	(1.8)	521	(3.5)
	Quebec	74.2	(2.1)	531	(2.7)	74.2	(2.1)	524	(2.9)
	Ontario	75.1	(2.4)	510	(3.1)	75.1	(2.4)	528	(3.2)
	Manitoba	75.6	(1.9)	470	(4.1)	75.6	(1.9)	511	(3.7)
	Alberta	79.5	(1.6)	490	(3.9)	79.5	(1.6)	534	(3.7)
	International average	**77.5**	**(0.2)**	**504**	**(0.5)**	**77.5**	**(0.2)**	**495**	**(0.5)**
Sometimes or never	**Canada**	**24.1**	**(1.3)**	**517**	**(4.9)**	**24.1**	**(1.3)**	**515** *	**(4.4)**
	Newfoundland and Labrador	7.8	(1.8)	486	(13.4)	7.8	(1.8)	516	(12.3)
	Quebec	25.8	(2.1)	532	(3.9)	25.8	(2.1)	514 *	(3.9)
	Ontario	24.9	(2.4)	521	(8.5)	24.9	(2.4)	518	(7.5)
	Manitoba	24.4	(1.9)	469	(4.4)	24.4	(1.9)	484 *	(5.4)
	Alberta	20.5	(1.6)	490	(7.8)	20.5	(1.6)	515 *	(7.4)
	International average	**22.5**	**(0.2)**	**492** *	**(0.8)**	**22.5**	**(0.2)**	**477** *	**(0.8)**

* Significant difference compared to the average score in the "Always or almost always" category.

TABLE B.2.7 Percentage of students and achievement scores by how often students feel tired at school: MATHEMATICS and SCIENCE

How often students feel tired at school	Canada, provinces, and international average	Mathematics				Science			
		%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
Every day	**Canada**	**21.6**	**(0.7)**	**483 ***	**(3.1)**	**21.6**	**(0.7)**	**507 ***	**(2.9)**
	Newfoundland and Labrador	29.2	(1.9)	462 *	(6.0)	29.2	(1.9)	509 *	(5.8)
	Quebec	16.3	(1.0)	514 *	(4.1)	16.3	(1.0)	511 *	(4.0)
	Ontario	22.6	(1.1)	483 *	(5.2)	22.6	(1.1)	506 *	(4.5)
	Manitoba	28.6	(1.3)	443 *	(5.4)	28.6	(1.3)	484 *	(5.3)
	Alberta	24.4	(1.3)	469 *	(5.0)	24.4	(1.3)	513 *	(5.5)
	International average	**19.4**	**(0.1)**	**478 ***	**(0.6)**	**19.4**	**(0.1)**	**470 ***	**(0.7)**
Almost every day	**Canada**	**21.8**	**(0.5)**	**516 ***	**(2.2)**	**21.8**	**(0.5)**	**528**	**(2.2)**
	Newfoundland and Labrador	20.5	(1.4)	481	(7.2)	20.5	(1.4)	525	(6.1)
	Quebec	22.0	(0.9)	533	(3.4)	22.0	(0.9)	523	(3.5)
	Ontario	21.4	(0.9)	519	(3.9)	21.4	(0.9)	532	(3.8)
	Manitoba	20.8	(1.0)	480	(4.3)	20.8	(1.0)	515	(5.0)
	Alberta	23.0	(0.9)	491	(4.7)	23.0	(0.9)	533	(4.5)
	International average	**15.4**	**(0.1)**	**507 ***	**(0.7)**	**15.4**	**(0.1)**	**497 ***	**(0.8)**
Sometimes	**Canada**	**47.0**	**(0.6)**	**523**	**(2.0)**	**47.0**	**(0.6)**	**531**	**(2.4)**
	Newfoundland and Labrador	42.6	(1.8)	485	(4.8)	42.6	(1.8)	527	(4.5)
	Quebec	52.8	(1.2)	537	(2.8)	52.8	(1.2)	526	(3.1)
	Ontario	45.7	(1.2)	525	(3.3)	45.7	(1.2)	534	(3.7)
	Manitoba	41.7	(1.3)	484	(4.0)	41.7	(1.3)	514	(3.9)
	Alberta	43.4	(1.3)	500	(4.3)	43.4	(1.3)	537	(4.1)
	International average	**46.5**	**(0.1)**	**511**	**(0.5)**	**46.5**	**(0.1)**	**501**	**(0.6)**
Never	**Canada**	**9.6**	**(0.3)**	**514**	**(5.0)**	**9.6**	**(0.3)**	**522 ***	**(4.6)**
	Newfoundland and Labrador	7.7	(1.0)	484	(9.1)	7.7	(1.0)	518	(8.5)
	Quebec	8.9	(0.7)	527 *	(5.6)	8.9	(0.7)	515 *	(5.3)
	Ontario	10.3	(0.6)	517	(8.2)	10.3	(0.6)	522	(7.2)
	Manitoba	8.9	(0.8)	475	(7.6)	8.9	(0.8)	504	(7.7)
	Alberta	9.2	(0.8)	500	(8.0)	9.2	(0.8)	539	(8.0)
	International average	**18.6**	**(0.1)**	**503 ***	**(0.7)**	**18.6**	**(0.1)**	**490 ***	**(0.8)**

* Significant difference compared to the average score in the "Sometimes" category.

TABLE B.2.8 Percentage of students and achievement scores by how often students feel hungry at school: MATHEMATICS and SCIENCE

How often students feel hungry at school	Canada, provinces, and international average	Mathematics				Science			
		%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
Every day	**Canada**	**18.4**	**(0.7)**	**494 ***	**(3.3)**	**18.4**	**(0.7)**	**507 ***	**(3.1)**
	Newfoundland and Labrador	17.4	(1.5)	460 *	(6.2)	17.4	(1.5)	506 *	(6.4)
	Quebec	21.2	(0.9)	521 *	(3.4)	21.2	(0.9)	513 *	(3.8)
	Ontario	17.3	(1.2)	488 *	(5.6)	17.3	(1.2)	503 *	(5.4)
	Manitoba	19.6	(0.9)	450 *	(7.2)	19.6	(0.9)	486 *	(7.2)
	Alberta	16.8	(1.1)	472 *	(5.6)	16.8	(1.1)	513 *	(6.0)
	International average	**16.4**	**(0.1)**	**481 ***	**(0.7)**	**16.4**	**(0.1)**	**472 ***	**(0.8)**
Almost every day	**Canada**	**14.8**	**(0.5)**	**506 ***	**(2.9)**	**14.8**	**(0.5)**	**517 ***	**(2.6)**
	Newfoundland and Labrador	14.0	(0.9)	464 *	(6.7)	14.0	(0.9)	510 *	(6.5)
	Quebec	16.1	(0.7)	525 *	(4.3)	16.1	(0.7)	516	(4.3)
	Ontario	14.2	(0.9)	507	(5.2)	14.2	(0.9)	518 *	(4.2)
	Manitoba	14.3	(0.9)	470	(5.7)	14.3	(0.9)	505	(6.6)
	Alberta	14.4	(0.8)	483 *	(4.7)	14.4	(0.8)	525	(5.1)
	International average	**11.8**	**(0.1)**	**498 ***	**(0.7)**	**11.8**	**(0.1)**	**487 ***	**(0.8)**
Sometimes	**Canada**	**42.1**	**(0.6)**	**516**	**(2.2)**	**42.1**	**(0.6)**	**529**	**(2.2)**
	Newfoundland and Labrador	43.3	(1.6)	485	(5.2)	43.3	(1.6)	529	(4.9)
	Quebec	43.7	(1.2)	534	(3.1)	43.7	(1.2)	524	(3.3)
	Ontario	41.1	(1.1)	518	(3.9)	41.1	(1.1)	532	(3.3)
	Manitoba	42.4	(1.4)	474	(3.6)	42.4	(1.4)	511	(4.0)
	Alberta	42.4	(1.3)	494	(3.7)	42.4	(1.3)	535	(3.5)
	International average	**40.8**	**(0.1)**	**507**	**(0.5)**	**40.8**	**(0.1)**	**497**	**(0.6)**
Never	**Canada**	**24.7**	**(0.7)**	**526 ***	**(3.9)**	**24.7**	**(0.7)**	**536 ***	**(3.4)**
	Newfoundland and Labrador	25.2	(1.2)	485	(6.8)	25.2	(1.2)	524	(6.2)
	Quebec	19.0	(1.0)	548 *	(3.6)	19.0	(1.0)	535 *	(4.2)
	Ontario	27.4	(1.3)	528	(6.5)	27.4	(1.3)	537	(5.4)
	Manitoba	23.7	(1.2)	487 *	(4.7)	23.7	(1.2)	513	(4.5)
	Alberta	26.4	(1.3)	507 *	(6.7)	26.4	(1.3)	543	(6.2)
	International average	**31.0**	**(0.2)**	**515 ***	**(0.6)**	**31.0**	**(0.2)**	**504 ***	**(0.6)**

* Significant difference compared to the average score in the "Sometimes" category.

TABLE B.2.9 Percentage of students and achievement scores by preschool attendance: MATHEMATICS and SCIENCE

Preschool attendance	Canada, provinces, and international average	Mathematics				Science			
		%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
Did not attend	**Canada**	**11.3**	**(0.7)**	**504 ***	**(6.6)**	**11.3**	**(0.7)**	**521 ***	**(5.0)**
	Newfoundland and Labrador	13.8	(1.6)	481	(10.1)	13.8	(1.6)	530	(10.2)
	Quebec	5.6	(0.5)	518	(7.2)	5.6	(0.5)	510	(7.7)
	Ontario	15.7	(1.3)	506	(9.1)	15.7	(1.3)	523	(6.9)
	Manitoba	11.0	(1.2)	460 *	(8.9)	11.0	(1.2)	494 *	(7.8)
	Alberta	7.5	(0.7)	493	(8.4)	7.5	(0.7)	536	(8.2)
	International average	**11.2**	**(0.2)**	**464 ***	**(1.5)**	**11.2**	**(0.2)**	**452 ***	**(1.6)**
1 year or less	**Canada**	**18.5**	**(1.0)**	**519**	**(6.0)**	**18.5**	**(1.0)**	**535**	**(4.7)**
	Newfoundland and Labrador	31.1	(2.0)	478	(6.9)	31.1	(2.0)	524	(6.3)
	Quebec	15.4	(0.9)	532	(4.8)	15.4	(0.9)	525	(4.5)
	Ontario	16.7	(2.0)	528	(11.8)	16.7	(2.0)	541	(9.0)
	Manitoba	25.3	(1.5)	483	(5.4)	25.3	(1.5)	515	(5.2)
	Alberta	26.9	(1.7)	502	(6.6)	26.9	(1.7)	544	(5.7)
	International average	**15.5**	**(0.1)**	**483 ***	**(1.0)**	**15.5**	**(0.1)**	**472 ***	**(1.0)**
2 years	**Canada**	**24.7**	**(0.8)**	**519**	**(2.7)**	**24.7**	**(0.8)**	**533**	**(3.1)**
	Newfoundland and Labrador	21.1	(2.0)	487	(8.6)	21.1	(2.0)	523	(7.7)
	Quebec	13.6	(0.8)	531	(5.5)	13.6	(0.8)	524	(5.9)
	Ontario	29.1	(1.3)	522	(4.3)	29.1	(1.3)	531	(4.5)
	Manitoba	26.1	(1.6)	490	(6.3)	26.1	(1.6)	525	(6.4)
	Alberta	32.5	(1.6)	509	(5.3)	32.5	(1.6)	548	(4.7)
	International average	**16.8**	**(0.1)**	**495**	**(1.0)**	**16.8**	**(0.1)**	**489**	**(1.1)**
3 years or more	**Canada**	**45.5**	**(1.4)**	**533 ***	**(2.5)**	**45.5**	**(1.4)**	**537**	**(2.5)**
	Newfoundland and Labrador	34.1	(2.2)	490	(6.7)	34.1	(2.2)	530	(5.6)
	Quebec	65.3	(1.3)	543 *	(2.9)	65.3	(1.3)	530	(3.4)
	Ontario	38.5	(2.5)	535 *	(4.1)	38.5	(2.5)	543 *	(3.8)
	Manitoba	37.6	(1.7)	494	(4.7)	37.6	(1.7)	522	(5.4)
	Alberta	33.1	(1.4)	504	(6.4)	33.1	(1.4)	541	(5.8)
	International average	**56.5**	**(0.2)**	**509 ***	**(0.6)**	**56.5**	**(0.2)**	**500 ***	**(0.7)**

* Significant difference compared to the average score in the "2 years" category.

TABLE B.2.10 Percentage of students and achievement scores by engagement in early literacy and numeracy activities: MATHEMATICS and SCIENCE

Engagement in early literacy and numeracy activities	Canada, provinces, and international average	Mathematics				Science			
		%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
Often	**Canada**	**55.8**	**(0.8)**	**530 ***	**(2.1)**	**55.8**	**(0.8)**	**541 ***	**(2.2)**
	Newfoundland and Labrador	74.7	(2.1)	487	(4.4)	74.7	(2.1)	529	(3.7)
	Quebec	47.6	(1.2)	547 *	(2.9)	47.6	(1.2)	538 *	(3.4)
	Ontario	59.7	(1.4)	530 *	(3.8)	59.7	(1.4)	541 *	(3.7)
	Manitoba	56.2	(1.5)	498 *	(3.8)	56.2	(1.5)	530 *	(4.1)
	Alberta	59.4	(1.7)	512 *	(4.0)	59.4	(1.7)	552 *	(3.6)
	International average	**42.1**	**(0.1)**	**516 ***	**(0.6)**	**42.1**	**(0.1)**	**507 ***	**(0.7)**
Sometimes	**Canada**	**43.1**	**(0.8)**	**515**	**(2.6)**	**43.1**	**(0.8)**	**522**	**(2.6)**
	Newfoundland and Labrador	25.1	(2.0)	478	(5.8)	25.1	(2.0)	525	(5.1)
	Quebec	51.1	(1.2)	531	(3.3)	51.1	(1.2)	519	(3.0)
	Ontario	39.1	(1.3)	514	(5.0)	39.1	(1.3)	525	(4.7)
	Manitoba	43.2	(1.5)	470	(4.2)	43.2	(1.5)	502	(4.2)
	Alberta	39.7	(1.6)	493	(5.5)	39.7	(1.6)	531	(5.2)
	International average	**55.1**	**(0.2)**	**495**	**(0.5)**	**55.1**	**(0.2)**	**484**	**(0.6)**
Never or almost never	**Canada**	**1.1**	**(0.2)**	**495**	**(11.7)**	**1.1**	**(0.2)**	**501 ***	**(9.6)**
	Newfoundland and Labrador	U	(0.2)	445 ‡	(30.9)	U	(0.2)	505 ‡	(27.5)
	Quebec	1.3	(0.3)	522	(18.3)	1.3	(0.3)	510	(16.7)
	Ontario	1.1	(0.3)	488	(19.5)	1.1	(0.3)	504	(14.8)
	Manitoba	U	(0.3)	470 ‡	(25.6)	U	(0.3)	476 ‡	(27.1)
	Alberta	0.9	(0.3)	443 ‡*	(19.0)	0.9	(0.3)	465 ‡*	(19.2)
	International average	**2.8**	**(0.1)**	**456 ***	**(3.0)**	**2.8**	**(0.1)**	**421 ***	**(3.2)**

‡ There are fewer than 30 observations.
U Too unreliable to be published.
* Significant difference compared to the average score in the "Sometimes" category.

TABLE B.2.11 Percentage of students and achievement scores by age at start of primary school (Grade 1): MATHEMATICS and SCIENCE

Age at start of primary school (Grade 1)	Canada, provinces, and international average	Mathematics				Science			
		%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
5 years old or younger	**Canada**	**32.5**	**(0.7)**	**511 ***	**(2.5)**	**32.5**	**(0.7)**	**522 ***	**(2.3)**
	Newfoundland and Labrador	39.7	(1.9)	476 *	(5.7)	39.7	(1.9)	518 *	(4.3)
	Quebec	24.9	(1.0)	530 *	(3.0)	24.9	(1.0)	519 *	(3.0)
	Ontario	35.8	(1.2)	511 *	(4.3)	35.8	(1.2)	522 *	(3.8)
	Manitoba	37.6	(1.2)	476 *	(5.0)	37.6	(1.2)	508 *	(5.0)
	Alberta	36.4	(1.4)	494 *	(4.1)	36.4	(1.4)	532 *	(3.9)
	International average	**15.4**	**(0.1)**	**491 ***	**(2.4)**	**15.4**	**(0.1)**	**482 ***	**(2.2)**
6 years old	**Canada**	**64.6**	**(0.7)**	**530**	**(2.2)**	**64.6**	**(0.7)**	**538**	**(2.2)**
	Newfoundland and Labrador	59.3	(1.8)	490	(4.2)	59.3	(1.8)	534	(3.9)
	Quebec	71.9	(1.0)	542	(2.8)	71.9	(1.0)	531	(3.2)
	Ontario	61.4	(1.2)	530	(4.1)	61.4	(1.2)	542	(3.9)
	Manitoba	59.4	(1.3)	492	(3.5)	59.4	(1.3)	525	(3.9)
	Alberta	60.6	(1.4)	510	(4.9)	60.6	(1.4)	550	(4.3)
	International average	**56.7**	**(0.1)**	**502**	**(0.6)**	**56.7**	**(0.1)**	**492**	**(0.7)**
7 years old or older	**Canada**	**2.9**	**(0.2)**	**520**	**(8.2)**	**2.9**	**(0.2)**	**518 ***	**(6.9)**
	Newfoundland and Labrador	U	(0.4)	490 ‡	(19.0)	U	(0.4)	538 ‡	(22.5)
	Quebec	3.2	(0.4)	526 *	(6.6)	3.2	(0.4)	510 *	(7.5)
	Ontario	2.8	(0.4)	530	(16.1)	2.8	(0.4)	526	(13.6)
	Manitoba	3.0	(0.5)	480	(18.7)	3.0	(0.5)	487 *	(16.9)
	Alberta	3.0	(0.6)	487	(13.9)	3.0	(0.6)	524 *	(13.4)
	International average	**27.9**	**(0.1)**	**491 ***	**(1.1)**	**27.9**	**(0.1)**	**480 ***	**(1.2)**

‡ There are fewer than 30 observations.
U Too unreliable to be published.
* Significant difference compared to the average score in the "6 years old" category.

