

TIMSS 2015

Canadian Results from the Trends in International Mathematics and Science Study



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Council of
Ministers
of Education,
Canada

Conseil des
ministres
de l'Éducation
(Canada)

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Note of appreciation

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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 II¹ 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 research studies of cross-national achievement conducted by IEA. The study is coordinated by the IEA's TIMSS & PIRLS 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 2015 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 2015 is coordinated by the Council of Ministers of Education, Canada (CMEC), on behalf of participating provinces.

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 and school supports, learning environments, and student attitudes. These data are collected through the administration of background questionnaires to students, teachers, school principals, parents (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. 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 levels. TIMSS 2015 marks the sixth TIMSS assessment cycle. Over 580,000 students from around the world took part in the assessment, including students from several provinces of Canada. With the results of the 2015 study, 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 results over the past 20 years.

TIMSS assessment results are used for research and policy purposes. In Canada, results are reported only at the national and provincial levels. They are not included in students' academic records, and no results for individual students, schools, or school boards are reported by CMEC, although the results and information may be available in individual provinces.

¹ The TIMSS Grade 8 assessment was administered to students in Secondary II in Quebec and in Grade 8 in the rest of the participating provinces in Canada.

Participation levels in Canada

IEA has established practices for participation in TIMSS since 1995. In total, 57 countries participated in TIMSS 2015 (50 countries at the Grade 4 level and 38 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. 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. However, their results are reported separately in the TIMSS International report. In TIMSS 2015, seven entities participated at the benchmarking level, including two Canadian provinces.

In Canada, five provinces (Alberta, Manitoba, Ontario, Quebec, and Newfoundland and Labrador) participated in TIMSS Grade 4, and four provinces (Manitoba, Ontario, Quebec, and Newfoundland and Labrador) participated in TIMSS Grade 8. At the time of the 2015 assessment, the student mean age in Canada was 9.5 years for the Grade 4 assessment and 13.5 years for the Grade 8 assessment. Overall, there were three levels of participation in Canada:

- **Benchmarking level:** 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 2015 International Report but are presented in the following pages.
- **Canadian level:** The size of the sample at this level is not sufficient to report reliable results for a province. Therefore, the results are aggregated at the country level and reported as part of the Canadian average. Manitoba and Newfoundland and Labrador both participated at this level in Grades 4 and 8.

The other Canadian provinces and territories did not participate in TIMSS 2015.

Why did Canada participate in TIMSS?

Mathematics and science are two 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 adopt healthy habits, make wise financial choices, and apply problem-solving skills effectively in their daily life. Mathematics and science knowledge is not only important at the individual level; it is also fundamental to our collective well-being as a society. Having a population that is well educated in mathematics and science is essential to improving the medical, housing, and transportation sectors, and to maintaining the health of our country's economy while promoting growth, managing environmental issues, and protecting Earth for future generations (adapted from Mullis & Martin, 2013).

CMEC's *Learn Canada 2020* declaration² 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 literacy skills for Canada's primary/elementary and middle school students at regular intervals.

Canadian jurisdictions invest significant amounts of money and other resources into 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 difficulties, and understand the factors that impact 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 20 years. The other participating provinces will be able to use the data obtained from the 2015 assessment in the years to come.

Sampling features of TIMSS 2015

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 2015 target grades appears in the *TIMSS 2015 Assessment Frameworks*³ 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. (Mullis & Martin, 2013, p. 86)

At the eighth grade, the TIMSS target grade should be the grade that represents eight years of schooling, counting from the first year of ISCED Level 1. (Mullis & Martin, 2013, p. 86)

² The document *Learn Canada 2020: Joint declaration, provincial and territorial ministers of education, 2008*, is available at <http://www.cmec.ca/Publications/Lists/Publications/Attachments/187/CMEC-2020-DECLARATION.en.pdf>

³ The *TIMSS 2015 Assessment Frameworks* (Mullis & Martin, 2013) can be found at http://timssandpirls.bc.edu/timss2015/downloads/T15_Frameworks_Full_Book.pdf

ISCED⁴ 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 (pre-primary education) to Level 8 (doctoral study). 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; similarly, the target grade of eight years of schooling would be Grade 8 (or Secondary II in the province of Quebec).

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 grades. If the sampled students' average age at the time of testing would be less than 9.5 years for TIMSS Grade 4 and less than 13.5 years for TIMSS Grade 8, the TIMSS policy recommends that countries sample the next higher grade (i.e., Grade 5 for the TIMSS Grade 4 assessment and Grade 9 for the TIMSS Grade 8 assessment).

The compulsory starting age of schooling in Canada varies across jurisdictions from age five to seven.⁵ Therefore, a student's average age after four and eight years of schooling in each province is at least 9.5 years and 13.5 years, respectively. As a result, in Canada, Grade 4 and Grade 8 were sampled for TIMSS 2015.

General sampling approach

It is highly important that the international target for comprehensive participation of eligible students is met in order to provide reliable results on students' achievement. The goal is to select a sample of students from the entire target population. In TIMSS, this included all students enrolled in the target grades, which represented all students in Grade 4 and in Grade 8 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 stratified⁶ 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 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**
 - o inaccessibility due to a geographically remote location
 - o extremely small size (e.g., four or fewer students in the target grades)
 - o offering a grade structure, or curriculum, radically different from the mainstream educational system
 - o providing instruction solely to students in the student-level exclusion categories listed below (i.e., catering only to special-needs students)

⁴ 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).

⁵ See the *TIMSS 2015 Encyclopedia* (Mullis, Martin, Goh, & Cotter, 2015) to obtain more information on education systems in all participating countries, including Canada.

⁶ For stratification variables, refer to Appendices 3A and 3B in Martin, Mullis & Hooper, 2016. Available at <http://timssandpirls.bc.edu/publications/timss/2015-methods.html>

- **Student-level exclusions**⁷
 - o students with functional disabilities
 - o students with intellectual disabilities
 - o 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 5 per cent of the national target population in a country.
- The overall number of students excluded because they attend very small schools must not exceed 2 per cent 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 2015 mathematics and science assessment is based on a comprehensive framework developed collaboratively with participating countries (Mullis & Martin, 2013). The framework has two dimensions:

1. a *content* dimension specifying the domains or subject matters 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.

The content domains and topic areas of the assessment are different for Grade 4 and Grade 8, but 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.

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.

⁷ For more detailed information, please see Appendix A.

TABLE 1 Content domains, topic areas, and target percentages of the TIMSS 2015 Mathematics Assessment in Grade 4 and Grade 8

	Content domains	Topic areas	%
Grade 4	Number	<ul style="list-style-type: none"> • Whole numbers • Fractions and decimals • Expressions, simple questions, and relationships 	50
	Geometric shapes and measures	<ul style="list-style-type: none"> • Points, lines, and angles • Two- and three-dimensional shapes 	35
	Data display	<ul style="list-style-type: none"> • Reading, interpreting, and representing 	15
Grade 8	Number	<ul style="list-style-type: none"> • Whole numbers • Fractions, decimals, and integers • Ratio, proportion, and per cent 	30
	Algebra	<ul style="list-style-type: none"> • Expressions and operations • Equations and inequalities • Relationships and functions 	30
	Geometry	<ul style="list-style-type: none"> • Geometric shapes • Geometric measurement • Location and movement 	20
	Data and chance	<ul style="list-style-type: none"> • Characteristics of data sets • Data interpretation • Chance 	20

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

TABLE 2 Cognitive domains, thinking processes, and target percentages of the TIMSS 2015 Mathematics Assessment in Grade 4 and Grade 8

Cognitive domains	Thinking processes	% (Grade 4)	% (Grade 8)
Knowing	<ul style="list-style-type: none"> • Recall • Recognize • Classify/order • Compute • Retrieve • Measure 	40	35
Applying	<ul style="list-style-type: none"> • Determine • Represent/model • Implement 	40	40
Reasoning	<ul style="list-style-type: none"> • Analyze • Integrate/synthesize • Evaluate • Draw conclusions • Generalize • Justify 	20	25

The content domains, related topics, 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 Content domains, topic areas, and target percentages of the TIMSS 2015 Science Assessment in Grade 4 and Grade 8

	Content domains	Topic areas	%
Grade 4	Life science	<ul style="list-style-type: none"> • Characteristics and life processes of organisms • Life cycles, reproduction, and heredity • Organisms, environment, and their interactions • Ecosystems • Human health 	45
	Physical science	<ul style="list-style-type: none"> • Classification and properties of matter and changes in matter • Forms of energy and energy transfer • Forces and motion 	35
	Earth science	<ul style="list-style-type: none"> • Earth’s structure, physical characteristics, and resources • Earth’s processes and history • Earth in the solar system 	20
Grade 8	Biology	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Composition of matter • Properties of matter • Chemical change 	20
	Physics	<ul style="list-style-type: none"> • Physical states and changes in matter • Energy transformation and transfer • Light and sound • Electricity and magnetism • Forces and motion 	25
	Earth science	<ul style="list-style-type: none"> • 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, their 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 Cognitive domains, thinking processes, and target percentages of the TIMSS 2015 Science Assessment in Grade 4 and Grade 8

Cognitive domains	Thinking processes	% (Grade 4)	% (Grade 8)
Knowing	<ul style="list-style-type: none">• Recall/recognize• Describe• Provide examples	40	35
Applying	<ul style="list-style-type: none">• Compare/contrast/classify• Relate• Use models• Interpret information• Explain	40	35
Reasoning	<ul style="list-style-type: none">• Analyze• Synthesize• Formulate questions/hypothesize/predict• Design investigations• Evaluate• Draw conclusions• Generalize• Justify	20	30

Student booklet design

The TIMSS 2015 mathematics and science assessment includes a large pool of items in order to maximize coverage of the framework.⁸ In 2015, approximately 350 items for Grade 4 and 450 items for Grade 8 were administered to students, with questionnaires used to gather contextual information. A designated sample of items was presented to each student, as it would be impossible to administer every question to each student. In this approach, which is known as matrix sampling, the assessment items are divided and distributed into a set of 14 unique students achievement booklets at each grade level. While each of these booklets varies in content, all include items in mathematics and in science presented in a pre-established order.

To facilitate distribution, the assessment items are grouped into a series of blocks. The number of assessment items in each block varies depending on the grade level. Grade 4 booklets contain 10 to 14 items per block, and Grade 8 booklets contain 12 to 18 items per block. In both grades, a total of 28 blocks of items, of which 14 are mathematics blocks and 14 are science blocks, are distributed across the 14 booklets. To enable linking between booklets, each block of items appears in 2 of the 14 achievement booklets. The location of a block and the combination of blocks differ by student booklet.

Each student booklet includes a total of four different blocks of items, 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 ones in mathematics.

⁸ See the *TIMSS 2015 Assessment Frameworks* (Mullis & Martin, 2013).

TIMSS also monitors changes in student achievement by measuring trends over time in mathematics and science at the Grade 4 and Grade 8 levels. To measure student performance over time, some common assessment items (or anchors) are used in each assessment cycle. For instance, among the 14 blocks of items in mathematics and the 14 blocks of items in science, 8 in each subject include items that also appeared in the 2011 TIMSS assessment. The remaining 6 blocks of items in mathematics and 6 blocks of items in science were newly developed for the 2015 assessment. These new items were extensively field tested in the year before the main study.

The assessment, which requires each student to complete one booklet, takes 72 minutes to complete at the Grade 4 level and 90 minutes at the Grade 8 level. The assessment is administered in two parts, with a short break in between. An additional 30 minutes are required for students to complete the Student Questionnaire, which collects information on students' characteristics and attitudes towards learning.