TABLE B.2.12 Percentage of students and achievement scores by school belonging: MATHEMATICS and SCIENCE

School belonging	Canada, provinces, and international average	Mathematics				Science			
		%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
High	**Canada**	**52.6**	**(0.8)**	**515 ***	**(2.4)**	**52.6**	**(0.8)**	**528 ***	**(2.3)**
	Newfoundland and Labrador	56.9	(2.4)	480	(5.3)	56.9	(2.4)	524	(4.8)
	Quebec	46.5	(1.5)	535	(2.8)	46.5	(1.5)	525	(3.3)
	Ontario	52.9	(1.4)	519 *	(4.2)	52.9	(1.4)	530 *	(3.8)
	Manitoba	55.5	(1.5)	477 *	(3.5)	55.5	(1.5)	510	(3.7)
	Alberta	60.5	(1.4)	495 *	(4.7)	60.5	(1.4)	535 *	(4.3)
	International average	**58.4**	**(0.2)**	**508 ***	**(0.5)**	**58.4**	**(0.2)**	**497 ***	**(0.6)**
Some	**Canada**	**37.2**	**(0.7)**	**510**	**(2.1)**	**37.2**	**(0.7)**	**520**	**(2.2)**
	Newfoundland and Labrador	33.7	(2.0)	476	(6.2)	33.7	(2.0)	517	(5.9)
	Quebec	41.4	(1.3)	533	(3.2)	41.4	(1.3)	522	(3.1)
	Ontario	37.0	(1.1)	509	(3.5)	37.0	(1.1)	521	(3.6)
	Manitoba	34.6	(1.2)	467	(4.7)	34.6	(1.2)	501	(4.6)
	Alberta	31.7	(1.2)	484	(4.3)	31.7	(1.2)	522	(4.1)
	International average	**33.7**	**(0.1)**	**498**	**(0.6)**	**33.7**	**(0.1)**	**487**	**(0.7)**
Little	**Canada**	**10.2**	**(0.4)**	**495 ***	**(4.2)**	**10.2**	**(0.4)**	**514 ***	**(3.4)**
	Newfoundland and Labrador	9.4	(1.2)	460	(9.1)	9.4	(1.2)	509	(6.6)
	Quebec	12.1	(1.0)	511 *	(4.7)	12.1	(1.0)	509 *	(3.9)
	Ontario	10.0	(0.7)	495 *	(6.8)	10.0	(0.7)	518	(5.2)
	Manitoba	9.8	(0.9)	441 *	(8.9)	9.8	(0.9)	485	(8.7)
	Alberta	7.8	(0.7)	477	(8.4)	7.8	(0.7)	524	(8.8)
	International average	**8.0**	**(0.1)**	**484 ***	**(0.9)**	**8.0**	**(0.1)**	**476 ***	**(1.0)**

* Significant difference compared to the average score in the "Some" category.

TABLE B.2.13 Percentage of students and achievement scores by frequency of bullying: MATHEMATICS and SCIENCE

Frequency of bullying	Canada, provinces, and international average	Mathematics				Science			
		%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
Never or almost never	**Canada**	**54.8**	**(0.7)**	**520 ***	**(2.2)**	**54.8**	**(0.7)**	**533 ***	**(2.2)**
	Newfoundland and Labrador	59.3	(2.2)	482	(5.9)	59.3	(2.2)	527	(5.2)
	Quebec	53.8	(1.3)	539 *	(3.0)	53.8	(1.3)	530 *	(3.1)
	Ontario	55.0	(1.3)	523 *	(3.9)	55.0	(1.3)	535 *	(3.5)
	Manitoba	52.2	(1.3)	480 *	(3.6)	52.2	(1.3)	513 *	(3.4)
	Alberta	56.4	(1.2)	499 *	(4.7)	56.4	(1.2)	539 *	(4.1)
	International average	**62.8**	**(0.2)**	**512 ***	**(0.5)**	**62.8**	**(0.2)**	**503 ***	**(0.5)**
About monthly	**Canada**	**37.7**	**(0.7)**	**505**	**(2.2)**	**37.7**	**(0.7)**	**517**	**(2.2)**
	Newfoundland and Labrador	32.4	(1.6)	476	(5.3)	32.4	(1.6)	518	(5.0)
	Quebec	39.0	(1.0)	526	(3.0)	39.0	(1.0)	515	(2.8)
	Ontario	37.5	(1.2)	506	(3.5)	37.5	(1.2)	518	(3.8)
	Manitoba	37.8	(1.1)	463	(3.9)	37.8	(1.1)	498	(4.2)
	Alberta	36.3	(1.1)	482	(4.5)	36.3	(1.1)	523	(4.0)
	International average	**29.0**	**(0.1)**	**495**	**(0.6)**	**29.0**	**(0.1)**	**486**	**(0.7)**
About weekly	**Canada**	**7.5**	**(0.3)**	**477 ***	**(4.4)**	**7.5**	**(0.3)**	**491 ***	**(4.3)**
	Newfoundland and Labrador	8.3	(1.4)	447 *	(9.8)	8.3	(1.4)	482 *	(9.7)
	Quebec	7.2	(0.7)	499 *	(6.2)	7.2	(0.7)	494 *	(4.9)
	Ontario	7.5	(0.5)	475 *	(7.8)	7.5	(0.5)	490 *	(7.0)
	Manitoba	10.0	(0.7)	444 *	(9.7)	10.0	(0.7)	478 *	(10.0)
	Alberta	7.3	(0.7)	464 *	(7.4)	7.3	(0.7)	500 *	(9.0)
	International average	**8.2**	**(0.1)**	**451 ***	**(1.1)**	**8.2**	**(0.1)**	**437 ***	**(1.2)**

* Significant difference compared to the average score in the "About monthly" category.

TABLE B.2.14 Percentage of students and achievement scores by sense of confidence in subject area: MATHEMATICS and SCIENCE

Sense of confidence in subject area	Canada, provinces, and international average	Mathematics				Science			
		%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
Very confident	**Canada**	**32.0**	**(0.5)**	**555 ***	**(2.4)**	**34.9**	**(0.7)**	**540 ***	**(2.4)**
	Newfoundland and Labrador	33.2	(1.4)	516 *	(5.5)	46.7	(2.3)	531 *	(4.0)
	Quebec	38.7	(1.1)	568 *	(2.8)	35.6	(1.1)	537 *	(3.4)
	Ontario	29.1	(0.8)	558 *	(4.4)	31.8	(1.1)	541 *	(4.6)
	Manitoba	26.6	(1.1)	513 *	(4.0)	34.2	(1.5)	528 *	(4.1)
	Alberta	30.9	(1.1)	534 *	(5.0)	42.1	(1.6)	546 *	(4.0)
	International average	**32.1**	**(0.1)**	**545 ***	**(0.6)**	**37.5**	**(0.2)**	**520 ***	**(0.6)**
Somewhat confident	**Canada**	**44.5**	**(0.6)**	**506**	**(2.3)**	**45.7**	**(0.7)**	**523**	**(2.1)**
	Newfoundland and Labrador	43.0	(1.6)	472	(5.8)	41.2	(1.9)	518	(4.5)
	Quebec	44.0	(1.2)	521	(2.7)	46.9	(1.2)	519	(3.0)
	Ontario	44.7	(1.0)	509	(4.0)	46.1	(1.1)	527	(3.2)
	Manitoba	47.5	(1.2)	468	(3.4)	45.3	(1.3)	500	(3.7)
	Alberta	44.0	(1.1)	486	(4.5)	42.7	(1.2)	525	(4.4)
	International average	**44.5**	**(0.1)**	**497**	**(0.5)**	**43.4**	**(0.1)**	**486**	**(0.6)**
Not confident	**Canada**	**23.5**	**(0.6)**	**464 ***	**(2.2)**	**19.4**	**(0.7)**	**498 ***	**(2.5)**
	Newfoundland and Labrador	23.8	(1.8)	433 *	(5.8)	12.1	(1.1)	491 *	(6.7)
	Quebec	17.4	(0.9)	476 *	(3.4)	17.4	(1.0)	496 *	(3.5)
	Ontario	26.2	(0.9)	470 *	(3.6)	22.1	(1.1)	501 *	(4.0)
	Manitoba	25.8	(1.1)	428 *	(5.3)	20.5	(1.1)	474 *	(5.6)
	Alberta	25.0	(1.1)	444 *	(4.3)	15.2	(1.2)	501 *	(7.1)
	International average	**23.5**	**(0.1)**	**456 ***	**(0.6)**	**19.1**	**(0.1)**	**453 ***	**(0.7)**

* Significant difference compared to the average score in the "Somewhat confident" category.

TABLE B.3.1 Percentage of students and achievement scores by school socioeconomic composition: MATHEMATICS and SCIENCE

School socioeconomic composition	Canada, provinces, and international average	Mathematics				Science			
		%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
More affluent	**Canada**	**43.3**	**(2.5)**	**530**	**(3.0)**	**43.3**	**(2.5)**	**534**	**(2.8)**
	Newfoundland and Labrador	35.8	(7.8)	485	(5.7)	35.8	(7.8)	527	(6.6)
	Quebec	55.4	(4.6)	541	(2.8)	55.4	(4.6)	530	(2.7)
	Ontario	39.6	(3.8)	535	(5.6)	39.6	(3.8)	539	(5.3)
	Manitoba	31.4	(4.4)	490	(5.7)	31.4	(4.4)	522	(6.0)
	Alberta	36.3	(4.6)	497	(6.8)	36.3	(4.6)	533	(7.0)
	International average	**41.2**	**(0.5)**	**521**	**(1.3)**	**41.2**	**(0.5)**	**512**	**(1.3)**
Neither more affluent nor more disadvantaged	**Canada**	**34.8**	**(2.5)**	**505 ***	**(2.8)**	**34.8**	**(2.5)**	**523 ***	**(2.7)**
	Newfoundland and Labrador	48.6	(7.6)	475	(6.1)	48.6	(7.6)	519	(6.1)
	Quebec	28.8	(4.0)	520 *	(4.2)	28.8	(4.0)	514 *	(3.9)
	Ontario	34.6	(4.2)	510 *	(4.4)	34.6	(4.2)	526 *	(4.2)
	Manitoba	37.4	(4.4)	471 *	(5.3)	37.4	(4.4)	505	(5.9)
	Alberta	44.4	(4.8)	490	(5.6)	44.4	(4.8)	533	(5.0)
	International average	**33.8**	**(0.5)**	**499 ***	**(0.9)**	**33.8**	**(0.5)**	**489 ***	**(1.0)**
More disadvantaged	**Canada**	**21.9**	**(2.2)**	**486 ***	**(4.1)**	**21.9**	**(2.2)**	**502 ***	**(3.4)**
	Newfoundland and Labrador	U	(5.6)	460 *	(9.4)	U	(5.6)	505 *	(7.3)
	Quebec	15.8	(3.4)	523 *	(6.3)	15.8	(3.4)	510 *	(5.9)
	Ontario	25.8	(3.9)	478 *	(5.1)	25.8	(3.9)	497 *	(4.6)
	Manitoba	31.2	(4.8)	450 *	(7.4)	31.2	(4.8)	484 *	(6.4)
	Alberta	19.4	(3.7)	479	(8.9)	19.4	(3.7)	517	(8.0)
	International average	**25.0**	**(0.4)**	**479 ***	**(1.1)**	**25.0**	**(0.4)**	**467 ***	**(1.1)**

U Too unreliable to be published.
* Significant difference compared to the average score in the "More affluent" category.

TABLE B.3.2 Percentage of students and achievement scores by schools with students having language of the test as first language: MATHEMATICS and SCIENCE

Students having language of the test as first language	Canada, provinces, and international average	Mathematics				Science			
		%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
More than 90%	**Canada**	**43.0**	**(2.3)**	**517**	**(3.0)**	**43.0**	**(2.3)**	**529**	**(3.0)**
	Newfoundland and Labrador	90.5	(4.9)	479	(4.3)	90.5	(4.9)	522	(3.6)
	Quebec	60.3	(4.5)	530	(3.0)	60.3	(4.5)	523	(3.0)
	Ontario	33.9	(3.5)	522	(6.6)	33.9	(3.5)	537	(6.0)
	Manitoba	32.8	(3.8)	469	(7.7)	32.8	(3.8)	510	(8.3)
	Alberta	36.7	(3.5)	490	(4.8)	36.7	(3.5)	531	(4.9)
	International average	**62.6**	**(0.4)**	**506**	**(0.6)**	**62.6**	**(0.4)**	**498**	**(0.7)**
51 to 90%	**Canada**	**38.6**	**(2.8)**	**505** *	**(3.2)**	**38.6**	**(2.8)**	**521**	**(3.0)**
	Newfoundland and Labrador	U	(3.0)	481	(13.5)	U	(3.0)	523	(10.5)
	Quebec	24.5	(4.4)	533	(4.3)	24.5	(4.4)	522	(4.6)
	Ontario	45.5	(4.7)	505 *	(4.7)	45.5	(4.7)	519 *	(4.2)
	Manitoba	49.2	(3.8)	466	(4.2)	49.2	(3.8)	497	(3.7)
	Alberta	43.8	(4.5)	490	(7.4)	43.8	(4.5)	532	(6.9)
	International average	**18.0**	**(0.4)**	**501**	**(1.5)**	**18.0**	**(0.4)**	**493**	**(1.5)**
50% or less	**Canada**	**18.4**	**(2.1)**	**512**	**(4.6)**	**18.4**	**(2.1)**	**516** *	**(3.7)**
	Newfoundland and Labrador	U	(4.1)	436 ‡	(5.9)	U	(4.1)	482 ‡	(9.9)
	Quebec	15.2	(3.4)	539	(7.8)	15.2	(3.4)	520	(6.4)
	Ontario	20.6	(3.4)	510	(5.9)	20.6	(3.4)	514 *	(5.1)
	Manitoba	18.1	(3.7)	480	(5.9)	18.1	(3.7)	508	(5.4)
	Alberta	19.5	(3.2)	491	(9.8)	19.5	(3.2)	524	(9.1)
	International average	**19.3**	**(0.3)**	**486** *	**(1.5)**	**19.3**	**(0.3)**	**471** *	**(1.5)**

‡ There are fewer than 30 observations.
U Too unreliable to be published.
* Significant difference compared to the average score in the "More than 90%" category.

TABLE B.3.3 Percentage of students and achievement scores by school discipline: MATHEMATICS and SCIENCE

School discipline	Canada, provinces, and international average	Mathematics				Science			
		%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
Hardly any problems	**Canada**	**52.7**	**(2.9)**	**516**	**(2.4)**	**52.7**	**(2.9)**	**528**	**(2.3)**
	Newfoundland and Labrador	66.2	(8.1)	482	(5.1)	66.2	(8.1)	526	(4.2)
	Quebec	60.4	(4.4)	534	(3.2)	60.4	(4.4)	525	(2.8)
	Ontario	42.2	(5.3)	519	(5.5)	42.2	(5.3)	529	(4.5)
	Manitoba	52.5	(4.7)	481	(4.1)	52.5	(4.7)	514	(4.3)
	Alberta	68.5	(4.5)	495	(4.4)	68.5	(4.5)	534	(4.2)
	International average	**59.6**	**(0.5)**	**508**	**(0.7)**	**59.6**	**(0.5)**	**498**	**(0.8)**
Minor problems	**Canada**	**43.0**	**(3.0)**	**510**	**(4.7)**	**43.0**	**(3.0)**	**521**	**(3.6)**
	Newfoundland and Labrador	33.8	(8.1)	470	(6.7)	33.8	(8.1)	511	(6.4)
	Quebec	37.4	(4.4)	528	(3.6)	37.4	(4.4)	518	(4.0)
	Ontario	51.3	(5.5)	513	(7.8)	51.3	(5.5)	525	(5.6)
	Manitoba	44.5	(4.7)	460 *	(6.2)	44.5	(4.7)	495 *	(6.0)
	Alberta	29.4	(4.4)	482	(8.5)	29.4	(4.4)	522	(8.0)
	International average	**32.1**	**(0.5)**	**494 ***	**(0.9)**	**32.1**	**(0.5)**	**483 ***	**(1.0)**
Moderate to severe problems	**Canada**	**4.3**	**(1.0)**	**470 ***	**(9.4)**	**4.3**	**(1.0)**	**489 ***	**(9.6)**
	Newfoundland and Labrador	--	--	--	--	--	--	--	--
	Quebec	U	(0.8)	557 *	(4.5)	U	(0.8)	536	(11.4)
	Ontario	6.6	(2.0)	456 *	(9.9)	6.6	(2.0)	480 *	(10.2)
	Manitoba	U	(1.6)	416 *	(18.7)	U	(1.6)	454 *	(18.2)
	Alberta	2.2	(0.6)	457	(19.4)	2.2	(0.6)	502	(27.6)
	International average	**8.3**	**(0.3)**	**466 ***	**(1.8)**	**8.3**	**(0.3)**	**457 ***	**(1.9)**

U Too unreliable to be published.
* Significant difference compared to the average score in the "Hardly any problems" category.

TABLE B.3.4 Percentage of students and achievement scores by safe and orderly schools: MATHEMATICS and SCIENCE

Safe and orderly schools	Canada, provinces, and international average	Mathematics				Science			
		%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
Very safe and orderly	**Canada**	**47.8**	**(2.9)**	**515**	**(4.4)**	**48.8**	**(2.5)**	**532**	**(2.6)**
	Newfoundland and Labrador	69.2	(7.8)	480	(4.5)	69.9	(7.8)	525	(3.6)
	Quebec	31.2	(4.1)	537	(3.9)	30.0	(4.0)	527	(3.7)
	Ontario	48.5	(5.7)	522	(8.4)	51.8	(4.7)	536	(4.9)
	Manitoba	55.0	(3.8)	478	(4.0)	54.9	(4.0)	510	(3.9)
	Alberta	73.9	(3.6)	498	(4.8)	73.2	(3.8)	535	(4.5)
	International average	**60.8**	**(0.4)**	**507**	**(0.6)**	**61.4**	**(0.4)**	**497**	**(0.6)**
Somewhat and less than safe and orderly	**Canada**	**52.2**	**(2.9)**	**510**	**(3.4)**	**51.2**	**(2.5)**	**518 ***	**(2.7)**
	Newfoundland and Labrador	30.8	(7.8)	473	(10.3)	30.1	(7.8)	513	(8.8)
	Quebec	68.8	(4.1)	531	(2.9)	70.0	(4.0)	521	(3.1)
	Ontario	51.5	(5.7)	502	(6.4)	48.2	(4.7)	517 *	(4.7)
	Manitoba	45.0	(3.8)	462 *	(6.7)	45.1	(4.0)	497	(6.6)
	Alberta	26.1	(3.6)	477	(9.1)	26.8	(3.8)	515 *	(8.9)
	International average	**39.2**	**(0.4)**	**493 ***	**(0.9)**	**38.6**	**(0.4)**	**483 ***	**(0.9)**

* Significant difference compared to the average score in the "Very safe and orderly" category.

TABLE B.3.5 Percentage of students and achievement scores by instruction in subject area affected by shortage of resources: MATHEMATICS and SCIENCE

Shortage of resources	Canada, provinces, and international average	Mathematics				Science			
		%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
Not affected	**Canada**	**42.6**	**(2.4)**	**521**	**(2.9)**	**32.5**	**(2.1)**	**530**	**(3.3)**
	Newfoundland and Labrador	47.9	(8.1)	483	(5.8)	35.8	(9.4)	525	(6.5)
	Quebec	48.5	(4.2)	535	(3.3)	28.7	(3.7)	526	(3.4)
	Ontario	35.0	(4.4)	530	(6.5)	29.0	(3.9)	533	(6.6)
	Manitoba	46.3	(3.9)	478	(5.2)	36.3	(3.8)	511	(5.3)
	Alberta	52.7	(4.7)	495	(4.2)	48.7	(4.8)	534	(4.2)
	International average	**26.0**	**(0.4)**	**514**	**(1.3)**	**23.9**	**(0.4)**	**508**	**(1.4)**
Somewhat or a lot affected	**Canada**	**57.4**	**(2.4)**	**504 ***	**(2.5)**	**67.5**	**(2.1)**	**520 ***	**(2.1)**
	Newfoundland and Labrador	52.1	(8.1)	472	(5.3)	64.2	(9.4)	517	(4.9)
	Quebec	51.5	(4.2)	530	(3.6)	71.3	(3.7)	521	(3.2)
	Ontario	65.0	(4.4)	501 *	(3.8)	71.0	(3.9)	520	(3.2)
	Manitoba	53.7	(3.9)	462 *	(5.2)	63.7	(3.8)	499	(4.8)
	Alberta	47.3	(4.7)	485	(7.0)	51.3	(4.8)	526	(6.1)
	International average	**74.0**	**(0.4)**	**499 ***	**(0.5)**	**76.1**	**(0.4)**	**488 ***	**(0.6)**

* Significant difference compared to the average score in the "Not affected" category.

TABLE B.3.6 Percentage of students and achievement scores by science laboratory in school and assistance during science experiments: SCIENCE

Science laboratory and assistance	Canada, provinces, and international average	Science							
		Yes				No			
		%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
Science laboratory in school	**Canada**	**10.5**	**(1.1)**	**537**	**(7.1)**	**89.5**	**(1.1)**	**522 ***	**(1.9)**
	Newfoundland and Labrador	31.8	(5.7)	510	(7.2)	68.2	(5.7)	525	(4.3)
	Quebec	7.2	(2.1)	510	(9.1)	92.8	(2.1)	523	(2.7)
	Ontario	7.9	(1.4)	562	(14.7)	92.1	(1.4)	521 *	(3.0)
	Manitoba	11.4	(3.0)	502	(16.8)	88.6	(3.0)	504	(3.3)
	Alberta	22.3	(3.3)	536	(9.9)	77.7	(3.3)	528	(4.4)
	International average	**35.8**	**(0.4)**	**496**	**(1.3)**	**64.2**	**(0.4)**	**486 ***	**(0.9)**
Teacher assistance during science experiments	**Canada**	**19.7**	**(2.4)**	**528**	**(5.7)**	**80.3**	**(2.4)**	**522**	**(2.2)**
	Newfoundland and Labrador	U	(0.2)	511 ‡	(28.9)	99.7	(0.2)	520	(3.8)
	Quebec	33.2	(4.2)	524	(4.1)	66.8	(4.2)	521	(3.0)
	Ontario	U	(4.0)	534	(28.5)	90.9	(4.0)	523	(3.2)
	Manitoba	34.8	(3.9)	512	(4.4)	65.2	(3.9)	499 *	(4.9)
	Alberta	23.3	(3.8)	541	(7.2)	76.7	(3.8)	527	(4.7)
	International average	**35.1**	**(0.4)**	**491**	**(1.1)**	**64.9**	**(0.4)**	**491**	**(0.7)**

‡ There are fewer than 30 observations.
U Too unreliable to be published.
* Significant difference compared to the average score in the "Yes" category.

TABLE B.3.7 Percentage of students and achievement scores by availability of digital resources: MATHEMATICS and SCIENCE

Availability of digital resources	Canada, provinces, and international average	Mathematics							
		Yes				No			
		%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
Online learning management system	**Canada**	**61.5**	**(2.4)**	**514**	**(2.3)**	**38.5**	**(2.4)**	**507**	**(3.3)**
	Newfoundland and Labrador	61.1	(7.7)	482	(5.1)	38.9	(7.7)	471	(6.9)
	Quebec	65.8	(4.5)	531	(2.9)	34.2	(4.5)	533	(4.4)
	Ontario	55.6	(4.4)	519	(4.6)	44.4	(4.4)	503 *	(4.9)
	Manitoba	54.3	(4.7)	470	(5.5)	45.7	(4.7)	470	(4.5)
	Alberta	73.5	(3.9)	490	(4.6)	26.5	(3.9)	492	(7.2)
	International average	**63.6**	**(0.4)**	**505**	**(0.8)**	**36.4**	**(0.4)**	**493** *	**(1.1)**
Access to digital learning resources	**Canada**	**89.4**	**(1.6)**	**512**	**(2.0)**	**10.6**	**(1.6)**	**506**	**(7.1)**
	Newfoundland and Labrador	83.0	(6.2)	480	(4.1)	U	(6.2)	465	(13.5)
	Quebec	84.9	(3.1)	532	(2.5)	15.1	(3.1)	531	(7.4)
	Ontario	92.5	(2.3)	513	(3.5)	7.5	(2.3)	494	(14.4)
	Manitoba	91.5	(2.4)	471	(3.8)	8.5	(2.4)	459	(12.5)
	Alberta	88.3	(2.9)	491	(4.6)	11.7	(2.9)	487	(8.1)
	International average	**75.4**	**(0.4)**	**503**	**(0.6)**	**24.6**	**(0.4)**	**497** *	**(1.3)**

Availability of digital resources	Canada, provinces, and international average	Science							
		Yes				No			
		%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
Online learning management system	**Canada**	**61.5**	**(2.4)**	**525**	**(2.2)**	**38.5**	**(2.4)**	**520**	**(3.0)**
	Newfoundland and Labrador	61.1	(7.7)	525	(4.3)	38.9	(7.7)	513	(5.9)
	Quebec	65.8	(4.5)	521	(2.5)	34.2	(4.5)	524	(4.8)
	Ontario	55.6	(4.4)	528	(4.2)	44.4	(4.4)	519	(4.7)
	Manitoba	54.3	(4.7)	504	(5.4)	45.7	(4.7)	503	(4.7)
	Alberta	73.5	(3.9)	530	(4.5)	26.5	(3.9)	528	(6.4)
	International average	**63.6**	**(0.4)**	**495**	**(1.0)**	**36.4**	**(0.4)**	**483** *	**(1.2)**
Access to digital learning resources	**Canada**	**89.4**	**(1.6)**	**524**	**(2.0)**	**10.6**	**(1.6)**	**515**	**(6.2)**
	Newfoundland and Labrador	83.0	(6.2)	522	(3.3)	U	(6.2)	512	(14.1)
	Quebec	84.9	(3.1)	522	(2.5)	15.1	(3.1)	522	(7.5)
	Ontario	92.5	(2.3)	526	(3.3)	7.5	(2.3)	505	(13.9)
	Manitoba	91.5	(2.4)	505	(3.8)	8.5	(2.4)	490	(13.9)
	Alberta	88.3	(2.9)	530	(4.4)	11.7	(2.9)	527	(7.1)
	International average	**75.4**	**(0.4)**	**493**	**(0.8)**	**24.6**	**(0.4)**	**486** *	**(1.2)**

U Too unreliable to be published.
* Significant difference compared to the average score in the "Yes" category.

TABLE B.3.8 Percentage of students by teacher characteristics: MATHEMATICS and SCIENCE

Teacher characteristics	Canada, provinces, and international average	Mathematics						Science					
		Female		Male		I identify another way or I prefer not to say		Female		Male		I identify another way or I prefer not to say	
		%	Standard error	%	Standard error	%	Standard error	%	Standard error	%	Standard error	%	Standard error
Sex	**Canada**	**84.1**	**(1.8)**	**14.3**	**(1.6)**	**U**	**(0.8)**	**82.5**	**(1.9)**	**15.7**	**(1.7)**	**U**	**(1.0)**
	Newfoundland and Labrador	89.9	(3.9)	U	(3.8)	U‡	(0.8)	89.9	(3.9)	U	(3.8)	U‡	(0.8)
	Quebec	93.3	(2.2)	6.7	(2.2)	--	--	91.1	(2.5)	7.6	(2.3)	U	(0.9)
	Ontario	77.6	(3.4)	19.3	(3.0)	U	(1.7)	76.3	(3.6)	21.0	(3.0)	U	(2.0)
	Manitoba	83.3	(3.0)	16.6	(3.0)	0.1‡	(0.0)	83.2	(3.0)	16.8	(3.0)	--	--
	Alberta	84.4	(3.1)	14.6	(3.0)	U‡	(0.7)	81.5	(3.6)	17.5	(3.5)	U‡	(0.7)
	International average	**81.8**	**(0.4)**	**18.2**	**(0.4)**	**--**	**--**	**81.7**	**(0.4)**	**18.3**	**(0.4)**	**--**	**--**

	Canada, provinces, and international average	Mathematics								Science							
		Under 30		30-39		40-49		50 or older		Under 30		30-39		40-49		50 or older	
		%	Standard error	%	Standard error	%	Standard error	%	Standard error	%	Standard error	%	Standard error	%	Standard error	%	Standard error
Age	**Canada**	**13.0**	**(1.7)**	**26.7**	**(2.1)**	**37.4**	**(3.1)**	**22.9**	**(2.4)**	**17.9**	**(2.8)**	**28.0**	**(2.4)**	**34.3**	**(3.0)**	**19.9**	**(2.0)**
	Newfoundland and Labrador	U	(3.3)	28.5	(6.5)	41.1	(8.5)	25.2	(7.1)	U	(3.3)	27.7	(6.5)	42.4	(8.5)	24.6	(7.1)
	Quebec	15.9	(3.8)	21.7	(3.2)	40.9	(4.1)	21.4	(3.3)	23.0	(4.4)	22.8	(3.5)	32.7	(4.0)	21.5	(3.4)
	Ontario	9.5	(2.4)	30.8	(3.7)	37.7	(5.5)	22.1	(4.3)	U	(5.2)	32.3	(3.8)	37.1	(5.4)	16.3	(3.1)
	Manitoba	16.6	(2.8)	35.4	(4.6)	26.5	(3.3)	21.5	(3.5)	17.5	(3.2)	36.0	(4.6)	26.0	(3.3)	20.4	(3.4)
	Alberta	17.1	(3.8)	21.4	(4.0)	33.2	(4.8)	28.3	(3.7)	18.8	(4.1)	23.9	(4.0)	31.7	(4.8)	25.6	(3.4)
	International average	**14.1**	**(0.3)**	**25.9**	**(0.4)**	**31.6**	**(0.4)**	**28.5**	**(0.4)**	**14.3**	**(0.3)**	**26.7**	**(0.4)**	**30.7**	**(0.5)**	**28.4**	**(0.4)**

	Canada, provinces, and international average	Mathematics				Science			
		Bachelor's or less		Master's or Doctoral		Bachelor's or less		Master's or Doctoral	
		%	Standard error	%	Standard error	%	Standard error	%	Standard error
Degree	**Canada**	**80.5**	**(2.0)**	**19.5**	**(2.0)**	**83.8**	**(2.5)**	**16.2**	**(2.5)**
	Newfoundland and Labrador	30.6	(7.2)	69.4	(7.2)	30.7	(7.2)	69.3	(7.2)
	Quebec	91.1	(2.6)	8.9	(2.6)	92.4	(2.4)	7.6	(2.4)
	Ontario	72.8	(3.8)	27.2	(3.8)	77.8	(5.0)	22.2	(5.0)
	Manitoba	93.6	(2.1)	6.4	(2.1)	93.5	(2.1)	6.5	(2.1)
	Alberta	83.6	(3.0)	16.4	(3.0)	86.3	(3.2)	13.7	(3.2)
	International average	**71.5**	**(0.4)**	**28.5**	**(0.4)**	**70.9**	**(0.4)**	**29.1**	**(0.4)**

‡ There are fewer than 30 observations.
U Too unreliable to be published.

TABLE B.3.9 Percentage of students and achievement scores by teachers' degree: MATHEMATICS and SCIENCE

Canada, provinces, and international average	Mathematics				Science			
	Major in primary education and major in mathematics				Major in primary education and major in science			
	%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
Canada	**10.7**	**(1.4)**	**509**	**(5.5)**	**12.9**	**(1.8)**	**530**	**(5.7)**
Newfoundland and Labrador	U	(4.5)	481	(6.0)	25.6	(7.1)	518	(7.6)
Quebec	9.0	(1.9)	522	(6.8)	5.7	(1.4)	522	(6.1)
Ontario	12.4	(2.7)	514	(8.9)	18.1	(3.7)	532	(8.3)
Manitoba	18.6	(3.1)	479	(8.1)	12.4	(2.8)	509	(11.5)
Alberta	U	(2.3)	487	(16.2)	12.1	(2.7)	540	(12.4)
International average	**33.3**	**(0.5)**	**497**	**(1.1)**	**29.4**	**(0.5)**	**489**	**(1.3)**

	Major in primary education but no major in mathematics				Major in primary education but no major in science			
	%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
Canada	**74.4**	**(1.9)**	**515**	**(2.4)**	**68.8**	**(2.6)**	**525**	**(2.4)**
Newfoundland and Labrador	80.1	(5.9)	479	(5.0)	66.8	(7.5)	525	(4.3)
Quebec	82.1	(2.7)	534	(2.6)	83.5	(3.1)	523	(2.8)
Ontario	70.2	(3.3)	515	(4.8)	58.2	(4.6)	527	(5.2)
Manitoba	61.4	(4.2)	470	(4.0)	68.5	(3.6)	507	(3.7)
Alberta	75.5	(4.3)	494	(4.7)	68.8	(4.8)	531	(4.7)
International average	**44.4**	**(0.5)**	**503**	**(1.4)**	**46.2**	**(0.5)**	**491**	**(1.2)**

	Major in mathematics but no major in primary education				Major in science but no major in primary education			
	%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
Canada	**U**	**(0.9)**	**501**	**(11.3)**	**6.4**	**(2.1)**	**526**	**(9.6)**
Newfoundland and Labrador	U	(3.5)	481	(13.0)	U	(3.5)	513	(9.2)
Quebec	U	(0.8)	562 *	(14.4)	U	(1.7)	519	(12.5)
Ontario	U	(1.8)	496 *	(7.7)	U	(4.3)	534	(14.4)
Manitoba	U	(0.7)	478 ‡	(27.2)	U	(2.4)	493	(13.7)
Alberta	U	(1.7)	468	(18.3)	U	(3.0)	521	(15.6)
International average	**12.5**	**(0.4)**	**487**	**(2.6)**	**14.5**	**(0.4)**	**480**	**(2.5)**

	All other majors				All other majors			
	%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
Canada	**12.6**	**(1.4)**	**504 ***	**(4.3)**	**11.8**	**(1.5)**	**520**	**(3.7)**
Newfoundland and Labrador	U	(1.3)	446 *	(12.4)	U	(1.2)	496	(17.2)
Quebec	7.5	(2.1)	535	(5.1)	7.5	(2.2)	528	(7.3)
Ontario	14.9	(2.6)	504	(6.0)	15.4	(2.9)	519	(5.4)
Manitoba	18.8	(3.2)	462	(12.4)	14.0	(2.7)	494	(16.0)
Alberta	14.9	(3.6)	495	(11.5)	10.9	(3.0)	525	(10.5)
International average	**9.8**	**(0.3)**	**490 ***	**(2.7)**	**9.9**	**(0.3)**	**478**	**(2.4)**

‡ There are fewer than 30 observations.
U Too unreliable to be published.
* Significant difference compared to the average score in the "Major in primary education but no major in mathematics" category.