Question types and scoring procedures

The following two formats were used for items in the TIMSS 2015 assessment:

- ***Multiple-choice:*** This format included four response options of which only one was correct and three were incorrect but somewhat plausible. Multiple-choice items are written clearly and concisely to minimize the reading load, requiring a relatively short time to answer. Each multiple choice question was worth 1 point and was scored automatically.
- ***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. Students' responses were not scored based on their ability to write. However, it was important that responses be clear and understandable for scorers. Trained teachers scored all constructed-response questions.

Background questionnaires

TIMSS 2015 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 questionnaires administered are the following:

- ***Student Questionnaire:*** This questionnaire was completed by each participating student after the administration of the achievement booklets. 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. The questions were identical for both grades, but the language was simplified for Grade 4 students and more specific for Grade 8 students. This questionnaire required between 15 to 30 minutes for students to complete.
- ***Early Learning Survey (Home Questionnaire) for Grade 4 only:*** Parents or 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' attitudes towards reading and mathematics, and parental education and occupation. It took between 15 to 30 minutes to complete this questionnaire.

- **Teacher Questionnaire:** This questionnaire was administered to teachers of mathematics and science in the selected classes. It asked about teachers' backgrounds, their views on opportunities for collaboration with other teachers, their job satisfaction, their education and training, and their professional development. It also asked about characteristics of the participating classes, instructional time, materials, and activities for teaching mathematics and science and promoting students' interest in mathematics and science, use of computers, assessment practices, and homework. While the questionnaire was similar in Grades 4 and 8, some of the content was specific to teachers at each grade level. The questionnaire took about 30 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 characteristics, instructional time, resources and technology, parental involvement, school climate for learning, teaching staff, the role of the principal, and students' school readiness. It took approximate 30 minutes to complete.
- **Curriculum Questionnaire:** This questionnaire was completed by the TIMSS 2015 National Research Coordinator of each participating country. It asked about the country's curriculum in mathematics and science and the content related to these subjects. Questions on promotion and retention policies, jurisdictional or national examination systems, as well as goals and standards for mathematics and science instruction were also part of this questionnaire. In Canada, ministries or departments of education from most jurisdictions completed this questionnaire. The responses were then collected and aggregated at the Canadian level. Commonalities and differences between 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 2015 Encyclopedia* (<http://timssandpirls.bc.edu/timss2015/international-results/encyclopedia/>).

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 assessments in Grade 4 and Grade 8. 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. The report includes three chapters, as outlined below. Additional information on sampling procedures, exclusion and participation rates, and international benchmarks is provided in the appendices.

Chapter 1 provides information on the overall performance of Grade 4 students in mathematics and science. The chapter provides results for both assessment domains (content and cognitive). Average student achievement scores at the provincial, national, and international levels are presented. Student achievement is also 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). In addition, the chapter presents the changes in student performance in mathematics over time for the provinces of Alberta, Ontario, and Quebec, which participated in past TIMSS assessment cycles.

Chapter 2 provides information on the overall performance of Grade 8 students in mathematics and science. Results for both the content and cognitive domains are presented, as are average student scores at the provincial, national, and international levels. The percentages of Canadian students reaching the advanced, high, intermediate, and low international benchmarks are shown. This chapter also presents trends in student performance in mathematics and science over the years for those provinces (Ontario and Quebec) that participated in TIMSS in previous years.

Chapter 3 presents data from the background questionnaires—more precisely, the Student Questionnaire, the Early Learning Survey (Grade 4 only), the Teacher Questionnaire, the School Questionnaire, and the Curriculum Questionnaire. It reports statistics for variables of interest and, where pertinent, provides an analysis of the relationship between certain variables and student performance in mathematics and science.

The conclusion summarizes the major findings of the Canadian results of the TIMSS 2015 assessment. Finally, the appendices provide additional details on sampling and response rates, level descriptors for the TIMSS international benchmarks, and a number of data tables.

Terminology used in the charts and tables

Differences

In this report, the terms “difference” or “different,” used in the context of achievement levels, benchmarks, and percentages, refer to a difference in a technical sense—that is, to a **statistically significant difference**. A difference is statistically different when there is no overlap of **confidence intervals** between different measurements being compared. Throughout this report, average scores that are significantly different from the Canadian average score are indicated using bold font.

Confidence intervals

In TIMSS 2015, a random sample of Grade 4 and Grade 8 students was selected to participate in the assessment. The average scores were computed based on these students’ responses. Since the purpose of this study is to report results on the Grade 4 and Grade 8 student population (and not individual average scores), the reported achievement scores provide estimates of the achievement results students would have demonstrated if all students in the population had participated in this assessment. This introduced a **sampling error**. In addition, a degree of error is associated with the scores describing student reading skills because these scores are estimated, based on student responses to test items. This error is called the **error of measurement**. Because an estimate that is based on a sample is rarely exact, and because the error

of measurement exists, a **standard error** (S.E.) is computed. In large-scale assessments such as TIMSS, it is common practice, when reporting mean scores, to provide a range of scores within which the “true” achievement level might fall. This range of scores expressed for each average score is called a **confidence interval**. A 95 per cent confidence interval is used in this report to represent the high- and low-end points between which the actual average score should fall 95 per cent of the time (and is computed as ± 1.96 S.E.). It is important to consider the standard error when comparing the results among groups in order to determine if the scores are statistically different from one another.

In other words, one can be confident that the actual achievement level of all students would fall somewhere in the established range 19 times out of 20, if the assessment were repeated with different samples randomly drawn from the same student population. In the charts in this report, confidence intervals are represented by the following symbol: \overline{H} . If the confidence intervals overlap, the differences are defined as not statistically significant. An additional test of significance (t-test) was conducted when the confidence intervals overlapped slightly in order to verify if the difference is statistically significant.

Results for the province of Quebec in this report should be treated with caution because of a possible non-response bias (see Appendix A for further details).

CHAPTER 1

The performance of Canadian Grade 4 students in mathematics and science

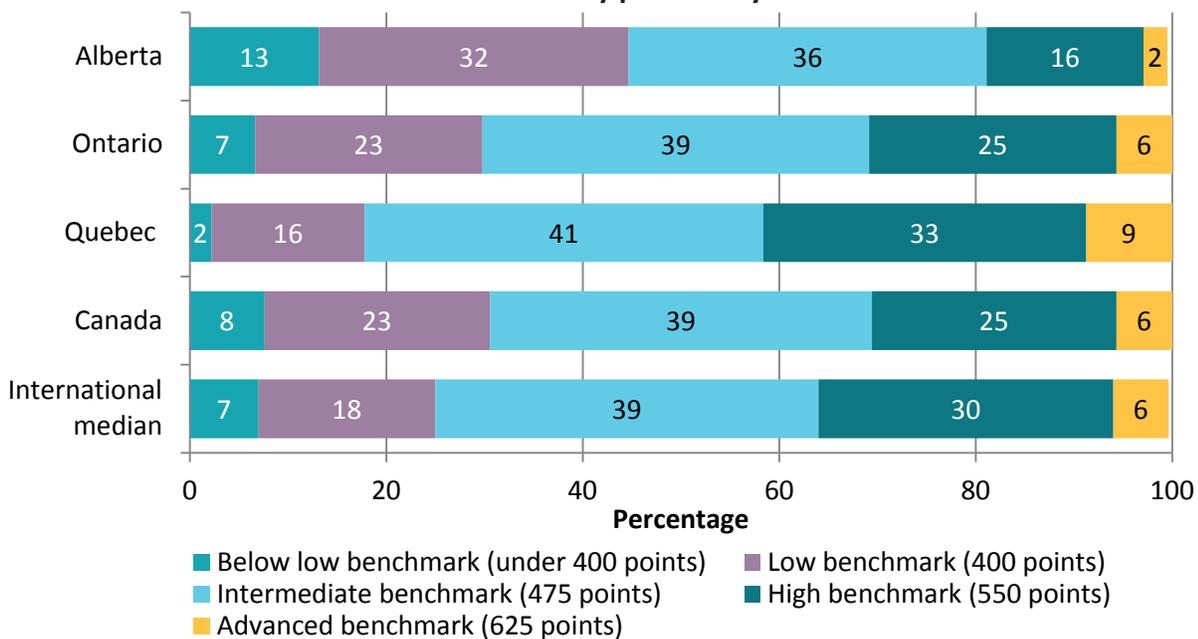
This chapter presents results of the TIMSS 2015 assessment in mathematics and science at the Grade 4 level. The overall proficiency levels will be presented for provinces participating at the benchmark and oversampling levels (see page 10), followed by the results for Canada as a whole and the average scores for all participating countries and jurisdictions. The results will then be broken down by content and cognitive domains, by gender, and by official language. Finally, change in mathematics and science performance over time will be discussed for the three provinces that participated at the benchmarking (Ontario and Quebec) and oversampling (Alberta) levels.

In Canada, over 90 per cent of Grade 4 students have reached a basic level of achievement in mathematics and science

TIMSS reports achievement using four points along a scale of international benchmarks: advanced (625 points), high (550 points), intermediate (475 points), and low (400). 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. Sample items and detailed level descriptors by grade level and subject are available on the TIMSS Web site.⁹

In mathematics, over 90 per cent of Canadian students reached at least the basic (low) level of achievement. Sixty-nine per cent reached at least the intermediate level, compared to 75 per cent internationally. Within Canada, this proportion ranged from 55 per cent in Alberta to 82 per cent in Quebec (Chart 1.1, Appendix B.1.1).

CHART 1.1 Distribution of Grade 4 students by proficiency level in mathematics

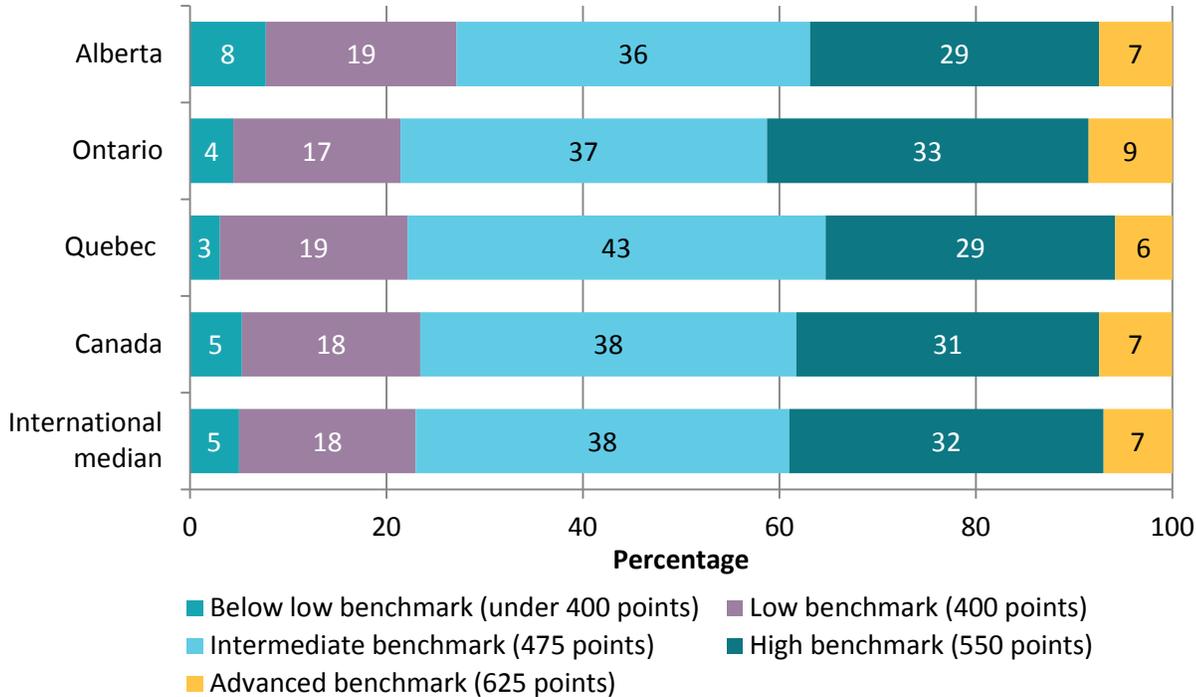


Note: Percentages may not add up to 100 due to rounding.

⁹ <http://timssandpirls.bc.edu/timss2015/international-results/timss-2015/mathematics/performance-at-international-benchmarks/item-map-and-summary-of-international-benchmarks/>

In science, more than 90 per cent of Canadian students also reached at least the basic (low) level of achievement, and 77 per cent reached at least the intermediate level—a proportion that was the same as that achieved internationally. Among provinces, Ontario had the most students (79 per cent) reaching the intermediate level, while Alberta (73 per cent) had the fewest (Chart 1.2, Appendix B.1.2).

CHART 1.2 Distribution of Grade 4 students by proficiency level in science



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

Canadian Grade 4 students performed above the international average in mathematics and science

Table 1.1 lists those countries and provinces performing significantly better than, as well as, or not as well as Canada¹⁰ on the overall mathematics and science scales. Overall, Canadian Grade 4 students achieved a mean score of 511 in mathematics and 525 in science, both above the international centrepoint of 500.

In mathematics, 26 countries scored higher than the Canadian average, 4 countries scored statistically the same, and 18 countries scored lower (Table 1.1). For the three Canadian provinces for which results can be reported, Quebec performed better than Canada, with an average score of 536; Ontario performed as well as Canada, with an average score of 512; and Alberta did not perform as well as Canada, with an average score of 484 (Appendix B.1.3).

In science, 17 countries achieved a higher average score than Canada; 10 countries achieved a statistically equivalent score; and 19 countries achieved a lower score. Within the country, Ontario, Quebec, and Alberta all performed as well as Canada taken as a whole (Table 1.1, Appendix B1.4).

¹⁰ The Canadian average comprises achievement results of Grade 4 students in five provinces: Alberta, Manitoba, Ontario, Quebec, and Newfoundland and Labrador

TABLE 1.1 Comparison of country and provincial results to the Canadian average in Grade 4 mathematics and science

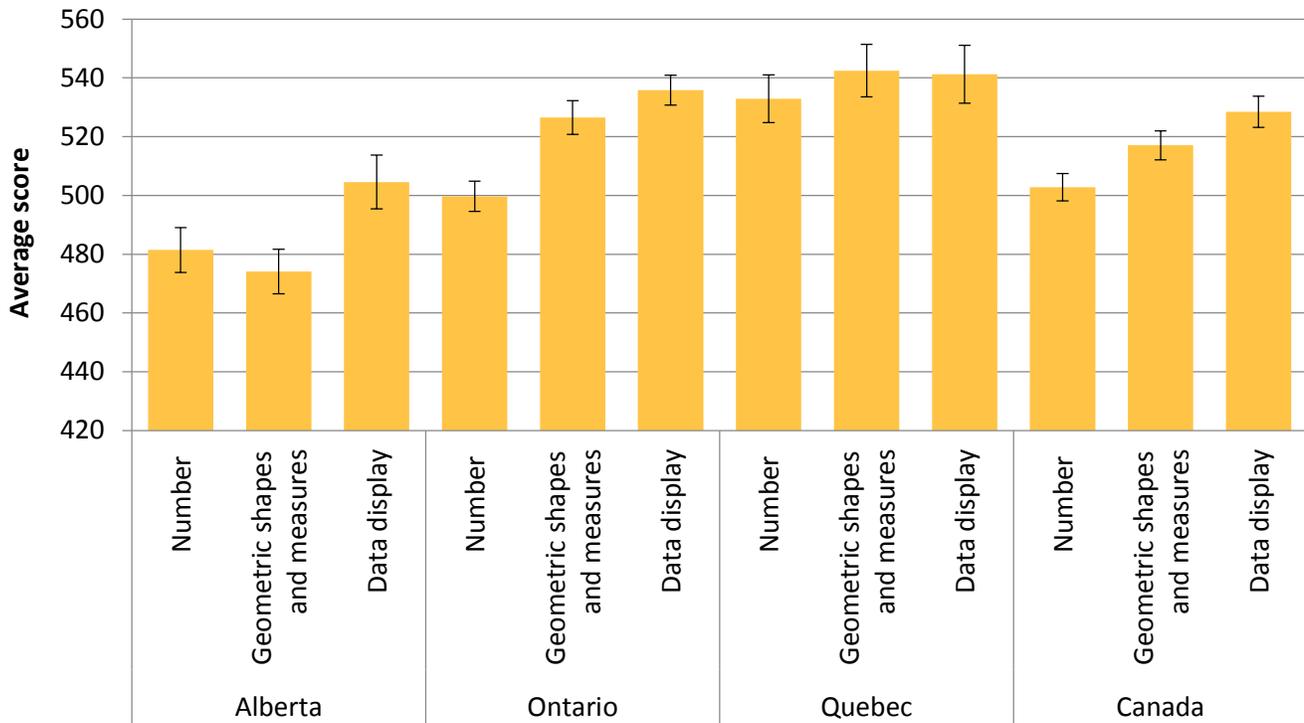
Subject area	Better than Canada*	As well as Canada*	Not as well as Canada*
Mathematics	Singapore, Hong Kong SAR, Korea, Chinese Taipei, Japan, Northern Ireland, Russian Federation, Norway, Ireland, England, Belgium (Flemish), Kazakhstan, Portugal, United States, Denmark, Quebec , Lithuania, Finland, Poland, Netherlands, Hungary, Czech Republic, Bulgaria, Cyprus, Germany, Slovenia, Sweden	Serbia, Australia, Ontario , Italy, Spain	Croatia, Slovak Republic, New Zealand, France, Alberta , Turkey, Georgia, Chile, United Arab Emirates, Bahrain, Qatar, Islamic Republic of Iran, Oman, Indonesia, Jordan, Saudi Arabia, Morocco, South Africa, Kuwait
Science	Singapore, Korea, Japan, Russian Federation, Hong Kong SAR, Chinese Taipei, Finland, Kazakhstan, Poland, United States, Slovenia, Hungary, Sweden, Norway, England, Czech Republic, Croatia	Bulgaria, Ontario , Ireland, Germany, Lithuania, Denmark, Serbia, Quebec , Australia, Slovak Republic, Northern Ireland, Alberta , Spain	Netherlands, Italy, Belgium (Flemish), Portugal, New Zealand, France, Turkey, Cyprus, Chile, Bahrain, Georgia, United Arab Emirates, Qatar, Oman, Iran, Indonesia, Saudi Arabia, Morocco, Kuwait

* Differences in scores are statistically significant only when confidence intervals do not overlap. If the confidence intervals overlap, an additional test of significance was conducted to determine whether the difference was statistically significant. Countries performing as well as Canada have a confidence interval that overlaps that of Canada.

Canadian Grade 4 students were stronger in dealing with data and in reasoning in mathematics

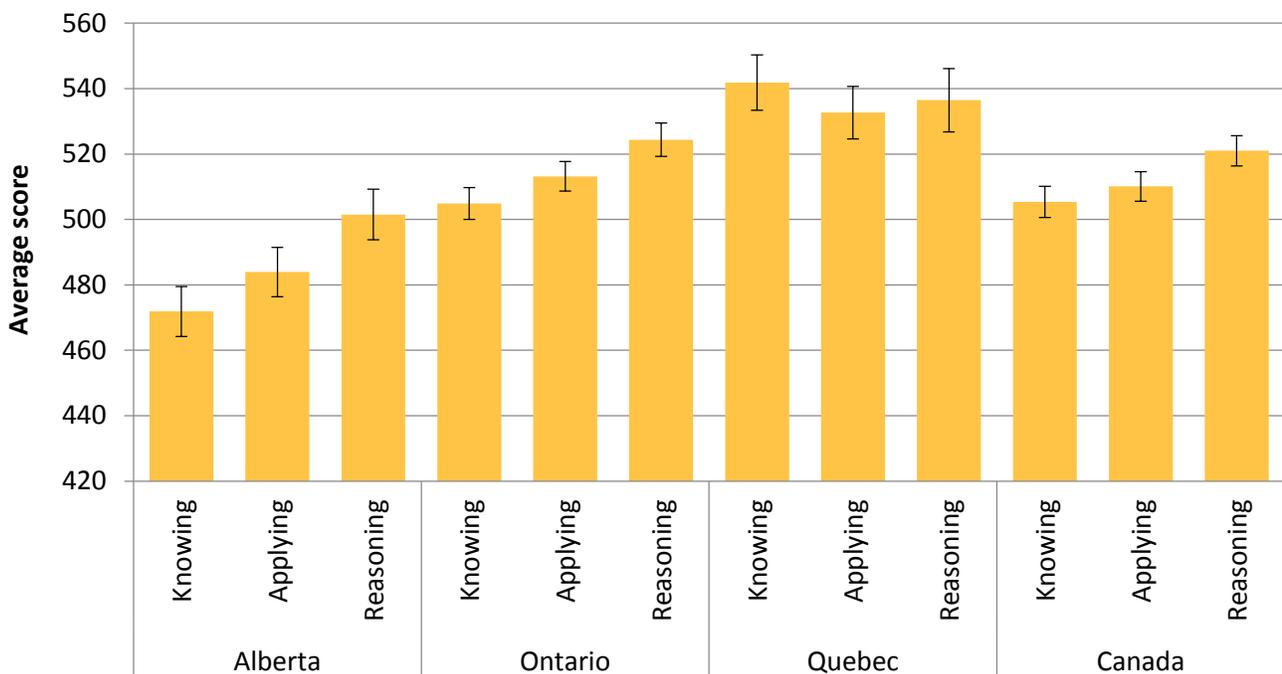
There are three content domains in mathematics (*number*, *geometric shapes and measures*, and *data display*). In Canada overall, students had much stronger results in *data display* and *geometric shapes and measures* than in *number*. A similar pattern was observed in Ontario, whereas students in Quebec showed roughly equal strength in all three domains and Alberta students were stronger in *data display* (Chart 1.3, Appendix B.1.5).

CHART 1.3 Grade 4 results in mathematics by content domain



In analyzing performance by mathematical processes (*knowing*, *applying*, and *reasoning*), it was found that students in Canada overall and Quebec tended to be equally strong in all three processes, whereas students in Ontario and Alberta tended to perform better in *applying* and *reasoning* than in *knowing* (Chart 1.4, Appendix B.1.6).

CHART 1.4 Grade 4 results in mathematics by cognitive domain



Canadian Grade 4 students showed strong results in life science

The three content domains in science examined in TIMSS are *life science*, *physical science*, and *Earth science*, and the three cognitive domains are *knowing*, *applying*, and *reasoning*. Canadian students obtained higher results in *life science* than in the other content domains, with Ontario students showing the highest average score (Chart 1.5, Appendix B.1.7). Results by cognitive domain were, by contrast, fairly uniform: across all three domains, and in all jurisdictions, students achieved broadly similar results (Chart 1.6, Appendix B.1.8).