TABLE B.3.10 Percentage of students and achievement scores by years of teachers' experience: MATHEMATICS and SCIENCE

Years of teachers' experience	Canada, provinces, and international average	Mathematics				Science			
		%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
Less than 5 years	**Canada**	**13.0**	**(1.7)**	**508**	**(4.2)**	**15.8**	**(2.6)**	**526**	**(8.0)**
	Newfoundland and Labrador	U	(2.9)	483 ‡	(31.7)	U	(2.9)	529 ‡	(15.5)
	Quebec	12.9	(3.0)	532	(6.9)	16.7	(3.5)	517	(5.2)
	Ontario	10.7	(2.6)	508	(9.6)	U	(5.1)	537	(20.6)
	Manitoba	23.4	(3.5)	467	(6.7)	21.4	(3.5)	496	(6.9)
	Alberta	17.3	(4.1)	492	(7.0)	19.0	(4.4)	531	(4.7)
	International average	**14.3**	**(0.4)**	**494** *	**(1.3)**	**14.9**	**(0.4)**	**485** *	**(1.4)**
5 to 9 years	**Canada**	**17.4**	**(1.9)**	**513**	**(4.6)**	**19.0**	**(2.0)**	**526**	**(3.9)**
	Newfoundland and Labrador	U	(3.7)	493	(12.1)	U	(3.7)	532	(10.0)
	Quebec	13.9	(3.1)	534	(5.6)	18.9	(3.5)	530	(4.4)
	Ontario	20.3	(3.3)	519	(6.7)	20.0	(3.4)	530	(6.9)
	Manitoba	19.9	(3.3)	463	(5.2)	20.9	(3.7)	497	(5.5)
	Alberta	15.4	(3.0)	477 *	(9.9)	16.5	(3.5)	518	(9.9)
	International average	**15.5**	**(0.4)**	**500**	**(1.2)**	**16.7**	**(0.4)**	**492**	**(1.3)**
10 to 19 years	**Canada**	**39.1**	**(2.7)**	**513**	**(5.4)**	**38.9**	**(2.8)**	**525**	**(3.2)**
	Newfoundland and Labrador	38.3	(6.4)	474	(6.8)	38.1	(6.4)	519	(6.5)
	Quebec	37.2	(4.5)	532	(3.8)	31.8	(4.5)	521	(4.9)
	Ontario	42.5	(5.5)	512	(10.4)	46.2	(5.8)	526	(4.8)
	Manitoba	33.5	(3.9)	473	(5.8)	33.9	(4.0)	508	(5.5)
	Alberta	34.9	(4.8)	496	(6.2)	34.6	(4.9)	535	(6.9)
	International average	**29.0**	**(0.5)**	**504**	**(1.2)**	**28.6**	**(0.4)**	**492**	**(1.2)**
20 years or more	**Canada**	**30.5**	**(2.8)**	**513**	**(4.1)**	**26.3**	**(2.4)**	**522**	**(2.9)**
	Newfoundland and Labrador	48.3	(7.2)	478	(5.9)	48.4	(7.2)	521	(4.6)
	Quebec	36.0	(4.6)	533	(2.8)	32.5	(4.5)	524	(3.2)
	Ontario	26.4	(4.5)	508	(9.6)	19.9	(3.3)	518	(6.7)
	Manitoba	23.3	(3.9)	477	(10.4)	23.7	(4.0)	513	(9.5)
	Alberta	32.3	(4.4)	496	(8.3)	29.8	(4.6)	530	(7.4)
	International average	**41.2**	**(0.5)**	**503**	**(0.9)**	**39.9**	**(0.5)**	**492**	**(1.1)**

	Canada, provinces, and international average	Mathematics		Science	
		Average	Standard error	%	Standard error
Years of experience	**Canada**	**15**	**(0.4)**	**14**	**(0.6)**
	Newfoundland and Labrador	18	(1.1)	18	(1.1)
	Quebec	16	(0.8)	14	(0.8)
	Ontario	15	(0.6)	14	(0.9)
	Manitoba	13	(0.8)	13	(0.8)
	Alberta	15	(0.9)	15	(1.0)
	International average	**17**	**(0.1)**	**17**	**(0.1)**

‡ There are fewer than 30 observations.
U Too unreliable to be published.
* Signficant difference compared to the average score in the "10 to 19 years" category.

TABLE B.3.11 **Percentage of students by teachers' participation in professional development over past 2 years and teachers' need for future professional development: MATHEMATICS**

Professional development	Canada, provinces, and international average	Mathematics											
		Math content		Math pedagogy		Math curriculum		Integrating technology		Problem-solving skills		Math assessment		Student needs	
		%	Standard error	%	Standard error	%	Standard error	%	Standard error	%	Standard error	%	Standard error	%	Standard error
Participation in professional development over past 2 years															
	Canada	**62.3**	**(2.1)**	**67.5**	**(1.8)**	**47.0**	**(2.8)**	**37.2**	**(3.0)**	**58.4**	**(2.1)**	**51.9**	**(2.9)**	**52.0**	**(2.1)**
	Newfoundland and Labrador	23.8	(6.0)	31.3	(6.7)	19.2	(4.8)	24.9	(5.1)	21.4	(5.8)	17.8	(5.3)	31.6	(7.9)
	Quebec	38.2	(4.0)	50.0	(4.5)	19.9	(3.3)	22.3	(4.0)	33.9	(4.4)	44.0	(4.2)	26.6	(3.9)
	Ontario	81.0	(2.6)	81.3	(2.4)	65.5	(5.1)	48.6	(5.5)	76.5	(3.3)	61.4	(5.4)	68.0	(3.7)
	Manitoba	61.5	(4.1)	67.1	(3.9)	49.5	(3.5)	36.6	(4.2)	61.7	(4.2)	43.2	(4.0)	48.4	(4.1)
	Alberta	59.8	(5.1)	66.4	(4.5)	48.5	(4.9)	34.6	(5.0)	57.0	(4.2)	46.3	(4.9)	59.3	(4.6)
	International average	**45.6**	**(0.5)**	**45.0**	**(0.5)**	**41.4**	**(0.5)**	**34.6**	**(0.4)**	**43.5**	**(0.5)**	**36.9**	**(0.4)**	**42.7**	**(0.5)**
Need for future professional development															
	Canada	**31.9**	**(2.4)**	**49.8**	**(3.0)**	**32.2**	**(2.3)**	**74.6**	**(2.4)**	**63.6**	**(2.4)**	**49.9**	**(3.0)**	**56.1**	**(2.5)**
	Newfoundland and Labrador	32.3	(8.4)	43.9	(8.1)	30.5	(6.2)	78.2	(6.9)	77.3	(5.9)	62.8	(7.3)	62.0	(6.8)
	Quebec	14.7	(2.7)	45.0	(4.1)	12.3	(2.8)	72.3	(4.0)	55.7	(4.6)	34.2	(3.9)	48.2	(4.2)
	Ontario	37.7	(4.2)	48.6	(5.9)	38.3	(4.0)	78.8	(3.7)	60.9	(4.4)	54.6	(5.6)	55.6	(4.6)
	Manitoba	41.3	(4.3)	53.7	(4.2)	35.2	(4.1)	68.8	(3.7)	72.6	(3.6)	57.4	(4.4)	64.8	(3.9)
	Alberta	44.8	(4.7)	61.7	(5.1)	52.5	(5.3)	68.7	(4.5)	81.9	(4.0)	62.7	(4.8)	69.5	(4.6)
	International average	**45.2**	**(0.5)**	**54.8**	**(0.5)**	**44.0**	**(0.5)**	**72.5**	**(0.5)**	**68.8**	**(0.5)**	**53.7**	**(0.5)**	**63.6**	**(0.5)**

TABLE B.3.12 Percentage of students by teachers' participation in professional development over past 2 years and teachers' need for future professional development: SCIENCE

Professional development	Canada, provinces, and international average	Science															
		Science content		Science pedagogy		Science curriculum		Integrating technology		Student critical thinking skills		Science assessment		Student needs		Integrating science subjects	
		%	Standard error	%	Standard error	%	Standard error	%	Standard error	%	Standard error	%	Standard error	%	Standard error	%	Standard error
Participation in professional development over past 2 years																	
	Canada	**15.5**	**(1.7)**	**13.6**	**(1.8)**	**15.2**	**(1.5)**	**18.0**	**(1.7)**	**24.5**	**(2.4)**	**9.1**	**(1.7)**	**22.7**	**(2.2)**	**19.8**	**(2.0)**
	Newfoundland and Labrador	47.0	(8.1)	48.2	(7.8)	52.0	(8.7)	28.8	(6.6)	35.3	(7.0)	25.8	(5.1)	26.5	(6.4)	24.1	(6.0)
	Quebec	18.5	(3.4)	16.8	(3.6)	U	(1.6)	12.4	(3.0)	U	(1.7)	U	(2.4)	U	(1.6)	9.2	(2.8)
	Ontario	9.6	(2.7)	8.8	(2.4)	19.0	(3.1)	20.6	(3.3)	34.8	(4.9)	U	(3.2)	34.0	(4.4)	23.0	(3.6)
	Manitoba	8.3	(2.5)	10.6	(2.9)	U	(2.8)	12.7	(3.2)	27.4	(4.0)	U	(1.8)	15.9	(3.1)	17.9	(3.4)
	Alberta	25.2	(4.3)	17.4	(3.7)	26.6	(4.3)	22.3	(4.3)	32.0	(4.4)	14.0	(3.1)	28.6	(4.7)	31.6	(4.8)
	International average	**34.9**	**(0.4)**	**32.6**	**(0.4)**	**33.9**	**(0.4)**	**31.8**	**(0.4)**	**36.3**	**(0.5)**	**28.4**	**(0.4)**	**33.4**	**(0.5)**	**31.3**	**(0.5)**
Need for future professional development																	
	Canada	**49.6**	**(2.5)**	**56.3**	**(2.9)**	**41.5**	**(2.4)**	**70.4**	**(2.0)**	**61.5**	**(2.8)**	**50.3**	**(2.4)**	**47.9**	**(3.2)**	**61.9**	**(2.2)**
	Newfoundland and Labrador	39.1	(7.9)	46.5	(7.6)	42.9	(7.6)	73.4	(7.3)	64.6	(8.3)	51.1	(7.3)	52.1	(7.5)	59.4	(6.9)
	Quebec	52.4	(4.8)	58.7	(4.4)	39.0	(4.5)	65.5	(4.3)	56.6	(4.5)	52.6	(5.0)	45.4	(4.9)	61.3	(4.6)
	Ontario	49.4	(4.7)	57.7	(5.9)	38.2	(4.3)	75.5	(2.9)	63.5	(5.4)	50.1	(4.6)	49.9	(6.3)	62.8	(4.3)
	Manitoba	36.0	(3.8)	45.1	(4.3)	35.9	(4.0)	77.5	(3.5)	71.0	(4.2)	48.6	(4.7)	48.1	(4.5)	63.3	(4.0)
	Alberta	50.9	(5.2)	53.2	(4.6)	56.5	(5.1)	63.0	(5.1)	62.0	(4.8)	46.9	(5.0)	46.5	(4.8)	60.2	(5.2)
	International average	**53.6**	**(0.5)**	**56.9**	**(0.5)**	**48.7**	**(0.5)**	**68.5**	**(0.5)**	**64.9**	**(0.5)**	**54.0**	**(0.5)**	**57.4**	**(0.5)**	**62.0**	**(0.5)**

U Too unreliable to be published.

TABLE B.3.13 Achievement scores by teachers' participation in professional development over past 2 years and teachers' need for future professional development: MATHEMATICS

Canada, provinces, and international average	Mathematics																			
	Math content				Math pedagogy				Math curriculum				Integrating technology				Problem-solving skills				Math assessment				Student needs			
	Yes		No		Yes		No		Yes		No		Yes		No		Yes		No		Yes		No		Yes		No	
	Average	Standard error	Average	Standard error	Average	Standard error	Average	Standard error	Average	Standard error	Average	Standard error	Average	Standard error	Average	Standard error	Average	Standard error	Average	Standard error	Average	Standard error	Average	Standard error	Average	Standard error	Average	Standard error
Participation in professional development over past 2 years																												
Canada	**509**	**(2.9)**	**517***	**(2.3)**	**511**	**(2.7)**	**514**	**(3.0)**	**507**	**(5.1)**	**517**	**(2.6)**	**511**	**(6.0)**	**513**	**(2.6)**	**510**	**(3.0)**	**516**	**(2.5)**	**514**	**(4.4)**	**511**	**(3.0)**	**511**	**(3.5)**	**514**	**(2.2)**
Newfoundland and Labrador	476	(8.8)	479	(4.9)	479	(7.7)	478	(5.1)	491	(10.1)	475	(4.5)	479	(5.5)	478	(5.4)	481	(8.5)	477	(4.7)	490	(11.3)	476	(4.5)	476	(8.5)	479	(5.1)
Quebec	531	(3.7)	533	(2.7)	531	(3.2)	534	(2.9)	527	(4.8)	534	(2.6)	535	(4.5)	532	(2.6)	529	(3.5)	534	(2.9)	534	(2.8)	531	(2.9)	529	(4.8)	533	(2.2)
Ontario	511	(4.4)	516	(5.6)	512	(4.4)	512	(7.4)	509	(7.5)	518	(6.6)	510	(9.7)	514	(5.5)	511	(4.4)	516	(6.4)	511	(7.8)	513	(6.6)	514	(5.1)	508	(4.9)
Manitoba	470	(4.9)	471	(4.7)	472	(4.4)	467	(5.8)	470	(5.5)	471	(4.4)	468	(6.5)	472	(4.3)	477	(4.6)	460*	(5.6)	476	(6.3)	467	(4.3)	472	(5.6)	469	(4.8)
Alberta	490	(6.3)	495	(5.0)	495	(5.6)	486	(5.9)	498	(5.9)	487	(5.8)	500	(7.5)	488	(4.3)	495	(6.4)	488	(5.1)	501	(6.2)	485*	(4.9)	496	(6.4)	488	(4.5)
International average	**502**	**(0.8)**	**502**	**(0.7)**	**502**	**(0.8)**	**502**	**(0.7)**	**502**	**(0.9)**	**501**	**(0.8)**	**502**	**(1.0)**	**501**	**(0.6)**	**502**	**(0.8)**	**501**	**(0.7)**	**501**	**(0.9)**	**501**	**(0.6)**	**501**	**(0.8)**	**501**	**(0.7)**
Need for Future Professional Development																												
Canada	**507**	**(3.7)**	**515**	**(2.5)**	**515**	**(3.0)**	**511**	**(4.6)**	**504**	**(3.5)**	**517***	**(2.5)**	**514**	**(2.5)**	**509**	**(4.5)**	**514**	**(2.7)**	**510**	**(3.2)**	**510**	**(3.3)**	**516**	**(4.5)**	**515**	**(2.8)**	**510**	**(2.9)**
Newfoundland and Labrador	474	(9.1)	480	(5.3)	475	(7.3)	480	(5.4)	483	(7.8)	476	(5.4)	481	(5.2)	467	(8.2)	478	(4.9)	480	(8.4)	478	(5.9)	478	(6.0)	480	(5.8)	475	(7.0)
Quebec	535	(5.8)	533	(2.5)	534	(3.8)	533	(2.7)	530	(6.7)	533	(2.4)	533	(2.8)	533	(4.3)	533	(3.2)	533	(3.2)	537	(4.1)	531	(2.6)	534	(3.5)	532	(2.4)
Ontario	513	(5.6)	512	(5.0)	517	(5.7)	508	(9.5)	509	(5.3)	515	(5.3)	515	(4.6)	505	(7.5)	522	(4.9)	498*	(5.0)	512	(5.5)	514	(10.1)	520	(5.5)	504*	(4.6)
Manitoba	462	(6.4)	476	(4.0)	472	(4.8)	469	(5.5)	465	(5.9)	473	(4.5)	472	(4.1)	468	(7.0)	472	(4.1)	466	(8.0)	470	(4.3)	471	(6.3)	472	(4.5)	470	(6.1)
Alberta	491	(6.1)	493	(6.2)	498	(5.1)	482*	(6.2)	491	(5.6)	494	(6.7)	492	(5.4)	493	(8.5)	492	(5.3)	494	(6.7)	494	(4.9)	489	(6.8)	495	(4.6)	485	(8.2)
International average	**499**	**(0.8)**	**503***	**(0.9)**	**499**	**(0.7)**	**502***	**(0.8)**	**499**	**(0.8)**	**503***	**(0.8)**	**501**	**(0.6)**	**499**	**(1.0)**	**500**	**(0.6)**	**501**	**(1.0)**	**499**	**(0.7)**	**502***	**(0.9)**	**500**	**(0.6)**	**502**	**(0.9)**

* Significant difference between the average score of "Yes" and "No".