CHART 1.5 Grade 4 results in science by content domain

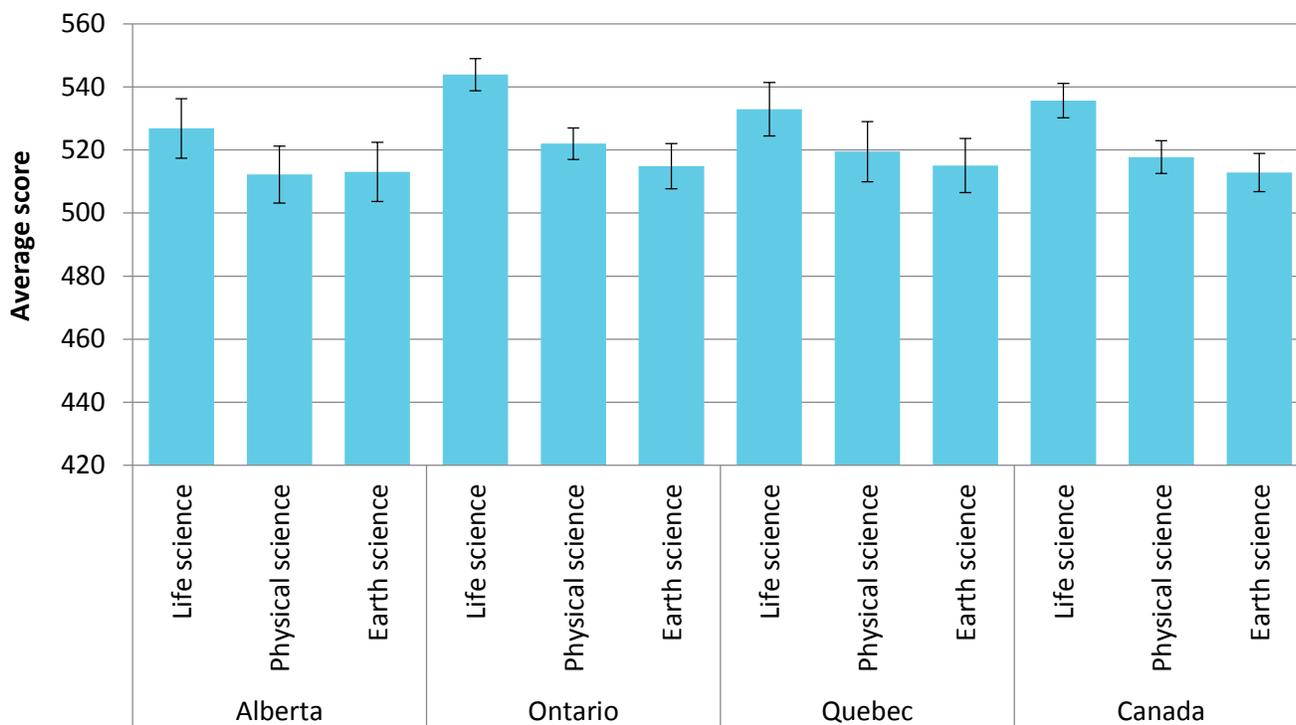
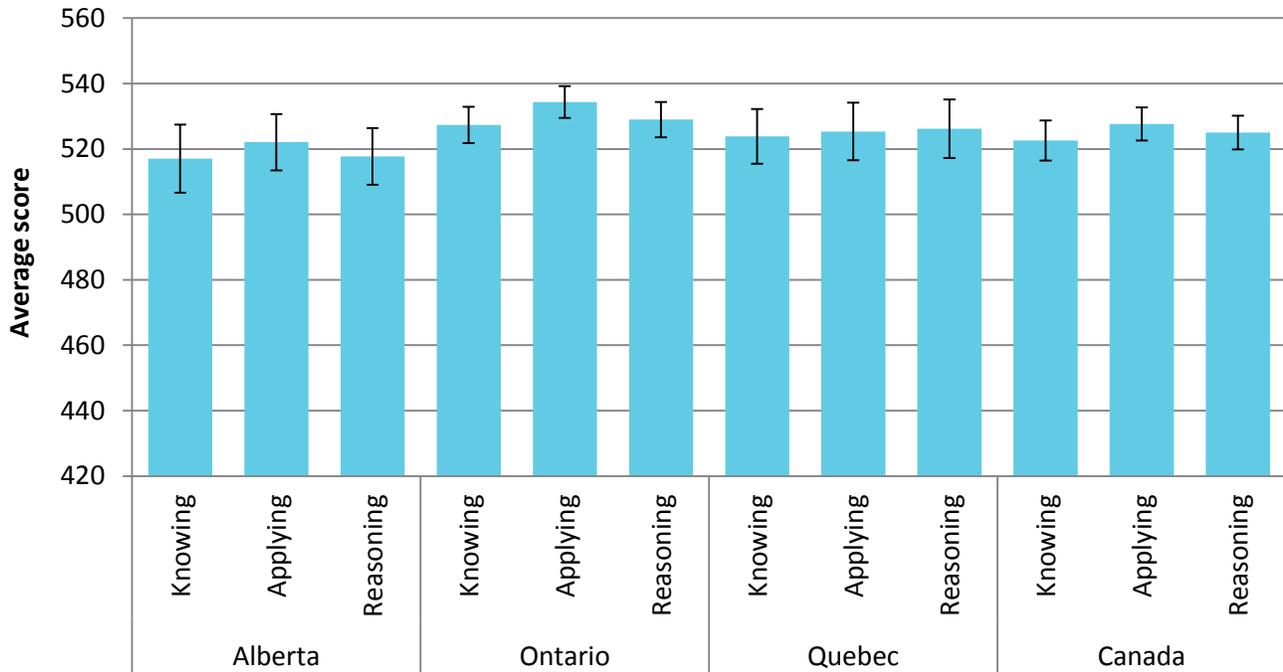


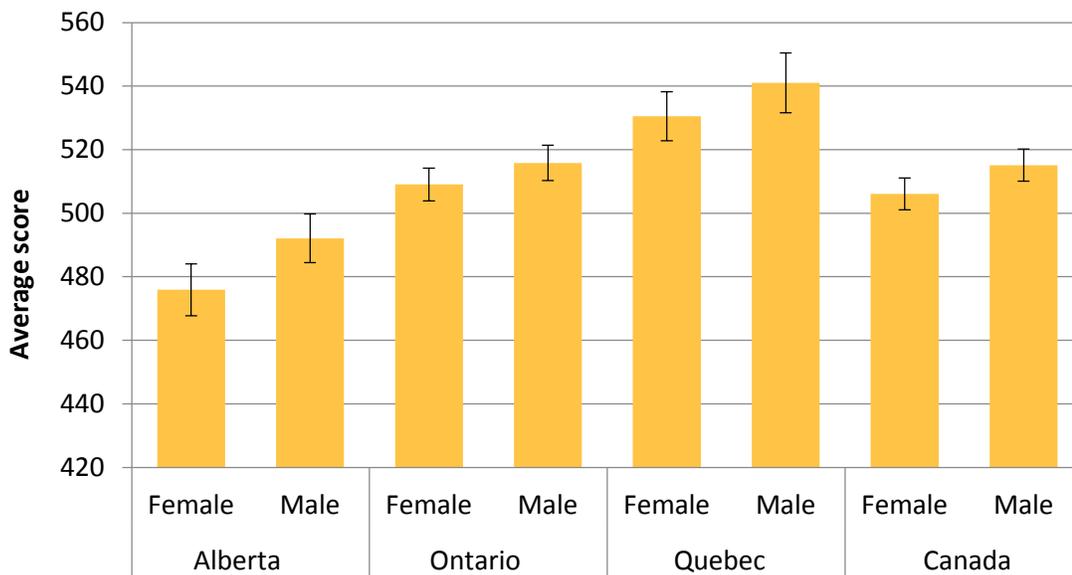
CHART 1.6 Grade 4 results in science by cognitive domain



There was a small but significant gender gap in favour of Grade 4 boys in mathematics

While there was no gender difference in overall mathematics achievement internationally, in Canada boys performed better than girls by nine points. The gender difference was larger in Alberta than in Ontario and Quebec (Chart 1.7, Appendix B.1.9).

CHART 1.7 Grade 4 results in overall mathematics by gender



Across Canada, there are also gender differences found in the mathematics subdomains. Boys performed better than girls in *geometric shapes and measures* and in *number* in Canada overall and in the three provinces; in *data display*, boys performed better than girls in Alberta only (Table 1.2).

TABLE 1.2 Grade 4 results in mathematics by content domain and gender

Mathematics content domain	Jurisdiction	Average score				Difference between genders*	
		Female	S.E.	Male	S.E.	Score difference	S.E.
Number	Alberta	472	4.5	490	4.1	-18*	3.5
	Ontario	495	3.1	504	2.9	-9*	3.0
	Quebec	526	4.1	539	5.1	-13*	4.0
	Canada	497	2.7	509	2.6	-11*	2.2
Geometric shapes and measures	Alberta	466	4.7	482	3.8	-16*	3.6
	Ontario	523	3.0	530	3.6	-7*	3.0
	Quebec	538	4.5	547	5.5	-8*	4.3
	Canada	513	2.7	521	2.8	-9*	2.2
Data display	Alberta	499	5.1	510	5.0	-11*	3.5
	Ontario	534	3.0	537	3.0	-3	3.0
	Quebec	539	5.2	543	5.7	-4	4.1
	Canada	526	2.7	531	3.1	-4	2.3

*Statistically significant difference

Turning to results by mathematical process, we find that boys performed better than girls in all cognitive domains in every jurisdiction, with the exception of *knowing* in Ontario and Quebec. The differences were the largest in *reasoning* (Table 1.3).

TABLE 1.3 Grade 4 results in mathematics by cognitive domain and gender

Mathematics cognitive domain	Jurisdiction	Average score				Difference between genders*	
		Female	S.E.	Male	S.E.	Score difference	S.E.
Knowing	Alberta	465	4.7	479	4.1	-15*	3.8
	Ontario	502	2.9	508	2.9	-5	3.0
	Quebec	538	4.1	546	5.3	-7	3.8
	Canada	502	2.5	509	2.8	-7*	2.3
Applying	Alberta	476	4.5	492	3.9	-15*	3.2
	Ontario	510	2.7	516	2.8	-6*	2.9
	Quebec	528	4.1	537	4.8	-9*	3.6
	Canada	506	2.5	514	2.5	-8*	2.0
Reasoning	Alberta	492	4.3	511	4.3	-19*	3.3
	Ontario	519	2.9	529	3.3	-10*	3.5
	Quebec	529	4.9	544	5.8	-16*	4.3
	Canada	515	2.5	527	2.8	-13*	2.6

*Statistically significant difference

There was no gender gap in Grade 4 in science overall

There was no gender gap in science overall at the Grade 4 level (Chart 1.8, Appendix B.1.10); however, there were gender differences in the science subdomains. Girls performed better than boys in *life science* in Canada overall and in Ontario. Boys outperformed girls in *Earth science* in Canada overall and in Alberta and Quebec, and in *physical science* in Alberta and Quebec (Table 1.4).