TABLE B.3.14 Achievement scores by teachers' participation in professional development over past 2 years and teachers' need for future professional development: SCIENCE

Canada, provinces, and international average	Science																					
	Science content				Science pedagogy				Science curriculum				Integrating technology				Student critical thinking skills				Science assessment			
	Yes		No		Yes		No		Yes		No		Yes		No		Yes		No		Yes		No	
	Average	Standard error	Average	Standard error	Average	Standard error	Average	Standard error	Average	Standard error	Average	Standard error	Average	Standard error	Average	Standard error	Average	Standard error	Average	Standard error	Average	Standard error	Average	Standard error
Participation in professional development over past 2 years																								
Canada	**525**	**(4.0)**	**524**	**(2.3)**	**522**	**(3.4)**	**525**	**(2.2)**	**539**	**(6.4)**	**522***	**(1.9)**	**537**	**(6.6)**	**522***	**(2.0)**	**529**	**(3.7)**	**523**	**(2.1)**	**537**	**(9.1)**	**523**	**(2.0)**
Newfoundland and Labrador	527	(6.5)	517	(5.5)	524	(6.4)	520	(5.5)	524	(6.1)	519	(5.9)	524	(6.8)	521	(4.7)	529	(6.3)	518	(4.7)	526	(10.4)	520	(3.9)
Quebec	528	(4.5)	521	(2.7)	528	(5.0)	521	(2.7)	526	(11.0)	522	(2.6)	527	(7.5)	522	(2.6)	526	(8.9)	522	(2.6)	527	(6.9)	522	(2.5)
Ontario	522	(8.5)	527	(4.0)	523	(9.0)	527	(3.9)	545	(10.6)	522*	(3.6)	543	(10.2)	522*	(3.6)	530	(5.3)	524	(4.3)	543	(20.0)	525	(3.5)
Manitoba	485	(21.1)	506	(3.6)	504	(10.8)	504	(4.1)	493	(19.9)	505	(3.4)	518	(8.7)	502	(4.0)	518	(5.8)	499*	(4.5)	528	(9.8)	503*	(3.8)
Alberta	529	(8.4)	532	(3.8)	516	(8.5)	534	(4.2)	539	(7.7)	528	(3.9)	538	(10.4)	529	(4.0)	532	(5.0)	531	(5.1)	538	(8.4)	530	(4.1)
International average	**493**	**(0.9)**	**488***	**(0.7)**	**492**	**(0.9)**	**490**	**(0.7)**	**491**	**(1.1)**	**490**	**(0.7)**	**492**	**(1.0)**	**490***	**(0.7)**	**491**	**(0.9)**	**489**	**(0.8)**	**491**	**(1.1)**	**490**	**(0.7)**
Need for future professional development																								
Canada	**525**	**(2.9)**	**525**	**(2.4)**	**526**	**(3.2)**	**524**	**(3.1)**	**524**	**(2.4)**	**526**	**(2.7)**	**524**	**(2.4)**	**527**	**(3.1)**	**525**	**(3.0)**	**525**	**(3.2)**	**524**	**(3.0)**	**526**	**(2.6)**
Newfoundland and Labrador	527	(5.1)	519	(5.6)	527	(4.4)	518	(6.3)	525	(5.9)	518	(5.4)	523	(5.2)	520	(4.7)	524	(5.7)	517	(5.4)	527	(5.5)	516	(6.1)
Quebec	523	(3.2)	522	(3.3)	523	(3.0)	522	(3.5)	525	(3.4)	521	(3.4)	523	(2.6)	522	(4.5)	523	(2.5)	522	(4.2)	523	(3.1)	522	(3.6)
Ontario	528	(5.8)	525	(4.1)	529	(6.4)	523	(5.5)	521	(5.0)	530	(4.9)	526	(4.5)	528	(5.9)	528	(5.9)	524	(5.9)	528	(5.7)	525	(4.5)
Manitoba	497	(5.1)	511*	(3.8)	501	(4.0)	512	(4.8)	499	(5.7)	510	(4.2)	505	(3.7)	510	(6.7)	503	(4.2)	512	(5.8)	498	(4.2)	514*	(4.2)
Alberta	529	(5.2)	534	(4.5)	527	(4.9)	536	(5.0)	531	(5.2)	532	(4.7)	528	(4.8)	537	(5.2)	528	(4.9)	536	(5.3)	522	(4.8)	539*	(5.8)
International average	**488**	**(0.8)**	**492***	**(1.0)**	**489**	**(0.8)**	**492***	**(0.9)**	**488**	**(0.9)**	**493***	**(1.1)**	**490**	**(0.7)**	**491**	**(1.1)**	**490**	**(0.7)**	**491**	**(1.0)**	**489**	**(0.8)**	**493***	**(1.1)**

Canada, provinces, and international average	Science																					
	Student needs				Integrating science subjects																	
	Yes		No		Yes		No															
	Average	Standard error	Average	Standard error	Average	Standard error	Average	Standard error														
Participation in professional development over past 2 years																						
Canada	**531**	**(4.5)**	**523**	**(2.0)**	**533**	**(5.7)**	**522**	**(2.0)**														
Newfoundland and Labrador	533	(8.1)	518	(4.5)	537	(8.8)	517*	(4.1)														
Quebec	511	(13.5)	523	(2.5)	522	(8.6)	523	(2.6)														
Ontario	532	(6.5)	523	(4.0)	538	(9.7)	523	(3.7)														
Manitoba	519	(8.7)	502	(4.0)	517	(6.4)	502	(4.2)														
Alberta	533	(5.9)	530	(4.6)	532	(7.0)	531	(4.0)														
International average	**491**	**(1.0)**	**490**	**(0.7)**	**491**	**(1.0)**	**490**	**(0.7)**														
Need for future professional development																						
Canada	**524**	**(3.6)**	**525**	**(2.9)**	**524**	**(2.5)**	**525**	**(2.9)**														
Newfoundland and Labrador	524	(5.6)	520	(5.8)	526	(4.9)	516	(6.1)														
Quebec	523	(3.1)	523	(3.5)	524	(2.7)	521	(4.4)														
Ontario	530	(6.9)	523	(5.2)	527	(4.8)	526	(5.2)														
Manitoba	502	(4.9)	509	(3.9)	501	(4.3)	513	(5.5)														
Alberta	522	(5.0)	539*	(5.6)	528	(5.7)	536	(5.2)														
International average	**488**	**(0.7)**	**492***	**(1.1)**	**489**	**(0.7)**	**492***	**(1.1)**														

* Significant difference between the average score of "Yes" and "No".

TABLE B.3.15 Percentage of students and achievement scores by teachers' professional development hours per year: MATHEMATICS and SCIENCE

Teachers' professional development hours per year	Canada, provinces, and international average	Mathematics				Science			
		%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
None	**Canada**	**12.1**	**(1.5)**	**515**	**(4.7)**	**60.3**	**(3.2)**	**521**	**(2.5)**
	Newfoundland and Labrador	38.1	(6.5)	479	(6.1)	41.8	(8.7)	519	(6.6)
	Quebec	23.6	(3.4)	530	(4.8)	71.4	(4.3)	522	(2.8)
	Ontario	U	(1.1)	513	(12.5)	60.4	(6.1)	523	(4.3)
	Manitoba	13.9	(3.0)	474	(11.3)	61.5	(4.1)	501	(3.9)
	Alberta	11.9	(3.6)	489	(9.6)	40.3	(4.9)	525	(4.7)
	International average	**24.4**	**(0.4)**	**500**	**(1.3)**	**37.0**	**(0.5)**	**489 ***	**(1.0)**
Less than 6 hours	**Canada**	**25.0**	**(1.8)**	**518**	**(3.4)**	**22.7**	**(1.9)**	**530**	**(3.4)**
	Newfoundland and Labrador	26.5	(7.8)	479	(9.6)	23.4	(5.0)	517	(7.2)
	Quebec	37.2	(4.1)	535	(3.7)	19.1	(3.5)	526	(5.4)
	Ontario	16.1	(2.8)	524	(7.9)	20.3	(3.2)	529	(6.9)
	Manitoba	21.1	(3.4)	462	(5.5)	23.0	(3.6)	515	(8.2)
	Alberta	28.2	(4.3)	484	(6.3)	36.4	(4.7)	540	(6.5)
	International average	**22.1**	**(0.4)**	**501**	**(1.2)**	**22.6**	**(0.5)**	**491**	**(1.4)**
6-15 hours	**Canada**	**32.4**	**(2.5)**	**514**	**(4.2)**	**10.7**	**(1.9)**	**531**	**(8.4)**
	Newfoundland and Labrador	30.3	(6.8)	476	(7.8)	32.4	(8.6)	529	(6.6)
	Quebec	29.6	(4.0)	531	(3.3)	U	(2.6)	524	(7.0)
	Ontario	36.5	(4.1)	517	(7.2)	9.5	(3.1)	545	(18.0)
	Manitoba	30.9	(3.8)	472	(5.9)	11.2	(2.5)	494	(14.2)
	Alberta	26.9	(3.9)	489	(7.1)	17.9	(4.0)	525	(10.6)
	International average	**25.4**	**(0.4)**	**502**	**(1.0)**	**20.3**	**(0.4)**	**494**	**(1.4)**
16-35 hours	**Canada**	**17.1**	**(1.9)**	**509**	**(6.3)**	**U**	**(1.4)**	**531**	**(13.9)**
	Newfoundland and Labrador	U	(1.8)	477	(8.9)	U	(1.3)	509	(10.9)
	Quebec	8.2	(2.6)	533	(8.2)	U	(0.6)	528	(17.1)
	Ontario	20.2	(2.7)	509	(9.0)	U	(3.0)	530	(21.4)
	Manitoba	21.1	(3.8)	463	(10.2)	U	(1.7)	530 *	(11.6)
	Alberta	26.0	(4.9)	506	(9.6)	U	(2.1)	541	(18.7)
	International average	**14.8**	**(0.3)**	**503**	**(1.2)**	**10.6**	**(0.3)**	**497**	**(1.7)**
More than 35 hours	**Canada**	**13.3**	**(1.9)**	**499 ***	**(5.6)**	**U**	**(0.8)**	**510**	**(11.8)**
	Newfoundland and Labrador	U	(1.6)	480	(5.7)	--	--	--	--
	Quebec	U	(0.8)	529	(13.5)	U	(0.7)	502	(16.5)
	Ontario	23.9	(3.8)	500	(6.3)	U	(1.6)	511	(15.8)
	Manitoba	13.1	(2.9)	489	(6.6)	U	(0.2)	518 ‡	(8.7)
	Alberta	7.0	(2.2)	489	(11.4)	U	(1.3)	517 ‡	(11.1)
	International average	**13.3**	**(0.3)**	**502**	**(1.9)**	**9.6**	**(0.3)**	**492**	**(2.0)**

‡ There are fewer than 30 observations.
U Too unreliable to be published.
* Significant difference compared to the average score in the "6-15 hours" category.

TABLE B.3.16 Percentage of students and achievement scores by teaching limited by students not ready for instruction: MATHEMATICS and SCIENCE

Teaching limited by students not ready for instruction	Canada, provinces, and international average	Mathematics				Science			
		%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
Very little	**Canada**	**22.3**	**(1.9)**	**537**	**(4.7)**	**23.7**	**(2.1)**	**543**	**(3.4)**
	Newfoundland and Labrador	25.4	(5.6)	489	(7.4)	26.1	(5.6)	533	(6.8)
	Quebec	20.0	(2.9)	545	(4.2)	22.6	(3.5)	534	(4.1)
	Ontario	25.8	(3.7)	541	(8.7)	27.3	(4.3)	545	(6.1)
	Manitoba	18.0	(3.3)	488	(5.3)	17.5	(3.2)	524	(5.6)
	Alberta	17.5	(3.7)	531	(9.0)	18.2	(3.6)	563	(8.4)
	International average	**35.6**	**(0.4)**	**517**	**(0.9)**	**36.7**	**(0.5)**	**506**	**(1.1)**
Some	**Canada**	**71.4**	**(2.2)**	**507 ***	**(2.4)**	**70.2**	**(2.5)**	**521 ***	**(2.2)**
	Newfoundland and Labrador	67.8	(5.4)	476	(5.0)	66.5	(5.5)	519	(4.2)
	Quebec	77.2	(3.2)	530 *	(2.6)	73.7	(3.9)	520 *	(2.8)
	Ontario	65.3	(4.1)	504 *	(4.3)	65.0	(4.7)	523 *	(4.3)
	Manitoba	69.8	(3.8)	474 *	(4.0)	70.2	(3.8)	508 *	(3.8)
	Alberta	78.9	(3.7)	484 *	(4.3)	78.1	(3.8)	522 *	(4.3)
	International average	**58.5**	**(0.5)**	**495 ***	**(0.6)**	**57.7**	**(0.5)**	**484 ***	**(0.7)**
A lot	**Canada**	**6.3**	**(1.3)**	**484 ***	**(7.9)**	**6.1**	**(1.2)**	**499 ***	**(7.0)**
	Newfoundland and Labrador	U	(3.2)	462	(28.6)	U	(3.3)	509	(22.4)
	Quebec	U	(1.2)	519	(12.8)	U	(1.6)	511 *	(10.9)
	Ontario	8.9	(2.5)	487 *	(9.9)	7.7	(2.4)	498 *	(9.8)
	Manitoba	12.2	(2.6)	425 *	(12.7)	12.3	(2.6)	458 *	(12.4)
	Alberta	U	(1.8)	489 *	(13.4)	U	(1.8)	527 *	(14.2)
	International average	**5.9**	**(0.2)**	**476 ***	**(2.2)**	**5.6**	**(0.2)**	**465 ***	**(2.5)**

U Too unreliable to be published.
* Significant difference compared to the average score in the "Very little" category.

TABLE B.3.17 Percentage of students and achievement scores by instructional clarity in subject lesson: MATHEMATICS and SCIENCE

Instructional clarity in subject lesson	Canada, provinces, and international average	Mathematics				Science			
		%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
High clarity	**Canada**	**75.5**	**(0.8)**	**514**	**(2.1)**	**72.0**	**(0.9)**	**526**	**(2.0)**
	Newfoundland and Labrador	82.0	(1.3)	479	(4.4)	84.4	(1.5)	524	(3.8)
	Quebec	74.1	(1.5)	533	(2.7)	67.9	(1.5)	523	(3.1)
	Ontario	75.2	(1.1)	517	(3.7)	71.6	(1.4)	528	(3.4)
	Manitoba	75.0	(1.3)	475	(3.6)	75.0	(1.3)	508	(3.3)
	Alberta	77.9	(1.0)	492	(4.5)	77.8	(1.4)	531	(4.2)
	International average	**74.2**	**(0.2)**	**508**	**(0.5)**	**72.4**	**(0.2)**	**498**	**(0.5)**
Moderate clarity	**Canada**	**20.9**	**(0.7)**	**505 ***	**(3.0)**	**23.0**	**(0.8)**	**521 ***	**(2.5)**
	Newfoundland and Labrador	16.1	(1.3)	471	(6.6)	13.6	(1.5)	508	(8.5)
	Quebec	22.2	(1.3)	530	(4.7)	26.4	(1.1)	521	(3.5)
	Ontario	20.9	(0.9)	502 *	(4.5)	23.0	(1.2)	521	(4.0)
	Manitoba	21.8	(1.2)	459 *	(5.2)	20.8	(1.2)	495 *	(5.4)
	Alberta	18.9	(1.0)	487	(5.8)	19.0	(1.2)	529	(5.2)
	International average	**21.2**	**(0.1)**	**488 ***	**(0.7)**	**21.8**	**(0.1)**	**480 ***	**(0.8)**
Low clarity	**Canada**	**3.6**	**(0.3)**	**481 ***	**(4.8)**	**5.0**	**(0.3)**	**512 ***	**(5.0)**
	Newfoundland and Labrador	1.9	(0.3)	449 ‡	(18.4)	2.0	(0.5)	496 ‡	(19.6)
	Quebec	3.7	(0.5)	496 *	(8.2)	5.7	(0.7)	508 *	(7.1)
	Ontario	3.9	(0.4)	482 *	(8.0)	5.4	(0.5)	516	(7.8)
	Manitoba	3.1	(0.5)	427 *	(16.1)	4.2	(0.5)	484	(12.9)
	Alberta	3.3	(0.4)	465 *	(9.6)	3.1	(0.4)	519	(10.0)
	International average	**4.6**	**(0.1)**	**466 ***	**(1.2)**	**5.7**	**(0.1)**	**466 ***	**(1.3)**

‡ There are fewer than 30 observations.
* Significant difference compared to the average score in the "High clarity" category.

TABLE B.3.18 Percentage of students and achievement scores by teacher emphasis on science investigation: SCIENCE

Teacher emphasis on science investigation	Canada, provinces, and international average	Science			
		%	Standard error	Average	Standard error
About half the lessons	**Canada**	**17.1**	**(1.7)**	**519**	**(3.9)**
	Newfoundland and Labrador	16.3	(5.3)	521	(9.8)
	Quebec	14.7	(3.0)	523	(4.9)
	Ontario	16.2	(3.1)	519	(8.4)
	Manitoba	16.2	(3.2)	512	(7.6)
	Alberta	24.2	(3.7)	514	(5.6)
	International average	**30.6**	**(0.4)**	**491**	**(1.1)**
Less than half the lessons	**Canada**	**82.9**	**(1.7)**	**526**	**(2.2)**
	Newfoundland and Labrador	83.7	(5.3)	522	(4.3)
	Quebec	85.3	(3.0)	522	(2.7)
	Ontario	83.8	(3.1)	528	(3.9)
	Manitoba	83.8	(3.2)	503	(4.0)
	Alberta	75.8	(3.7)	535*	(4.8)
	International average	**69.4**	**(0.4)**	**490**	**(0.7)**

* Significant difference compared to the average score in the "About half the lessons" category.

TABLE B.3.19 Percentage of students and achievement scores by frequency students conduct science experiments in science lessons: SCIENCE

Frequency students conduct science experiments	Canada, provinces, and international average	Science			
		%	Standard error	Average	Standard error
At least once a week	**Canada**	**20.5**	**(0.8)**	**495 ***	**(3.2)**
	Newfoundland and Labrador	18.0	(1.7)	501 *	(7.0)
	Quebec	16.0	(1.3)	493 *	(5.0)
	Ontario	20.7	(1.3)	491 *	(5.2)
	Manitoba	21.0	(1.3)	473 *	(5.7)
	Alberta	27.5	(1.8)	511 *	(6.3)
	International average	**31.0**	**(0.2)**	**475 ***	**(0.7)**
Once or twice a month	**Canada**	**35.4**	**(1.1)**	**530**	**(2.4)**
	Newfoundland and Labrador	39.8	(2.4)	528	(4.5)
	Quebec	38.8	(2.0)	524	(2.9)
	Ontario	32.2	(1.8)	533	(4.2)
	Manitoba	34.5	(1.6)	510	(4.3)
	Alberta	39.1	(1.7)	542	(4.3)
	International average	**26.1**	**(0.2)**	**499**	**(0.7)**
A few times a year	**Canada**	**30.3**	**(1.1)**	**538 ***	**(3.3)**
	Newfoundland and Labrador	30.6	(1.9)	531	(5.5)
	Quebec	32.9	(1.8)	536 *	(3.2)
	Ontario	31.1	(2.0)	541	(5.7)
	Manitoba	30.2	(1.5)	522 *	(4.4)
	Alberta	23.5	(1.1)	540	(5.0)
	International average	**24.5**	**(0.2)**	**503 ***	**(0.8)**
Never	**Canada**	**13.8**	**(0.8)**	**520***	**(3.4)**
	Newfoundland and Labrador	11.5	(2.0)	499*	(12.2)
	Quebec	12.3	(2.2)	514	(5.9)
	Ontario	16.0	(0.9)	525	(4.7)
	Manitoba	14.2	(1.3)	495*	(6.9)
	Alberta	9.9	(0.9)	519*	(6.3)
	International average	**18.3**	**(0.2)**	**478***	**(0.9)**

* Significant difference compared to the average score in the "Once or twice a month" category.

TABLE B.3.20 Percentage of students and achievement scores by homework assigned per week: MATHEMATICS and SCIENCE

Homework assigned per week	Canada, provinces, and international average	Mathematics				Science			
		%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
No homework	**Canada**	**29.0**	**(2.1)**	**505**	**(3.6)**	**61.6**	**(3.0)**	**522**	**(2.4)**
	Newfoundland and Labrador	U	(6.6)	479	(13.3)	66.9	(7.5)	525	(4.0)
	Quebec	35.2	(4.0)	527 *	(4.4)	87.5	(3.3)	522	(2.7)
	Ontario	21.3	(3.4)	502	(6.6)	42.4	(5.5)	523	(5.2)
	Manitoba	40.5	(3.9)	460	(6.8)	62.7	(3.8)	497 *	(4.8)
	Alberta	36.8	(4.1)	489	(8.3)	63.8	(4.4)	530	(4.9)
	International average	**7.3**	**(0.2)**	**501**	**(3.2)**	**25.4**	**(0.4)**	**488**	**(2.7)**
Less than once a week	**Canada**	**24.0**	**(2.6)**	**513**	**(5.3)**	**28.7**	**(2.3)**	**527**	**(3.4)**
	Newfoundland and Labrador	30.5	(5.8)	481	(6.7)	33.0	(7.5)	515	(7.4)
	Quebec	16.6	(3.3)	541	(4.1)	11.2	(3.2)	526	(6.3)
	Ontario	28.0	(4.9)	515	(9.0)	38.4	(4.2)	527	(5.0)
	Manitoba	29.6	(3.4)	470	(6.2)	34.0	(3.9)	516	(4.9)
	Alberta	24.5	(3.9)	490	(6.4)	33.6	(4.3)	534	(6.3)
	International average	**7.6**	**(0.3)**	**499**	**(2.9)**	**28.2**	**(0.4)**	**493**	**(1.1)**
At least once a week	**Canada**	**46.9**	**(2.8)**	**517**	**(4.5)**	**9.6**	**(2.6)**	**532**	**(14.2)**
	Newfoundland and Labrador	53.4	(7.6)	476	(6.2)	U	(0.2)	561 ‡	(11.1)
	Quebec	48.2	(4.3)	533	(3.0)	U	(0.7)	504	(10.5)
	Ontario	50.8	(5.3)	516	(8.8)	19.3	(5.5)	535	(15.3)
	Manitoba	30.0	(3.4)	485	(5.0)	U	(1.5)	517	(20.8)
	Alberta	38.7	(4.2)	497	(6.1)	U	(1.8)	507	(36.4)
	International average	**85.1**	**(0.3)**	**502**	**(0.5)**	**46.4**	**(0.4)**	**494**	**(1.8)**

‡ There are fewer than 30 observations.
U Too unreliable to be published.
* Significant difference compared to the average score in the "Less than once a week" category.

TABLE B.3.21 Percentage of students and achievement scores by time spent on homework per assignment: MATHEMATICS and SCIENCE

Time spent on homework per assignment	Canada, provinces, and international average	Mathematics				Science			
		%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
15 minutes or less	**Canada**	**45.1**	**(2.8)**	**507**	**(3.0)**	**46.5**	**(5.2)**	**524**	**(4.1)**
	Newfoundland and Labrador	70.9	(7.0)	478	(5.7)	60.7	(14.2)	518	(9.0)
	Quebec	40.0	(5.2)	533	(3.9)	U	(13.8)	520	(9.6)
	Ontario	39.7	(4.4)	505	(5.4)	39.2	(6.6)	524	(6.3)
	Manitoba	68.3	(5.1)	478	(4.4)	68.5	(6.5)	516	(5.2)
	Alberta	63.5	(6.0)	494	(5.3)	75.2	(6.7)	531	(7.5)
	International average	**34.1**	**(0.4)**	**498**	**(1.1)**	**43.7**	**(0.6)**	**493**	(1.1)
More than 15 minutes	**Canada**	**54.9**	**(2.8)**	**523** *	**(3.9)**	**53.5**	**(5.2)**	**532**	**(7.1)**
	Newfoundland and Labrador	29.1	(7.0)	478	(6.8)	U	(14.2)	511	(14.2)
	Quebec	60.0	(5.2)	537	(3.1)	63.8	(13.8)	526	(7.7)
	Ontario	60.3	(4.4)	523 *	(6.2)	60.8	(6.6)	534	(8.9)
	Manitoba	31.7	(5.1)	477	(8.1)	31.5	(6.5)	518	(11.4)
	Alberta	36.5	(6.0)	495	(9.8)	24.8	(6.7)	536	(10.6)
	International average	**65.9**	**(0.4)**	**503** *	**(0.7)**	**56.3**	**(0.6)**	**493**	**(0.9)**

‡ There are fewer than 30 observations.
U Too unreliable to be published.
* Significant difference compared to the average score in the "15 minutes or less" category.

TABLE B.3.22 Percentage of students and achievement scores by access to computers for subject lessons: MATHEMATICS and SCIENCE

Access to computers for subject lessons	Canada, provinces, and international average	Mathematics				Science			
		%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
Yes	**Canada**	**51.4**	**(2.9)**	**506**	**(3.0)**	**63.7**	**(3.0)**	**524**	**(2.3)**
	Newfoundland and Labrador	64.2	(8.5)	483	(5.2)	67.1	(9.0)	524	(4.3)
	Quebec	32.2	(4.1)	528	(3.7)	38.2	(4.4)	522	(4.1)
	Ontario	58.7	(5.5)	509	(4.9)	74.8	(5.9)	525	(3.7)
	Manitoba	62.5	(3.8)	470	(4.8)	76.0	(3.5)	504	(4.2)
	Alberta	63.3	(4.6)	489	(5.7)	78.6	(3.7)	531	(5.1)
	International average	**38.6**	**(0.4)**	**506**	**(1.4)**	**45.5**	**(0.4)**	**496**	**(1.0)**
No	**Canada**	**48.6**	**(2.9)**	**520** *	**(4.2)**	**36.3**	**(3.0)**	**525**	**(4.1)**
	Newfoundland and Labrador	35.8	(8.5)	469	(7.5)	32.9	(9.0)	517	(8.0)
	Quebec	67.8	(4.1)	535	(2.8)	61.8	(4.4)	523	(2.6)
	Ontario	41.3	(5.5)	518	(10.5)	25.2	(5.9)	533	(11.9)
	Manitoba	37.5	(3.8)	472	(6.0)	24.0	(3.5)	506	(7.4)
	Alberta	36.7	(4.6)	498	(5.1)	21.4	(3.7)	524	(5.0)
	International average	**61.4**	**(0.4)**	**500** *	**(0.7)**	**54.5**	**(0.4)**	**490** *	**(0.8)**

Percent of students by computer access**		%	Standard error	%	Standard error
Each student has a computer	**Canada**	**12.6**	**(2.1)**	**15.6**	**(2.0)**
	Newfoundland and Labrador	U	(3.8)	U	(4.0)
	Quebec	7.6	(2.1)	9.5	(2.1)
	Ontario	12.7	(4.1)	14.6	(4.3)
	Manitoba	7.3	(2.1)	11.1	(2.7)
	Alberta	24.6	(4.1)	32.9	(4.5)
	International average	**12.6**	**(0.3)**	**14.2**	**(0.3)**
The class has computers that students can share	**Canada**	**31.5**	**(2.7)**	**39.6**	**(3.1)**
	Newfoundland and Labrador	47.1	(9.2)	51.1	(9.1)
	Quebec	17.2	(3.7)	19.6	(3.9)
	Ontario	41.6	(5.5)	52.4	(6.0)
	Manitoba	41.1	(3.8)	53.0	(4.2)
	Alberta	26.0	(4.1)	37.8	(4.8)
	International average	**16.7**	**(0.4)**	**21.6**	**(0.4)**
The school has computers that the class can sometimes use	**Canada**	**43.2**	**(2.8)**	**52.4**	**(3.1)**
	Newfoundland and Labrador	61.6	(8.4)	65.0	(9.1)
	Quebec	27.8	(4.2)	31.5	(4.4)
	Ontario	49.5	(5.3)	61.3	(6.2)
	Manitoba	54.0	(3.9)	67.7	(3.8)
	Alberta	49.5	(4.6)	62.3	(4.5)
	International average	**29.3**	**(0.4)**	**35.9**	**(0.5)**

U Too unreliable to be published.
* Significant difference compared to the average score in the "Yes" category.
** Teachers could indicate the class having more than one type of computer access.

TABLE B.3.23 Percentage of students and achievement scores by teachers supporting learning with computers during subject lesson: MATHEMATICS and SCIENCE

Teachers supporting learning with computers during subject lesson	Canada, provinces, and international average	Mathematics				Science			
		%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
Every or almost every day	**Canada**	**5.5**	**(1.0)**	**503**	**(6.2)**	**4.8**	**(1.2)**	**526**	**(9.8)**
	Newfoundland and Labrador	U	(7.4)	474	(7.7)	U	(2.9)	522 ‡	(11.4)
	Quebec	U	(1.3)	526	(13.0)	U	(0.5)	510	(4.7)
	Ontario	6.3	(1.8)	509	(8.6)	U	(2.3)	529	(15.9)
	Manitoba	6.0	(1.9)	480	(10.3)	U	(1.5)	522	(14.3)
	Alberta	U	(2.6)	487	(13.3)	U	(2.9)	525	(13.8)
	International average	**6.7**	**(0.2)**	**515**	**(2.4)**	**6.2**	**(0.2)**	**498**	**(2.3)**
Once or twice a week	**Canada**	**23.8**	**(2.0)**	**503**	**(3.9)**	**18.4**	**(2.1)**	**521**	**(3.8)**
	Newfoundland and Labrador	20.1	(5.2)	489	(10.0)	U	(6.8)	530	(8.0)
	Quebec	15.3	(3.2)	531	(4.3)	U	(1.5)	504	(11.2)
	Ontario	22.5	(3.5)	505	(6.7)	28.2	(4.4)	522	(5.0)
	Manitoba	37.5	(3.3)	464	(6.7)	16.5	(3.4)	488	(10.5)
	Alberta	39.7	(4.8)	489	(6.6)	20.2	(4.2)	532	(8.7)
	International average	**13.7**	**(0.3)**	**509**	**(1.6)**	**13.5**	**(0.3)**	**498**	**(1.6)**
Once or twice a month	**Canada**	**19.1**	**(2.5)**	**511**	**(6.1)**	**32.0**	**(2.4)**	**524**	**(3.3)**
	Newfoundland and Labrador	U	(6.9)	485	(7.8)	33.0	(7.7)	521	(6.5)
	Quebec	13.7	(3.4)	525	(6.6)	22.0	(3.7)	522	(4.9)
	Ontario	24.6	(5.1)	514	(9.5)	33.1	(4.3)	524	(5.7)
	Manitoba	15.5	(3.3)	479	(9.7)	43.4	(4.5)	505	(5.0)
	Alberta	14.9	(3.3)	485	(13.3)	44.3	(5.1)	535	(5.9)
	International average	**13.0**	**(0.3)**	**510**	**(1.6)**	**20.1**	**(0.4)**	**500**	**(1.5)**
Never or almost never	**Canada**	**51.7**	**(3.0)**	**519**	**(4.0)**	**44.8**	**(2.6)**	**526**	**(2.9)**
	Newfoundland and Labrador	39.4	(8.7)	470	(7.0)	43.9	(8.7)	519	(6.1)
	Quebec	68.2	(4.1)	535	(2.8)	72.4	(3.9)	524	(2.7)
	Ontario	46.6	(5.7)	516	(9.6)	32.3	(4.3)	535	(7.4)
	Manitoba	40.9	(3.7)	472	(5.7)	36.8	(4.0)	509	(6.2)
	Alberta	38.6	(4.7)	499	(5.0)	27.8	(4.2)	521	(5.7)
	International average	**66.6**	**(0.4)**	**500** *	**(0.7)**	**60.2**	**(0.4)**	**490** *	**(0.7)**

‡ There are fewer than 30 observations.
U Too unreliable to be published.
* Significant difference compared to the average score in the "Once or twice a month" category.

TABLE B.3.24 Percentage of students and achievement scores by students take tests on computers/tablets: MATHEMATICS and SCIENCE

Students take tests on computers/tablets	Canada, provinces, and international average	Mathematics				Science			
		%	Standard error	Average	Standard error	%	Standard error	Average	Standard error
At least once a month	**Canada**	**12.8**	**(1.5)**	**500**	**(7.5)**	**10.9**	**(1.5)**	**520**	**(4.3)**
	Newfoundland and Labrador	U	(3.5)	502 *	(10.7)	U	(3.8)	522	(8.2)
	Quebec	10.0	(2.6)	533	(5.8)	14.1	(2.9)	516	(6.2)
	Ontario	14.1	(2.9)	494	(10.4)	7.9	(2.0)	520	(7.5)
	Manitoba	10.7	(2.6)	442 *	(9.2)	U	(0.9)	504	(19.8)
	Alberta	15.4	(3.3)	486	(8.8)	16.6	(3.6)	527	(8.9)
	International average	**17.2**	**(0.4)**	**502**	**(1.4)**	**16.2**	**(0.4)**	**489**	**(1.5)**
Once or twice a year	**Canada**	**8.6**	**(1.1)**	**508**	**(7.2)**	**10.2**	**(1.5)**	**536 ***	**(5.3)**
	Newfoundland and Labrador	U	(4.0)	472	(6.7)	U	(1.8)	546	(19.1)
	Quebec	U	(2.1)	527	(9.1)	6.9	(2.0)	523	(8.1)
	Ontario	7.6	(1.6)	521	(11.9)	9.4	(2.5)	537	(11.6)
	Manitoba	U	(1.8)	470	(10.1)	U	(1.1)	518	(7.9)
	Alberta	19.7	(3.8)	488	(11.6)	23.0	(4.3)	543	(8.7)
	International average	**18.4**	**(0.4)**	**504**	**(1.2)**	**14.1**	**(0.3)**	**491**	**(1.5)**
Never	**Canada**	**78.7**	**(1.9)**	**515**	**(2.3)**	**78.8**	**(2.1)**	**524**	**(2.3)**
	Newfoundland and Labrador	84.2	(5.4)	476	(4.9)	88.2	(4.3)	521	(4.3)
	Quebec	84.8	(3.2)	533	(2.4)	79.0	(3.5)	524	(2.8)
	Ontario	78.3	(3.3)	514	(4.2)	82.8	(3.2)	527	(4.2)
	Manitoba	84.8	(3.0)	474	(3.9)	95.8	(1.4)	504	(3.8)
	Alberta	64.9	(4.3)	495	(4.7)	60.4	(4.2)	528	(4.3)
	International average	**64.3**	**(0.4)**	**501**	**(0.7)**	**69.7**	**(0.4)**	**492**	**(0.7)**

U Too unreliable to be published.
* Significant difference compared to the average score in the "Never" category.