CHART 1.8 Grade 4 results in overall science by gender

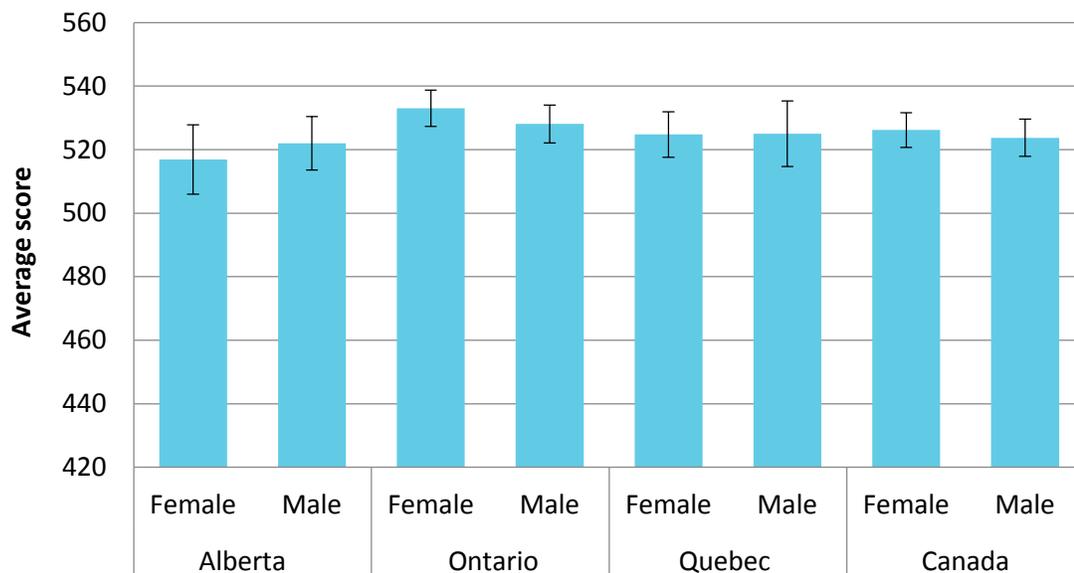


TABLE 1.4 Grade 4 results in science by content domain and gender

Science content domain	Jurisdiction	Average score				Difference between genders*	
		Female	S.E.	Male	S.E.	Score difference	S.E.
Life science	Alberta	529	5.7	525	4.7	4	3.5
	Ontario	551	3.1	537	3.0	15*	3.3
	Quebec	536	4.2	530	5.1	6	3.8
	Canada	541	3.1	531	2.9	11*	2.2
Physical science	Alberta	508	5.3	517	4.8	-9*	4.1
	Ontario	523	3.4	521	2.9	2	3.7
	Quebec	515	5.0	524	5.5	-8*	3.8
	Canada	517	3.1	519	2.9	-3	2.6
Earth science	Alberta	507	6.0	519	5.0	-12*	5.3
	Ontario	514	4.5	516	4.1	-2	4.5
	Quebec	510	4.2	520	5.3	-11*	4.0
	Canada	510	3.6	516	3.5	-6*	3.5

*Statistically significant difference

In science, gender differences were less common among the cognitive domains. There was no difference in average scores between the two sexes in any of the domains except for *reasoning* (where girls performed better than boys in Canada overall and in Ontario) and *knowing* (where boys performed better than girls in Alberta) (Table 1.5).

TABLE 1.5 Grade 4 results in science by cognitive domain and gender

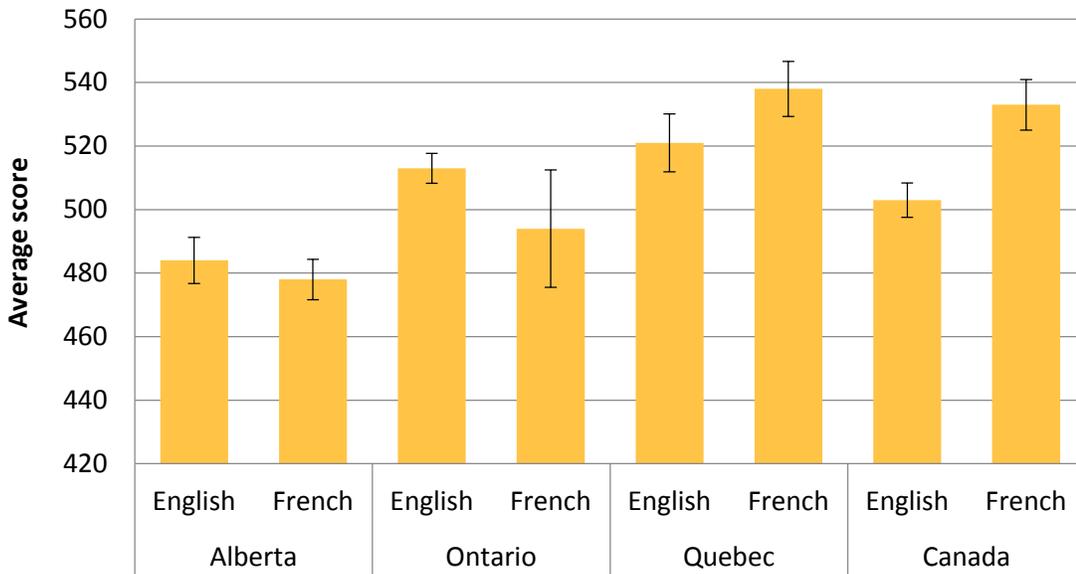
Science cognitive domain	Jurisdiction	Average score				Difference between genders*	
		Female	S.E.	Male	S.E.	Score difference	S.E.
Knowing	Alberta	513	6.1	522	5.2	-9*	4.0
	Ontario	528	3.4	527	3.4	2	3.8
	Quebec	521	4.5	527	5.0	-6	4.2
	Canada	522	3.6	524	3.2	-2	2.7
Applying	Alberta	520	5.7	524	4.1	-4	4.5
	Ontario	538	3.1	531	2.9	7	3.4
	Quebec	525	4.6	526	5.1	-1	3.8
	Canada	529	3.1	526	2.7	3	2.5
Reasoning	Alberta	520	5.8	516	3.9	5	4.1
	Ontario	536	2.8	522	3.4	14*	3.0
	Quebec	528	4.9	524	5.0	4	3.7
	Canada	530	2.7	520	2.9	10*	2.0

*Statistically significant difference

There were notable differences in mathematics achievement by language of the school system

The performance of Canadian students also reveals some differences by language. In Quebec, students in the French-language school system performed better in mathematics (by 16 points) than students in the English-language system; this had the effect of raising the results for students in Canada’s francophone school systems above those of their English-language counterparts, even though students in the English-language school systems in Ontario and Alberta had higher results than their francophone peers (Chart 1.9, Appendix B.1.11).

CHART 1.9 Grade 4 results in overall mathematics by language of the school system



Turning to results by content domain in mathematics, students in the English-language school system in Alberta and Ontario performed better than their French-language counterparts in *data display*. In Quebec, students in the French-language school system had significantly higher results in *geometric shapes and measures* and in *number*. Finally, in Canada overall, students in the French-language systems achieved higher results in all three domains (Table 1.6).

TABLE 1.6 Grade 4 results in mathematics by content domain and language of the school system

Mathematics content domain	Jurisdiction	Average score				Difference between systems*	
		English	S.E.	French	S.E.	Score difference	S.E.
Number	Alberta	481	3.9	480	3.2	1	6.5
	Ontario	500	2.7	486	10.9	14	11.1
	Quebec	517	5.6	535	4.6	-18*	7.2
	Canada	493	2.8	530	4.3	-37*	4.8
Geometric shapes and measures	Alberta	474	3.9	469	4.2	5	5.4
	Ontario	527	3.0	507	10.4	20	10.7
	Quebec	523	6.5	545	5.1	-22*	8.3
	Canada	509	3.0	541	4.7	-33*	5.6
Data display	Alberta	505	4.7	484	6.6	21*	6.5
	Ontario	537	2.7	506	12.0	31*	12.5
	Quebec	541	5.9	541	5.5	0	7.7
	Canada	525	3.0	538	5.2	-13*	5.8

*Statistically significant difference

In all three cognitive domains in mathematics, students in French-language school systems in Canada overall performed better than their English-language counterparts. In Quebec, students in the French-language school system achieved higher results in *knowing* and in *applying*, while in Ontario students in the English-language system performed better in *reasoning* (Table 1.7).

TABLE 1.7 Grade 4 results in mathematics by cognitive domain and language of the school system

Mathematics cognitive domain	Jurisdiction	Average score				Difference between systems*	
		English	S.E.	French	S.E.	Score difference	S.E.
Knowing	Alberta	472	3.9	469	5.5	3	5.9
	Ontario	506	2.5	490	10.2	16	10.4
	Quebec	524	6.1	544	4.8	-20*	7.5
	Canada	494	2.8	539	4.4	-45*	5.1
Applying	Alberta	484	3.9	478	3.2	6	4.9
	Ontario	514	2.4	496	9.5	18	9.7
	Quebec	520	5.5	534	4.5	-14*	7.1
	Canada	503	2.7	530	4.2	-27*	4.9
Reasoning	Alberta	502	4.0	493	5.5	9	7.2
	Ontario	526	2.7	500	11.6	25*	12.0
	Quebec	527	6.6	538	5.5	-11	8.8
	Canada	516	2.8	534	5.1	-18*	6.0

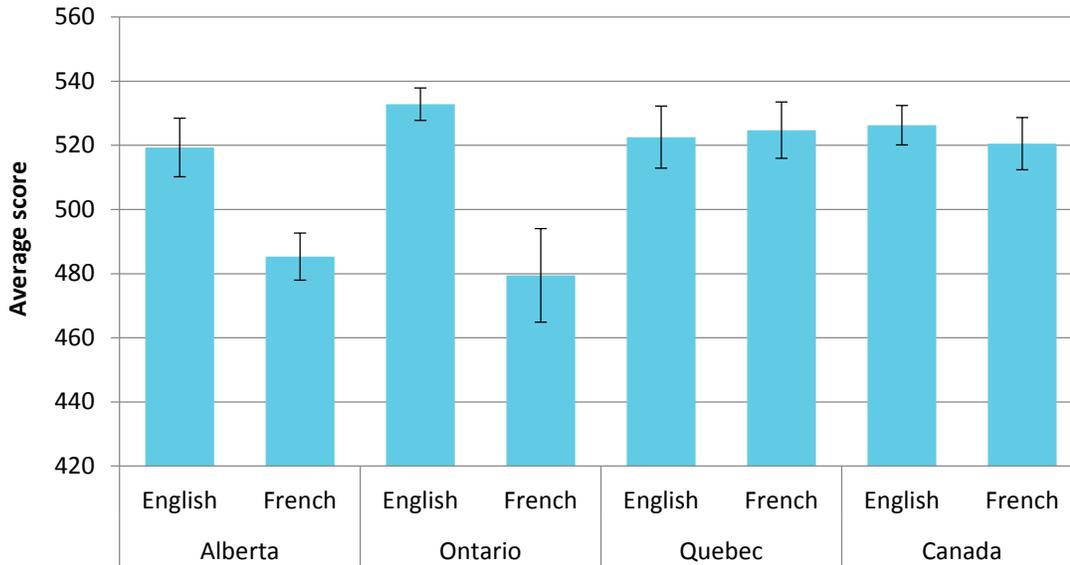
*Statistically significant difference

Note: Score difference may be larger than expected due to rounding.

There were notable differences in science achievement by language of the school system

In overall science, students from English-language school systems performed better than students in French-language school systems in Ontario and in Alberta, but not in Quebec or in Canada overall (Chart 1.10, Appendix B.1.12).

CHART 1.10 Grade 4 results in overall science by language of the school system



In the three science content domains, there were also large differences by language. In Ontario and Alberta, students in the English-language school systems outperformed those in the French-language systems, with differences of over 50 points in Ontario and over 30 points Alberta. There were no statistically significant differences in any content domain in Canada overall and in Quebec (Table 1.8).