TABLE B.3.25 Percentage of TIMSS curriculum topics covered in Grade 4 mathematics for Newfoundland and Labrador

Mathematics — Newfoundland and Labrador	Mostly taught before this year		Mostly taught this year		Not yet taught or just introduced	
	%	Standard error	%	Standard error	%	Standard error
Number						
Concepts of whole numbers, including place value and ordering	62.4	(7.4)	37.6	(7.4)	0.0	(0.0)
Adding, subtracting, multiplying, and dividing with whole numbers	25.2	(7.2)	72.9	(7.2)	U	(1.1)
Concepts of multiples and factors; odd and even numbers	35.9	(7.5)	47.9	(7.6)	U	(5.4)
Number sentences (finding the missing number, representing problem situations with number sentences)	25.9	(6.9)	71.2	(6.8)	2.9	(0.6)
Number patterns (extending number patterns and finding missing terms)	32.9	(6.9)	66.4	(6.9)	U ‡	(0.7)
Concepts of fractions, including representing, comparing and ordering, adding and subtracting simple fractions	U	(3.3)	65.6	(8.3)	29.3	(8.0)
Concepts of decimals, including place value and ordering, adding and subtracting with decimals	U ‡	(0.7)	75.0	(6.6)	24.0	(6.6)
Measurement and geometry						
Solving problems involving length, including measuring and estimating	33.9	(6.7)	31.4	(6.8)	34.7	(4.9)
Solving problems involving mass, volume, and time	U	(5.2)	26.9	(6.6)	62.9	(7.4)
Finding and estimating perimeter, area, and volume	U	(6.0)	21.9	(6.0)	65.9	(7.0)
Parallel and perpendicular lines	U	(2.8)	U	(2.0)	87.8	(3.4)
Comparing and drawing angles	U ‡	(0.3)	U	(4.9)	93.1	(4.9)
Elementary properties of common geometric shapes	33.5	(6.5)	38.9	(7.7)	27.6	(6.2)
Three-dimensional shapes, including relationships with their two-dimensional representations	33.5	(6.9)	25.7	(5.7)	40.8	(6.7)
Data display						
Reading and interpreting data from tables, pictographs, bar graphs, line graphs, and pie charts	26.1	(6.3)	70.5	(6.4)	U	(1.9)
Organizing and representing data to help answer questions	31.9	(6.8)	66.8	(6.8)	U ‡	(0.9)
Drawing conclusions from data displays	28.1	(6.8)	68.4	(7.2)	U	(2.5)

‡ There are fewer than 30 observations.
U Too unreliable to be published.

TABLE B.3.26 Percentage of TIMSS curriculum topics covered in Grade 4 science for Newfoundland and Labrador

Science — Newfoundland and Labrador	Mostly taught before this year		Mostly taught this year		Not yet taught or just introduced	
	%	Standard error	%	Standard error	%	Standard error
Life science						
Physical and behavioural characteristics of living things and major groups of living things (e.g., mammals, birds, insects, flowering plants)	45.6	(7.7)	U	(6.0)	37.9	(6.5)
Major body structures and their functions in humans, other animals, and plants	U	(6.2)	24.8	(7.7)	58.5	(9.0)
Life cycles of common plants and animals (e.g., flowering plants, butterflies, frogs)	62.3	(6.0)	17.8	(4.2)	19.9	(6.3)
Characteristics of plants and animals that are inherited	30.1	(7.0)	U	(6.7)	51.7	(7.8)
Interactions between organisms and their environments (e.g., physical features and behaviours that help living things survive in their environments)	20.6	(5.9)	36.4	(7.7)	43.1	(6.0)
Relationships in ecosystems (e.g., simple food chains, predator-prey relationships, competition)	21.7	(6.7)	37.7	(7.7)	40.5	(4.9)
Human health (transmission and prevention of diseases, everyday behaviours that promote good health)	15.5	(4.4)	38.5	(7.7)	46.0	(7.4)
Physical science						
States of matter (solid, liquid, gas) and their properties (volume, shape)	42.5	(8.5)	25.0	(6.8)	32.5	(6.9)
Classifying materials based on physical properties (e.g., weight/mass, volume, state of matter, conductivity of heat or electricity)	24.8	(4.6)	22.3	(7.2)	52.9	(7.1)
Mixtures, including methods for separating a mixture into its components (e.g., sifting, filtering, evaporation, using a magnet)	32.8	(5.2)	U	(6.1)	56.5	(6.4)
Properties of magnets (e.g., like poles repel and opposite poles attract, magnets can attract some objects)	67.9	(7.0)	U	(1.9)	29.2	(7.1)
Physical changes in everyday life (e.g., changes of state, dissolving)	37.6	(8.0)	U	(5.0)	48.6	(6.4)
Chemical changes in everyday life (e.g., decaying, burning, rusting, cooking)	29.5	(8.0)	U	(3.9)	64.0	(7.6)
Common sources of energy (e.g., the sun, wind, oil) and uses of energy (heating and cooling homes, providing light)	U	(6.0)	61.3	(7.0)	25.7	(5.7)
Light and sound in everyday life (e.g., shadows and reflections, vibrating objects make sound)	U	(1.8)	91.6	(3.4)	U	(3.1)
Heat transfer (e.g., energy flows from a hot object to a colder object)	U	(2.4)	43.2	(7.0)	52.5	(7.2)
Electricity and simple electrical circuits (e.g., a circuit must be complete to work correctly)	U ‡	(0.6)	U	(4.1)	92.5	(4.2)
Forces that cause objects to move (e.g., gravity, pushing/pulling) or change their motion (e.g., friction)	29.2	(8.6)	U	(1.0)	68.5	(8.5)
Simple machines (e.g., levers, pulleys, wheels, ramps) that help make motion easier	U	(6.9)	U	(0.8)	78.8	(6.9)
Earth science						
Physical makeup of Earth's surface (e.g., land and water in unequal proportions, sources of fresh and salt water)	U	(2.0)	50.3	(8.2)	45.3	(8.1)
Earth's resources used in everyday life (e.g., water, wind, soil, forests, oil, natural gas, minerals)	16.4	(5.1)	64.5	(8.0)	19.1	(6.3)
Changes in Earth's surface over time (e.g., mountain building, weathering, erosion)	U	(3.5)	81.2	(6.4)	U	(5.3)
Fossils and what they can tell us about past conditions on Earth	U	(3.2)	85.9	(2.7)	U	(3.3)
Weather and climate (e.g., daily, seasonal, and locational variations versus long-term trends)	U	(4.6)	45.5	(7.5)	43.9	(7.6)
Objects in the solar system (the Sun, the Earth, the Moon, and other planets) and their movements	U	(2.4)	U	(1.2)	92.9	(2.8)
Earth's motion and related patterns observed on Earth (e.g., day and night, seasons)	U	(5.6)	U	(3.8)	75.6	(6.6)

‡ There are fewer than 30 observations.
U Too unreliable to be published.

TABLE B.3.27 Percentage of TIMSS curriculum topics covered in Grade 4 mathematics for Quebec

Mathematics — Quebec	Mostly taught before this year		Mostly taught this year		Not yet taught or just introduced	
	%	Standard error	%	Standard error	%	Standard error
Number						
Concepts of whole numbers, including place value and ordering	75.9	(3.3)	24.1	(3.3)	0.0	(0.0)
Adding, subtracting, multiplying, and dividing with whole numbers	34.7	(3.9)	64.4	(3.8)	U	(0.7)
Concepts of multiples and factors; odd and even numbers	24.0	(3.6)	59.5	(4.1)	16.5	(3.3)
Number sentences (finding the missing number, representing problem situations with number sentences)	40.7	(4.2)	52.4	(4.3)	U	(2.7)
Number patterns (extending number patterns and finding missing terms)	50.8	(4.5)	44.5	(4.0)	U	(2.0)
Concepts of fractions, including representing, comparing and ordering, adding and subtracting simple fractions	11.4	(2.9)	63.1	(4.2)	25.5	(4.0)
Concepts of decimals, including place value and ordering, adding and subtracting with decimals	8.6	(2.2)	84.6	(3.1)	6.9	(2.2)
Measurement and geometry						
Solving problems involving length, including measuring and estimating	39.8	(3.9)	52.0	(4.5)	8.2	(2.3)
Solving problems involving mass, volume, and time	10.8	(2.2)	55.1	(4.0)	34.0	(4.1)
Finding and estimating perimeter, area, and volume	19.1	(2.7)	69.9	(3.2)	11.0	(2.0)
Parallel and perpendicular lines	47.0	(4.1)	50.8	(4.0)	U	(1.6)
Comparing and drawing angles	36.3	(4.1)	51.4	(4.3)	12.3	(2.3)
Elementary properties of common geometric shapes	58.9	(4.2)	40.1	(4.1)	U	(0.6)
Three-dimensional shapes, including relationships with their two-dimensional representations	25.9	(3.3)	57.1	(4.0)	17.0	(3.2)
Data display						
Reading and interpreting data from tables, pictographs, bar graphs, line graphs, and pie charts	34.7	(3.7)	52.1	(4.0)	13.2	(3.4)
Organizing and representing data to help answer questions	34.9	(3.4)	50.0	(3.8)	15.0	(3.4)
Drawing conclusions from data displays	24.4	(3.5)	56.3	(4.9)	19.4	(4.0)

U Too unreliable to be published.

TABLE B.3.28 Percentage of TIMSS curriculum topics covered in Grade 4 science for Quebec

Science — Quebec	Mostly taught before this year		Mostly taught this year		Not yet taught or just introduced	
	%	Standard error	%	Standard error	%	Standard error
Life science						
Physical and behavioural characteristics of living things and major groups of living things (e.g., mammals, birds, insects, flowering plants)	45.3	(4.6)	44.4	(4.4)	10.3	(3.4)
Major body structures and their functions in humans, other animals, and plants	34.5	(4.8)	35.0	(4.4)	30.5	(4.5)
Life cycles of common plants and animals (e.g., flowering plants, butterflies, frogs)	51.4	(4.3)	30.6	(4.0)	18.0	(3.7)
Characteristics of plants and animals that are inherited	22.5	(3.4)	13.7	(2.9)	63.8	(4.2)
Interactions between organisms and their environments (e.g., physical features and behaviours that help living things survive in their environments)	21.5	(4.0)	45.9	(4.4)	32.6	(4.3)
Relationships in ecosystems (e.g., simple food chains, predator-prey relationships, competition)	20.8	(3.3)	51.3	(4.6)	27.9	(4.6)
Human health (transmission and prevention of diseases, everyday behaviours that promote good health)	23.3	(3.9)	33.3	(4.4)	43.4	(4.4)
Physical science						
States of matter (solid, liquid, gas) and their properties (volume, shape)	31.8	(4.0)	41.4	(4.8)	26.8	(4.3)
Classifying materials based on physical properties (e.g., weight/mass, volume, state of matter, conductivity of heat or electricity)	8.9	(2.7)	38.7	(4.5)	52.5	(4.8)
Mixtures, including methods for separating a mixture into its components (e.g., sifting, filtering, evaporation, using a magnet)	12.9	(3.0)	21.5	(3.6)	65.6	(4.1)
Properties of magnets (e.g., like poles repel and opposite poles attract, magnets can attract some objects)	14.9	(3.3)	21.4	(3.3)	63.7	(4.2)
Physical changes in everyday life (e.g., changes of state, dissolving)	17.7	(3.6)	36.4	(4.3)	45.8	(4.5)
Chemical changes in everyday life (e.g., decaying, burning, rusting, cooking)	U	(1.7)	19.7	(3.6)	75.8	(3.5)
Common sources of energy (e.g., the sun, wind, oil) and uses of energy (heating and cooling homes, providing light)	17.7	(3.1)	51.1	(4.0)	31.2	(3.9)
Light and sound in everyday life (e.g., shadows and reflections, vibrating objects make sound)	14.7	(3.0)	22.2	(4.0)	63.1	(4.4)
Heat transfer (e.g., energy flows from a hot object to a colder object)	6.7	(2.0)	24.6	(4.0)	68.7	(4.2)
Electricity and simple electrical circuits (e.g., a circuit must be complete to work correctly)	U	(1.9)	5.9	(1.4)	89.9	(2.1)
Forces that cause objects to move (e.g., gravity, pushing/pulling) or change their motion (e.g., friction)	9.4	(2.6)	38.2	(4.2)	52.4	(4.3)
Simple machines (e.g., levers, pulleys, wheels, ramps) that help make motion easier	15.2	(3.1)	61.0	(4.8)	23.8	(4.1)
Earth science						
Physical makeup of Earth's surface (e.g., land and water in unequal proportions, sources of fresh and salt water)	19.6	(3.8)	36.0	(4.7)	44.4	(4.9)
Earth's resources used in everyday life (e.g., water, wind, soil, forests, oil, natural gas, minerals)	15.9	(3.1)	47.4	(4.7)	36.6	(4.5)
Changes in Earth's surface over time (e.g., mountain building, weathering, erosion)	9.5	(2.9)	13.3	(2.7)	77.2	(3.8)
Fossils and what they can tell us about past conditions on Earth	15.7	(3.1)	24.2	(4.0)	60.1	(4.7)
Weather and climate (e.g., daily, seasonal, and locational variations versus long-term trends)	34.7	(4.4)	34.6	(4.1)	30.8	(3.8)
Objects in the solar system (the Sun, the Earth, the Moon, and other planets) and their movements	30.8	(4.6)	53.9	(5.1)	15.3	(3.0)
Earth's motion and related patterns observed on Earth (e.g., day and night, seasons)	33.2	(4.7)	50.3	(5.0)	16.5	(3.6)

U Too unreliable to be published.

TABLE B.3.29 Percentage of TIMSS curriculum topics covered in Grade 4 mathematics for Ontario

Mathematics — Ontario	Mostly taught before this year		Mostly taught this year		Not yet taught or just introduced	
	%	Standard error	%	Standard error	%	Standard error
Number						
Concepts of whole numbers, including place value and ordering	47.4	(5.5)	52.6	(5.5)	0.0	(0.0)
Adding, subtracting, multiplying, and dividing with whole numbers	26.1	(4.9)	67.4	(5.0)	U	(2.4)
Concepts of multiples and factors; odd and even numbers	29.1	(4.2)	55.9	(4.1)	15.0	(3.0)
Number sentences (finding the missing number, representing problem situations with number sentences)	25.3	(4.6)	64.0	(4.7)	10.7	(2.6)
Number patterns (extending number patterns and finding missing terms)	33.3	(5.1)	63.3	(5.3)	U	(1.5)
Concepts of fractions, including representing, comparing and ordering, adding and subtracting simple fractions	9.3	(2.4)	55.7	(3.5)	35.0	(3.4)
Concepts of decimals, including place value and ordering, adding and subtracting with decimals	U	(1.6)	56.9	(5.4)	38.9	(5.4)
Measurement and geometry						
Solving problems involving length, including measuring and estimating	33.3	(5.0)	62.8	(5.2)	U	(1.8)
Solving problems involving mass, volume, and time	20.3	(3.6)	50.2	(5.4)	29.5	(4.7)
Finding and estimating perimeter, area, and volume	11.3	(2.5)	71.7	(5.0)	17.0	(4.3)
Parallel and perpendicular lines	14.3	(2.7)	60.3	(4.1)	25.4	(3.8)
Comparing and drawing angles	8.4	(2.0)	73.8	(3.6)	17.8	(3.2)
Elementary properties of common geometric shapes	35.7	(3.7)	52.9	(5.3)	U	(4.8)
Three-dimensional shapes, including relationships with their two-dimensional representations	25.0	(3.6)	50.5	(4.1)	24.5	(2.8)
Data display						
Reading and interpreting data from tables, pictographs, bar graphs, line graphs, and pie charts	27.9	(3.7)	69.7	(3.6)	U	(1.1)
Organizing and representing data to help answer questions	31.1	(3.5)	67.7	(3.4)	U	(0.6)
Drawing conclusions from data displays	22.4	(3.3)	74.6	(3.3)	U	(1.2)

U Too unreliable to be published.