TABLE 1.8 Grade 4 results in science by content domain and language of the school system

Science content domain	Jurisdiction	Average score				Difference between systems*	
		English	S.E.	French	S.E.	Score difference	S.E.
Life science	Alberta	527	4.8	491	6.1	36*	6.7
	Ontario	547	2.6	490	8.4	56*	8.5
	Quebec	532	4.9	533	4.8	-2	7.3
	Canada	538	3.2	529	4.6	9	5.2
Physical science	Alberta	513	4.7	476	4.2	36*	6.3
	Ontario	524	2.6	473	6.8	52*	6.9
	Quebec	509	7.0	521	5.1	-12	7.4
	Canada	518	3.1	516	4.8	2	5.5
Earth science	Alberta	513	4.8	477	5.5	37*	7.2
	Ontario	518	3.6	460	9.6	58*	9.0
	Quebec	520	7.9	514	4.9	6	9.9
	Canada	514	3.6	509	4.7	5	5.5

*Statistically significant difference

Note: Score difference may be larger than expected due to rounding.

As was the case for the content domains, there were large differences in favour of students in the English-language school systems in all three science cognitive domains in Ontario and Alberta, while there were no differences in Canada overall and in Quebec (Table 1.9).

TABLE 1.9 Grade 4 results in science by cognitive domains and language of the school system

Science cognitive domain	Jurisdiction	Average score				Difference between systems*	
		English	S.E.	French	S.E.	Score difference	S.E.
Knowing	Alberta	517	5.3	478	6.9	39*	6.5
	Ontario	530	2.8	471	8.8	59*	8.5
	Quebec	525	5.0	524	4.7	1	6.9
	Canada	524	3.6	519	4.5	5	5.1
Applying	Alberta	522	4.4	486	4.8	36*	6.4
	Ontario	537	2.5	484	6.9	52*	7.2
	Quebec	519	6.6	526	4.9	-7	7.9
	Canada	530	3.0	522	4.5	7	5.4
Reasoning	Alberta	518	4.5	482	5.1	36*	6.3
	Ontario	531	2.8	479	8.1	53*	8.0
	Quebec	526	6.3	526	5.0	-1	8.1
	Canada	525	3.1	522	4.8	4	5.6

*Statistically significant difference

Note: Score difference may be larger than expected due to rounding.

Over the past 20 years, provincial results have fluctuated in Grade 4 in both subject areas

Even though Canada participated in previous cycles of TIMSS in 1995 and 1999, no comparisons over time are made here for the country overall, owing to 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. Between 1995 and 2015, Alberta's results in mathematics declined by about 40 points; results in Ontario improved between 1995 and 2003, and remained stable thereafter; and results in Quebec saw a significant decline between 1995 and 2003, and improved consistently thereafter (Table 1.10).

TABLE 1.10 Results over time in Grade 4 mathematics

	1995		1999		2003		2007		2011		2015	
	Average	S.E.										
Alberta	523	8.3	---	---	---	---	505	3.0	507	2.5	484	3.7
Ontario	489	3.5	---	---	511	3.0	512	3.0	518	3.0	512	2.3
Quebec	550	4.1	---	---	506	2.4	519	3.0	533	2.5	536	4.0

In science, results in Alberta declined in 2015 after remaining stable between 2007 and 2011. Results in Ontario remained stable since 2007 after a significant increase between 1995 and 2003 and between 1995 and 2007. In Quebec, scores underwent a substantial drop between 1995 and 2003 and improved thereafter (Table 1.11).

TABLE 1.11 Results over time in Grade 4 science

	1995		1999		2003		2007		2011		2015	
	Average	S.E.										
Alberta	555	8.4	---	---	---	---	543	3.8	541	2.4	519	4.6
Ontario	516	3.7	---	---	540	3.8	536	3.8	528	3.1	530	2.5
Quebec	529	4.2	---	---	500	2.4	517	2.8	516	2.7	525	4.1

CHAPTER 2

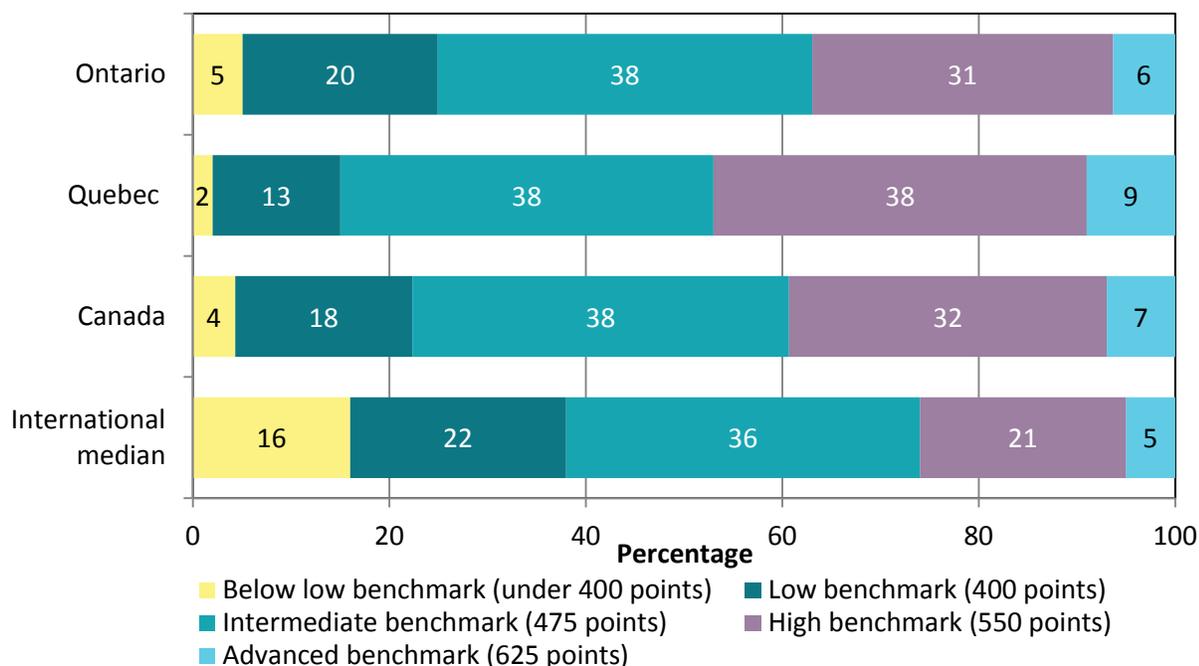
The performance of Canadian Grade 8 students in mathematics and science

This chapter presents results of the TIMSS 2015 assessment in mathematics and science at the Grade 8/ Secondary II level. The overall proficiency levels will be presented for provinces participating at the benchmark and oversampling levels (see page 10), followed by the results for Canada as a whole and the average scores for all participating countries and jurisdictions. The results will then be broken down by content and cognitive domains, by gender, and by official language. Finally, change in mathematics and science performance over time will be discussed for the two provinces that participated at the benchmarking level (Ontario and Quebec).

In Canada, over 90 per cent of Grade 8 students have reached a basic level of achievement in mathematics and science

TIMSS reports on Grade 8 achievement using the same scale noted in Chapter 1 for Grade 4, with the four benchmarks of advanced, high, intermediate, and low. Using this scale, the assessment found that more than 90 per cent of Canadian Grade 8 students achieved at least the low level in both science and mathematics. Additionally, in mathematics 78 per cent of Canadian students reached at least the intermediate benchmark, a figure that is well above the international median of 62 per cent. The figures for Quebec and Ontario were 86 per cent and 75 per cent, respectively (Chart 2.1, Appendix B.2.1).

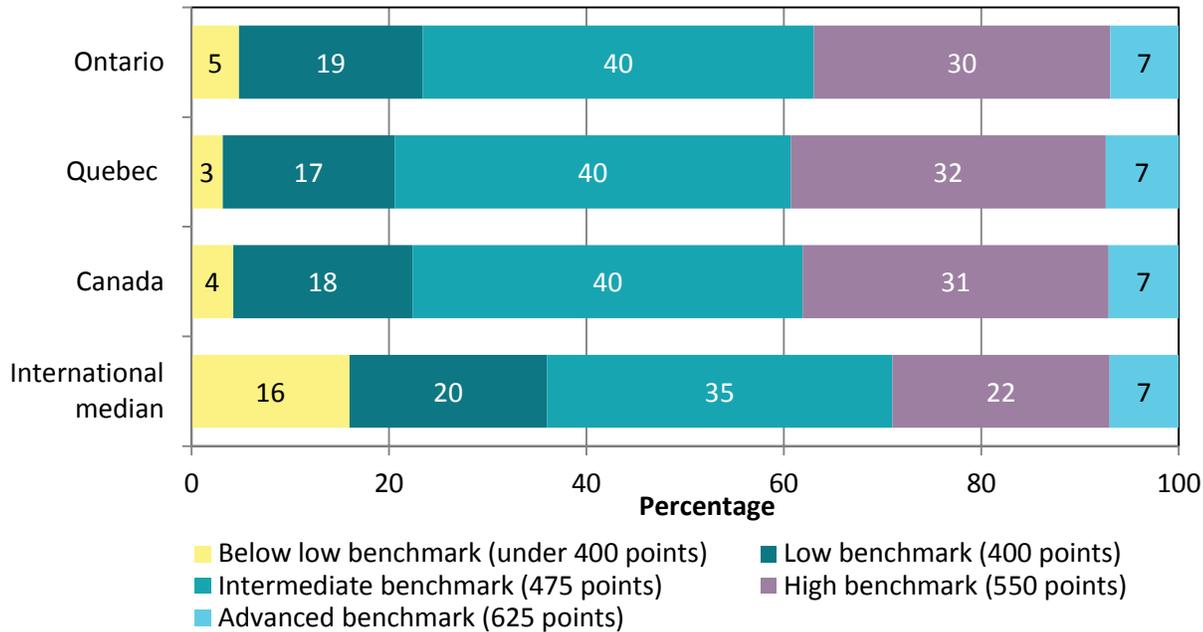
CHART 2.1 Distribution of Grade 8 students by proficiency level in mathematics



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

In science, 78 per cent of Canadian students also reached at least the intermediate level, once again surpassing the international median, which was 64 per cent. The figures for Quebec and Ontario were 79 per cent and 77 per cent, respectively (Chart 2.2, Appendix B.2.2).

CHART 2.2 Distribution of Grade 8 students by proficiency level in science



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

Canadian Grade 8 students performed above the international average in mathematics and science

At the Grade 8 level, the Canadian average score in mathematics was 527, above the international centerpoint of 500. Six countries (Singapore, Korea, Chinese Taipei, Hong Kong SAR, Japan, and the Russian Federation) scored higher, 29 countries scored lower, and 3 countries achieved a score that was statistically equivalent to Canada's.¹¹ At the provincial level, Quebec scored higher than Canada, while Ontario's score was statistically the same as that of Canada overall (Table 2.1 and Appendix B.2.3).

In science, 8 countries scored higher than Canada, 25 countries scored lower, and 5 performed at the same level. Provincially, both Quebec and Ontario performed at the Canadian average (Table 2.1, Appendix B.2.4).

¹¹ The Canadian average comprises achievement results by Grade 8 students in Manitoba, Ontario, Quebec, and Newfoundland and Labrador.

TABLE 2.1 Comparison of country and provincial results to the Canadian average in Grade 8 mathematics and science

Subject area	Better than Canada*	As well as Canada*	Not as well as Canada*
Mathematics	Singapore, Korea, Chinese Taipei, Hong Kong SAR, Japan, Quebec , Russian Federation,	Kazakhstan, Ireland, Ontario , England	United States, Slovenia, Hungary, Norway, Lithuania, Israel, Australia, Sweden, Italy, Malta, New Zealand, Malaysia, United Arab Emirates, Turkey, Bahrain, Georgia, Lebanon, Qatar, Islamic Republic of Iran, Thailand, Chile, Oman, Kuwait, Egypt, Botswana, Jordan, Morocco, South Africa, Saudi Arabia
Science	Singapore, Japan, Chinese Taipei, Korea, Slovenia, Hong Kong SAR, Russian Federation, England	Kazakhstan, Quebec , Ireland, United States, Hungary, Ontario , Sweden	Lithuania, New Zealand, Australia, Norway, Israel, Italy, Turkey, Malta, United Arab Emirates, Malaysia, Bahrain, Qatar, Iran, Thailand, Oman, Chile, Georgia, Jordan, Kuwait, Lebanon, Saudi Arabia, Morocco, Botswana, Egypt, South Africa

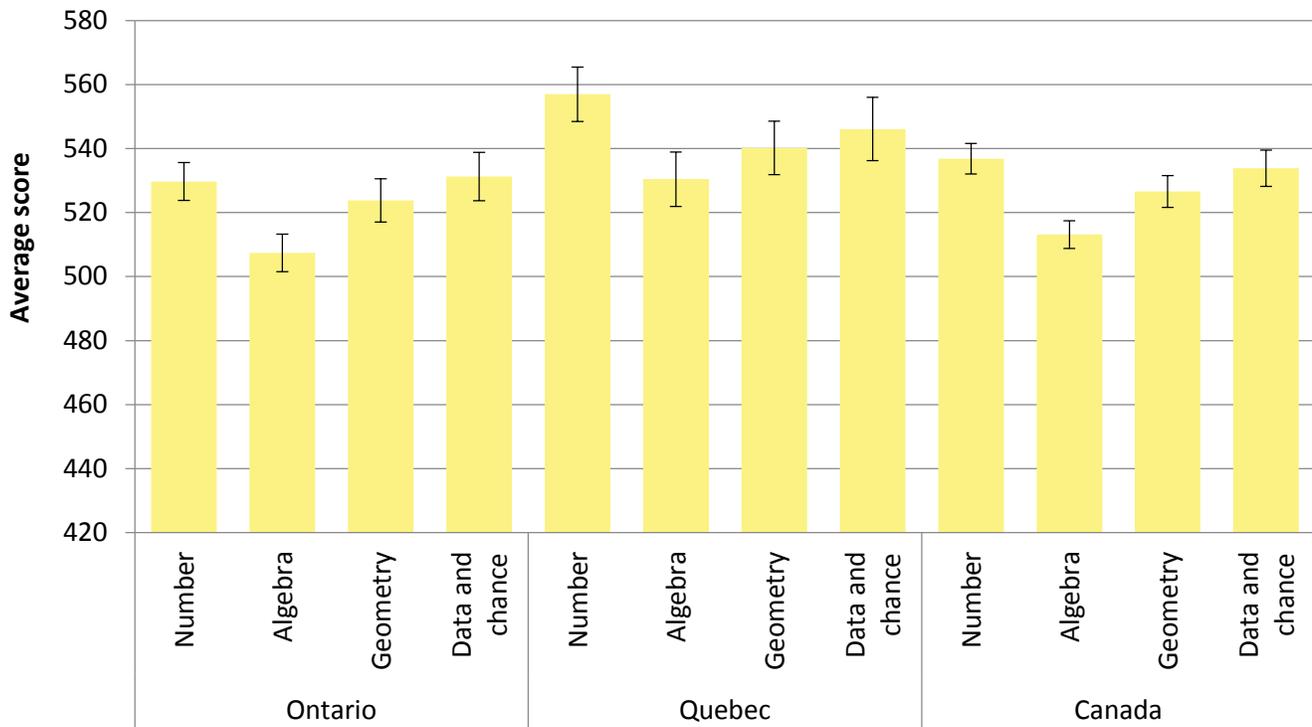
* Differences in scores are statistically significant only when confidence intervals do not overlap. If the confidence intervals overlap, an additional test of significance is conducted to determine whether the difference is statistically significant. Countries performing as well as Canada have a confidence interval that overlaps that of Canada.

Canadian Grade 8 students were stronger in dealing with data and in reasoning in mathematics

As described in the Introduction, TIMSS is organized around a content dimension that deals with subject matter and a cognitive dimension that assesses thinking processes.

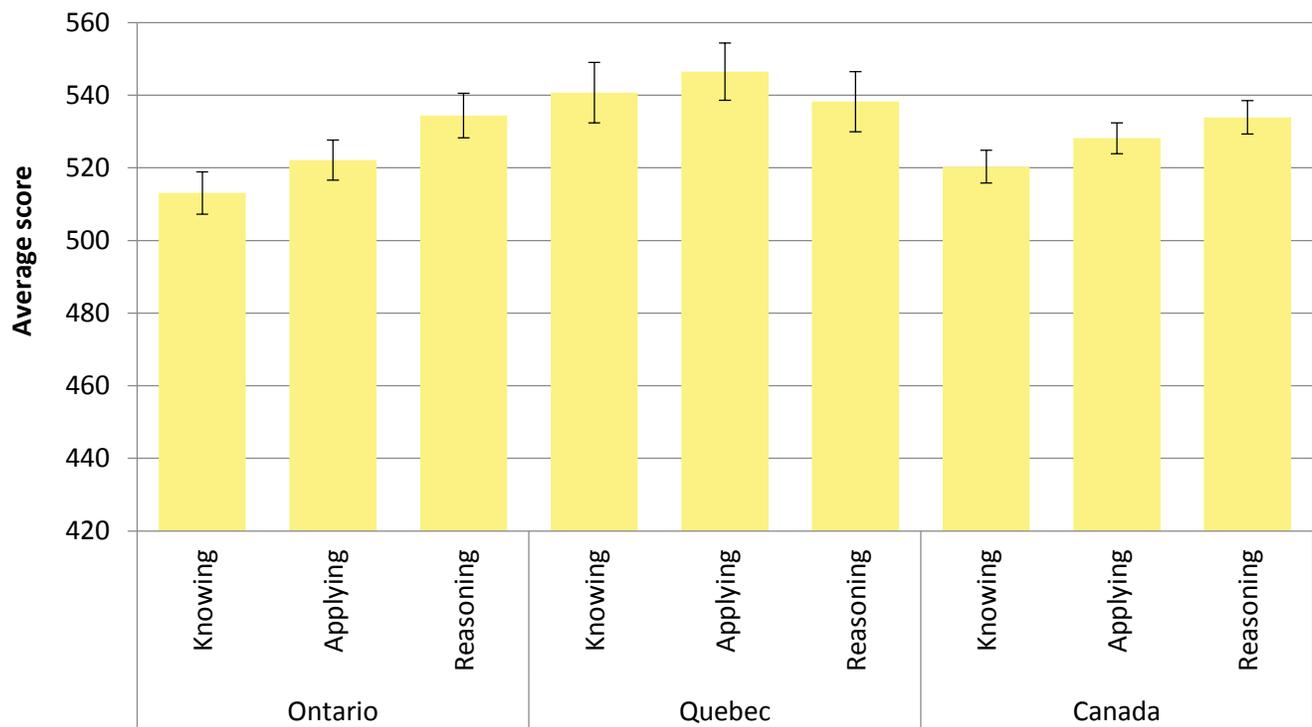
At the Grade 8 level, there are four content domains in mathematics (*number*, *algebra*, *geometry*, and *data and chance*). Canadian students—including students in Ontario and Quebec—showed the weakest results in *algebra* and the strongest results in *number* and *data and chance* (Chart 2.3, Appendix B.2.5).

CHART 2.3 Grade 8 results in mathematics by content domain



There are three cognitive domains in mathematics—*knowing*, *applying*, and *reasoning*. Students in Quebec tended to be equally strong in all three. Students in Canada overall and in Ontario performed better in *reasoning* and *applying* than in *knowing* (Chart 2.4, Appendix B.2.6).

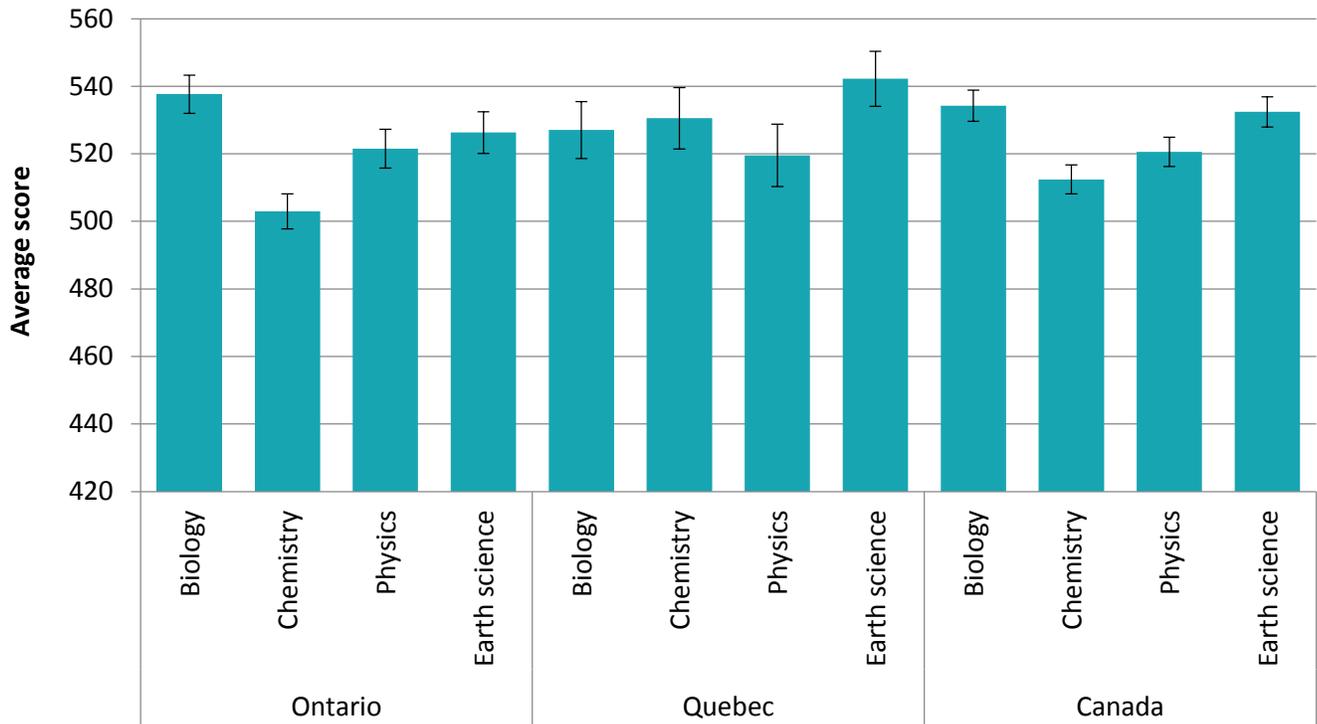
CHART 2.4 Grade 8 results in mathematics by cognitive domain