TABLE B.3.30 Percentage of TIMSS curriculum topics covered in Grade 4 science for Ontario

Science — Ontario	Mostly taught before this year		Mostly taught this year		Not yet taught or just introduced	
	%	Standard error	%	Standard error	%	Standard error
Life science						
Physical and behavioural characteristics of living things and major groups of living things (e.g., mammals, birds, insects, flowering plants)	37.1	(4.2)	47.0	(4.6)	15.8	(3.9)
Major body structures and their functions in humans, other animals, and plants	17.5	(3.4)	13.9	(4.3)	68.6	(5.5)
Life cycles of common plants and animals (e.g., flowering plants, butterflies, frogs)	63.0	(4.2)	22.5	(3.5)	14.5	(3.9)
Characteristics of plants and animals that are inherited	37.7	(4.5)	30.6	(4.5)	31.7	(4.6)
Interactions between organisms and their environments (e.g., physical features and behaviours that help living things survive in their environments)	16.2	(4.8)	70.0	(5.9)	13.8	(3.5)
Relationships in ecosystems (e.g., simple food chains, predator-prey relationships, competition)	11.7	(3.0)	72.7	(5.8)	15.6	(4.9)
Human health (transmission and prevention of diseases, everyday behaviours that promote good health)	17.1	(3.1)	30.9	(5.4)	52.0	(5.7)
Physical science						
States of matter (solid, liquid, gas) and their properties (volume, shape)	46.4	(4.5)	16.3	(3.7)	37.3	(4.1)
Classifying materials based on physical properties (e.g., weight/mass, volume, state of matter, conductivity of heat or electricity)	21.7	(4.9)	20.9	(3.8)	57.4	(4.5)
Mixtures, including methods for separating a mixture into its components (e.g., sifting, filtering, evaporation, using a magnet)	24.3	(3.8)	9.3	(2.5)	66.5	(4.4)
Properties of magnets (e.g., like poles repel and opposite poles attract, magnets can attract some objects)	45.9	(3.8)	12.2	(2.9)	41.9	(3.7)
Physical changes in everyday life (e.g., changes of state, dissolving)	34.7	(5.6)	15.9	(3.2)	49.4	(6.0)
Chemical changes in everyday life (e.g., decaying, burning, rusting, cooking)	17.7	(4.5)	9.4	(2.7)	72.9	(5.1)
Common sources of energy (e.g., the sun, wind, oil) and uses of energy (heating and cooling homes, providing light)	27.7	(4.5)	38.9	(4.5)	33.3	(4.0)
Light and sound in everyday life (e.g., shadows and reflections, vibrating objects make sound)	U	(3.8)	74.0	(5.0)	17.9	(2.9)
Heat transfer (e.g., energy flows from a hot object to a colder object)	12.1	(2.7)	22.3	(3.9)	65.6	(4.2)
Electricity and simple electrical circuits (e.g., a circuit must be complete to work correctly)	6.8	(2.0)	14.8	(3.0)	78.4	(3.3)
Forces that cause objects to move (e.g., gravity, pushing/pulling) or change their motion (e.g., friction)	41.7	(5.7)	21.4	(3.4)	36.9	(6.0)
Simple machines (e.g., levers, pulleys, wheels, ramps) that help make motion easier	31.4	(4.6)	51.0	(4.2)	17.6	(3.2)
Earth science						
Physical makeup of Earth's surface (e.g., land and water in unequal proportions, sources of fresh and salt water)	25.3	(4.7)	21.8	(3.7)	52.9	(5.8)
Earth's resources used in everyday life (e.g., water, wind, soil, forests, oil, natural gas, minerals)	18.6	(3.7)	43.8	(4.0)	37.7	(4.0)
Changes in Earth's surface over time (e.g., mountain building, weathering, erosion)	12.8	(3.1)	54.0	(4.0)	33.2	(4.2)
Fossils and what they can tell us about past conditions on Earth	4.0	(1.3)	51.9	(4.9)	44.1	(4.7)
Weather and climate (e.g., daily, seasonal, and locational variations versus long-term trends)	26.6	(3.9)	24.0	(3.4)	49.4	(4.4)
Objects in the solar system (the Sun, the Earth, the Moon, and other planets) and their movements	21.8	(3.6)	12.2	(2.6)	65.9	(4.5)
Earth's motion and related patterns observed on Earth (e.g., day and night, seasons)	35.6	(4.4)	9.8	(2.3)	54.6	(4.4)

U Too unreliable to be published.

TABLE B.3.31 Percentage of TIMSS curriculum topics covered in Grade 4 mathematics for Manitoba

Mathematics — Manitoba	Mostly taught before this year		Mostly taught this year		Not yet taught or just introduced	
	%	Standard error	%	Standard error	%	Standard error
Number						
Concepts of whole numbers, including place value and ordering	49.4	(4.1)	47.9	(4.0)	U ‡	(2.0)
Adding, subtracting, multiplying, and dividing with whole numbers	15.4	(2.9)	81.2	(3.3)	U	(1.5)
Concepts of multiples and factors; odd and even numbers	25.7	(4.0)	58.5	(4.2)	15.7	(3.0)
Number sentences (finding the missing number, representing problem situations with number sentences)	19.8	(3.4)	71.6	(3.8)	8.6	(2.7)
Number patterns (extending number patterns and finding missing terms)	38.4	(3.9)	54.9	(4.1)	U	(2.5)
Concepts of fractions, including representing, comparing and ordering, adding and subtracting simple fractions	U	(1.8)	48.2	(4.2)	47.3	(4.3)
Concepts of decimals, including place value and ordering, adding and subtracting with decimals	U	(0.7)	42.9	(4.1)	55.9	(4.2)
Measurement and geometry						
Solving problems involving length, including measuring and estimating	29.1	(3.7)	40.3	(4.2)	30.6	(3.1)
Solving problems involving mass, volume, and time	8.5	(2.1)	32.5	(3.5)	59.0	(3.8)
Finding and estimating perimeter, area, and volume	6.0	(1.6)	44.6	(3.9)	49.4	(4.0)
Parallel and perpendicular lines	6.7	(1.8)	24.5	(3.6)	68.8	(3.9)
Comparing and drawing angles	U	(0.9)	12.6	(3.0)	85.7	(3.2)
Elementary properties of common geometric shapes	36.7	(3.7)	27.5	(4.1)	35.7	(3.7)
Three-dimensional shapes, including relationships with their two-dimensional representations	24.3	(3.1)	32.7	(4.3)	43.0	(4.0)
Data display						
Reading and interpreting data from tables, pictographs, bar graphs, line graphs, and pie charts	26.5	(3.7)	54.9	(3.8)	18.6	(3.4)
Organizing and representing data to help answer questions	19.8	(3.3)	58.8	(3.9)	21.5	(3.2)
Drawing conclusions from data displays	17.5	(3.2)	55.1	(3.9)	27.4	(3.9)

‡ There are fewer than 30 observations.
U Too unreliable to be published.

TABLE B.3.32 Percentage of TIMSS curriculum topics covered in Grade 4 science for Manitoba

Science — Manitoba	Mostly taught before this year		Mostly taught this year		Not yet taught or just introduced	
	%	Standard error	%	Standard error	%	Standard error
Life science						
Physical and behavioural characteristics of living things and major groups of living things (e.g., mammals, birds, insects, flowering plants)	45.8	(4.0)	42.2	(4.1)	11.9	(2.7)
Major body structures and their functions in humans, other animals, and plants	23.3	(3.6)	24.4	(3.7)	52.2	(4.5)
Life cycles of common plants and animals (e.g., flowering plants, butterflies, frogs)	73.1	(3.6)	16.5	(2.7)	10.4	(2.7)
Characteristics of plants and animals that are inherited	43.4	(4.2)	27.3	(3.5)	29.3	(4.0)
Interactions between organisms and their environments (e.g., physical features and behaviours that help living things survive in their environments)	21.2	(3.5)	64.1	(4.2)	14.7	(2.9)
Relationships in ecosystems (e.g., simple food chains, predator-prey relationships, competition)	23.1	(3.3)	61.8	(4.4)	15.0	(3.1)
Human health (transmission and prevention of diseases, everyday behaviours that promote good health)	17.1	(3.2)	42.6	(4.2)	40.3	(4.2)
Physical science						
States of matter (solid, liquid, gas) and their properties (volume, shape)	67.1	(4.1)	8.8	(2.3)	24.1	(4.0)
Classifying materials based on physical properties (e.g., weight/mass, volume, state of matter, conductivity of heat or electricity)	35.2	(4.5)	15.3	(3.0)	49.5	(4.4)
Mixtures, including methods for separating a mixture into its components (e.g., sifting, filtering, evaporation, using a magnet)	38.7	(4.3)	12.9	(2.9)	48.5	(4.3)
Properties of magnets (e.g., like poles repel and opposite poles attract, magnets can attract some objects)	58.1	(4.6)	17.2	(3.5)	24.7	(3.7)
Physical changes in everyday life (e.g., changes of state, dissolving)	42.5	(4.4)	13.3	(2.6)	44.2	(4.0)
Chemical changes in everyday life (e.g., decaying, burning, rusting, cooking)	28.8	(3.8)	11.9	(2.8)	59.3	(4.3)
Common sources of energy (e.g., the sun, wind, oil) and uses of energy (heating and cooling homes, providing light)	24.5	(3.2)	52.1	(3.8)	23.4	(3.4)
Light and sound in everyday life (e.g., shadows and reflections, vibrating objects make sound)	15.5	(2.8)	64.6	(4.1)	19.9	(3.5)
Heat transfer (e.g., energy flows from a hot object to a colder object)	23.2	(3.5)	17.4	(2.9)	59.4	(3.9)
Electricity and simple electrical circuits (e.g., a circuit must be complete to work correctly)	16.2	(3.2)	5.7	(1.8)	78.0	(3.2)
Forces that cause objects to move (e.g., gravity, pushing/pulling) or change their motion (e.g., friction)	44.3	(4.3)	23.3	(3.5)	32.4	(4.1)
Simple machines (e.g., levers, pulleys, wheels, ramps) that help make motion easier	37.8	(4.2)	12.6	(3.1)	49.6	(4.1)
Earth science						
Physical makeup of Earth's surface (e.g., land and water in unequal proportions, sources of fresh and salt water)	32.7	(3.9)	21.1	(3.4)	46.2	(3.9)
Earth's resources used in everyday life (e.g., water, wind, soil, forests, oil, natural gas, minerals)	24.5	(3.8)	38.5	(4.2)	37.0	(4.5)
Changes in Earth's surface over time (e.g., mountain building, weathering, erosion)	14.3	(2.7)	38.9	(4.1)	46.8	(4.2)
Fossils and what they can tell us about past conditions on Earth	15.0	(2.6)	38.9	(4.5)	46.1	(4.4)
Weather and climate (e.g., daily, seasonal, and locational variations versus long-term trends)	23.6	(3.5)	22.5	(3.3)	54.0	(4.1)
Objects in the solar system (the Sun, the Earth, the Moon, and other planets) and their movements	15.0	(2.9)	U	(1.9)	80.7	(3.2)
Earth's motion and related patterns observed on Earth (e.g., day and night, seasons)	31.7	(3.8)	9.9	(2.7)	58.4	(4.0)

U Too unreliable to be published.

TABLE B.3.33 Percentage of TIMSS curriculum topics covered in Grade 4 mathematics for Alberta

Mathematics — Alberta	Mostly taught before this year		Mostly taught this year		Not yet taught or just introduced	
	%	Standard error	%	Standard error	%	Standard error
Number						
Concepts of whole numbers, including place value and ordering	46.6	(4.4)	53.4	(4.4)	0.0	(0.0)
Adding, subtracting, multiplying, and dividing with whole numbers	15.5	(3.6)	82.3	(3.9)	U	(1.5)
Concepts of multiples and factors; odd and even numbers	32.5	(4.5)	53.0	(4.8)	14.5	(3.2)
Number sentences (finding the missing number, representing problem situations with number sentences)	19.4	(3.4)	65.0	(4.5)	15.6	(3.7)
Number patterns (extending number patterns and finding missing terms)	34.5	(4.3)	51.1	(4.6)	14.4	(3.6)
Concepts of fractions, including representing, comparing and ordering, adding and subtracting simple fractions	U	(1.9)	48.1	(4.6)	47.7	(4.4)
Concepts of decimals, including place value and ordering, adding and subtracting with decimals	U ‡	(1.0)	53.2	(4.4)	45.3	(4.3)
Measurement and geometry						
Solving problems involving length, including measuring and estimating	31.4	(4.4)	39.4	(4.7)	29.2	(4.3)
Solving problems involving mass, volume, and time	10.1	(2.7)	29.9	(4.1)	60.0	(4.0)
Finding and estimating perimeter, area, and volume	10.1	(1.9)	37.9	(4.8)	52.0	(4.9)
Parallel and perpendicular lines	U	(2.8)	31.5	(5.2)	60.7	(5.4)
Comparing and drawing angles	U	(1.4)	10.7	(2.7)	86.9	(3.0)
Elementary properties of common geometric shapes	44.6	(4.5)	30.7	(4.5)	24.7	(3.9)
Three-dimensional shapes, including relationships with their two-dimensional representations	27.7	(4.3)	33.0	(4.3)	39.3	(4.6)
Data display						
Reading and interpreting data from tables, pictographs, bar graphs, line graphs, and pie charts	23.3	(3.5)	55.8	(4.3)	20.9	(3.3)
Organizing and representing data to help answer questions	17.8	(3.3)	57.3	(4.0)	24.9	(3.5)
Drawing conclusions from data displays	20.5	(3.4)	54.4	(3.9)	25.1	(2.9)

‡ There are fewer than 30 observations.
U Too unreliable to be published.

TABLE B.3.34 Percentage of TIMSS curriculum topics covered in Grade 4 science for Alberta

Science — Alberta	Mostly taught before this year		Mostly taught this year		Not yet taught or just introduced	
	%	Standard error	%	Standard error	%	Standard error
Life science						
Physical and behavioural characteristics of living things and major groups of living things (e.g., mammals, birds, insects, flowering plants)	60.1	(4.9)	18.6	(4.1)	21.3	(3.8)
Major body structures and their functions in humans, other animals, and plants	31.2	(4.4)	18.2	(3.7)	50.6	(4.3)
Life cycles of common plants and animals (e.g., flowering plants, butterflies, frogs)	44.7	(4.7)	30.8	(4.1)	24.6	(3.9)
Characteristics of plants and animals that are inherited	19.3	(4.1)	23.8	(3.7)	56.9	(4.7)
Interactions between organisms and their environments (e.g., physical features and behaviours that help living things survive in their environments)	33.0	(4.7)	32.9	(4.2)	34.1	(4.7)
Relationships in ecosystems (e.g., simple food chains, predator-prey relationships, competition)	30.3	(4.0)	34.6	(4.6)	35.0	(4.5)
Human health (transmission and prevention of diseases, everyday behaviours that promote good health)	24.5	(3.6)	26.7	(4.1)	48.8	(4.2)
Physical science						
States of matter (solid, liquid, gas) and their properties (volume, shape)	41.3	(4.4)	11.1	(3.2)	47.6	(4.9)
Classifying materials based on physical properties (e.g., weight/mass, volume, state of matter, conductivity of heat or electricity)	18.8	(3.8)	U	(2.9)	73.4	(4.6)
Mixtures, including methods for separating a mixture into its components (e.g., sifting, filtering, evaporation, using a magnet)	26.7	(4.2)	U	(2.3)	67.9	(4.6)
Properties of magnets (e.g., like poles repel and opposite poles attract, magnets can attract some objects)	58.3	(4.3)	3.9	(1.2)	37.7	(4.4)
Physical changes in everyday life (e.g., changes of state, dissolving)	25.5	(4.2)	U	(2.9)	66.6	(4.9)
Chemical changes in everyday life (e.g., decaying, burning, rusting, cooking)	U	(3.3)	14.2	(3.4)	76.5	(4.5)
Common sources of energy (e.g., the sun, wind, oil) and uses of energy (heating and cooling homes, providing light)	22.5	(4.0)	52.8	(4.1)	24.6	(4.2)
Light and sound in everyday life (e.g., shadows and reflections, vibrating objects make sound)	13.8	(3.5)	71.6	(4.7)	14.6	(3.2)
Heat transfer (e.g., energy flows from a hot object to a colder object)	27.9	(4.2)	10.3	(3.0)	61.8	(4.8)
Electricity and simple electrical circuits (e.g., a circuit must be complete to work correctly)	U	(2.7)	U	(1.7)	90.9	(3.1)
Forces that cause objects to move (e.g., gravity, pushing/pulling) or change their motion (e.g., friction)	8.7	(2.8)	62.7	(4.9)	28.6	(4.2)
Simple machines (e.g., levers, pulleys, wheels, ramps) that help make motion easier	U	(0.8)	92.3	(2.2)	6.8	(2.0)
Earth science						
Physical makeup of Earth's surface (e.g., land and water in unequal proportions, sources of fresh and salt water)	39.2	(4.9)	8.1	(2.5)	52.7	(4.7)
Earth's resources used in everyday life (e.g., water, wind, soil, forests, oil, natural gas, minerals)	16.4	(3.1)	58.4	(3.8)	25.1	(3.8)
Changes in Earth's surface over time (e.g., mountain building, weathering, erosion)	29.9	(4.6)	27.4	(4.2)	42.7	(4.5)
Fossils and what they can tell us about past conditions on Earth	22.7	(4.4)	49.1	(5.6)	28.2	(4.8)
Weather and climate (e.g., daily, seasonal, and locational variations versus long-term trends)	19.4	(4.0)	17.4	(3.7)	63.2	(5.0)
Objects in the solar system (the Sun, the Earth, the Moon, and other planets) and their movements	U	(3.4)	U	(1.3)	87.5	(3.6)
Earth's motion and related patterns observed on Earth (e.g., day and night, seasons)	13.3	(3.4)	12.3	(3.6)	74.4	(4.3)

U Too unreliable to be published.