Grade 8 students showed strong results in biology and Earth science

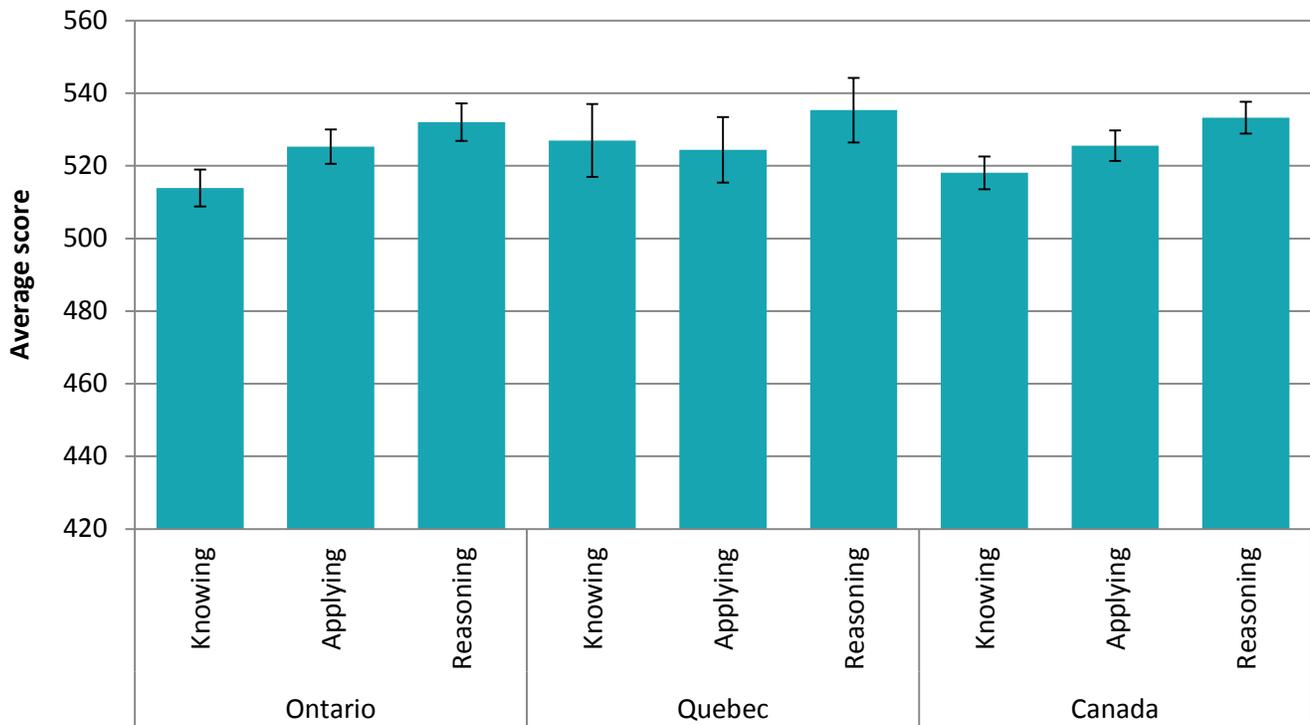
In science, TIMSS evaluated four content domains at the Grade 8 level (*biology, chemistry, physics, and Earth science*). In Ontario, students were strongest in *biology* and weakest in *chemistry*, while Quebec students achieved their highest score in *Earth science* (Chart 2.5, Appendix B.2.7).

CHART 2.5 Grade 8 results in science by content domain



Results by cognitive domain were fairly uniform across domains and jurisdictions, with the exception of *knowing*, where students in Canada overall and Ontario showed comparatively weaker results than in Quebec (Chart 2.6, Appendix B.2.8).

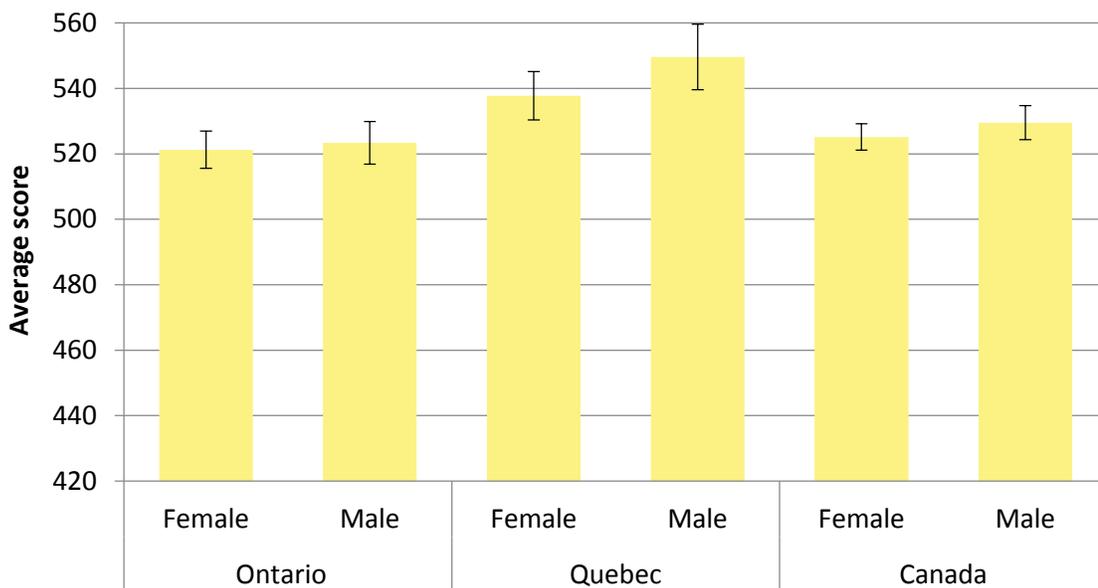
CHART 2.6 Grade 8 results in science by cognitive domain



There was no gender gap in mathematics at the Grade 8 level in Canada

As is the case internationally, there was no gender gap in mathematics among Grade 8 students in Ontario. However, in Canada overall and in Quebec, boys performed better than girls (Chart 2.7, Appendix B.2.9).

CHART 2.7 Grade 8 results in overall mathematics by gender



Across Canada, gender differences were evident in the mathematics content domains. In the *number* domain, boys outperformed girls in all three jurisdictions; boys also scored higher than girls in *data and chance* and *geometry* in Quebec (Table 2.2).

TABLE 2.2 Grade 8 results in mathematics by content domain and gender

Mathematics content domain	Jurisdiction	Average score				Difference between genders*	
		Female	S.E.	Male	S.E.	Score difference	S.E.
Number	Ontario	526	3.2	534	3.5	-8*	3.1
	Quebec	549	4.3	566	5.5	-17*	4.5
	Canada	532	2.4	542	2.9	-10*	2.3
Algebra	Ontario	508	3.2	507	3.5	0	2.7
	Quebec	527	4.4	535	5.5	-8	4.7
	Canada	512	2.2	514	2.8	-1	2.4
Geometry	Ontario	524	3.4	524	4.2	0	2.9
	Quebec	535	4.1	546	5.9	-11*	4.9
	Canada	525	2.4	528	3.2	-3	2.4
Data and chance	Ontario	531	4.1	532	4.4	-1	3.4
	Quebec	540	5.2	553	6.4	-14*	6.1
	Canada	532	2.9	536	3.5	-4	2.7

*Statistically significant difference

Note: Score difference may be larger than expected due to rounding.

The analysis of the mathematics results by cognitive process revealed gender differences, with boys performing better than girls in Quebec in all three domains and in Canada overall in *knowing* and *applying* (Table 2.3).

TABLE 2.3 Grade 8 results in mathematics by cognitive domain and gender

Mathematics cognitive domain	Jurisdiction	Average score				Difference between genders*	
		Female	S.E.	Male	S.E.	Score difference	S.E.
Knowing	Ontario	512	3.2	514	3.4	-3	3.0
	Quebec	534	3.7	548	5.7	-13*	5.0
	Canada	518	2.4	523	2.8	-5*	2.5
Applying	Ontario	521	3.0	523	3.3	-2	2.8
	Quebec	541	3.5	553	5.3	-12*	4.8
	Canada	526	2.1	531	2.7	-5*	2.2
Reasoning	Ontario	534	3.4	535	3.4	-1	3.0
	Quebec	532	3.7	545	5.6	-13*	5.2
	Canada	532	2.3	536	2.9	-5	2.4

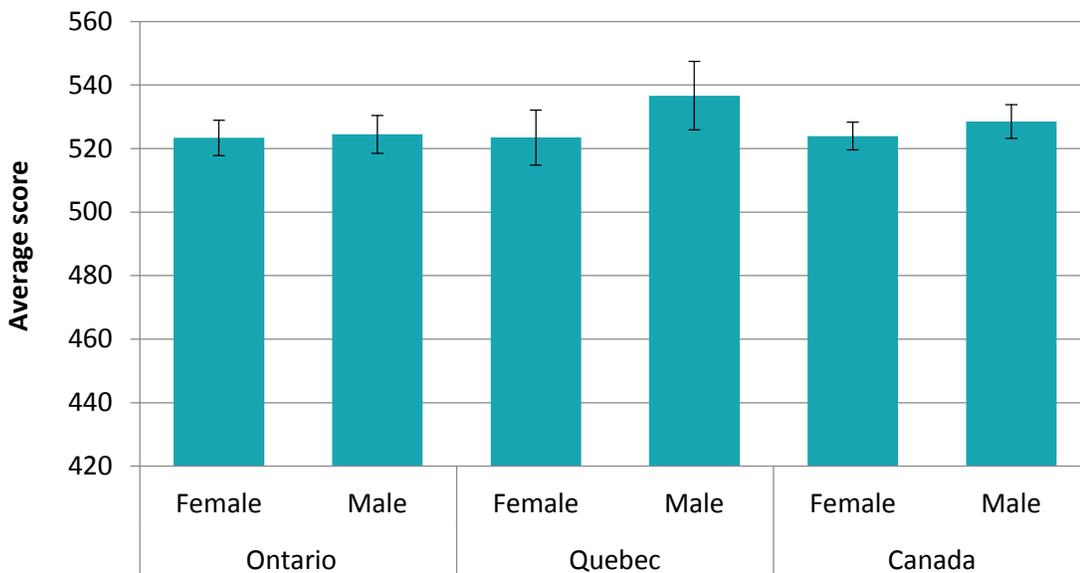
*Statistically significant difference

Note: Score difference may be larger than expected due to rounding.

There was no gender gap in science at the Grade 8 level in Canada

There was no gender gap in sciences among Grade 8 students in Canada overall or in Ontario. As was the case in mathematics, the only significant gender gap observed was in Quebec, where boys performed better than girls by a significant margin (Chart 2.8, Appendix B.2.10).

CHART 2.8 Grade 8 results in overall science by gender



In the content domains in science, boys achieved higher scores than girls in *Earth science* and *physics* in all jurisdictions, while in *biology* girls outperformed boys in Ontario (Table 2.4).

TABLE 2.4 Grade 8 results in science by content domain and gender

Science content domain	Jurisdiction	Average score				Difference between genders*	
		Female	S.E.	Male	S.E.	Score difference	S.E.
Biology	Ontario	542	3.2	534	3.2	8*	2.9
	Quebec	524	4.5	530	5.1	-6	4.4
	Canada	536	2.5	532	2.8	4	2.5
Chemistry	Ontario	505	3.0	501	3.4	4	3.6
	Quebec	527	4.6	534	5.7	-7	4.5
	Canada	513	2.3	512	2.8	2	2.7
Physics	Ontario	516	3.3	527	3.2	-11*	2.9
	Quebec	508	4.8	532	5.5	-24*	4.4
	Canada	513	2.4	528	2.6	-15*	2.3
Earth science	Ontario	517	3.6	535	4.0	-18*	4.1
	Quebec	528	4.5	558	5.0	-29*	4.8
	Canada	522	2.6	543	3.0	-21*	3.3

*Statistically significant difference

In the cognitive domains in science, Grade 8 boys achieved a higher average score than girls in *knowing* in all three jurisdictions. In Quebec, boys also scored higher than girls in the other two cognitive domains (Table 2.5).

TABLE 2.5 Grade 8 results in science by cognitive domain and gender

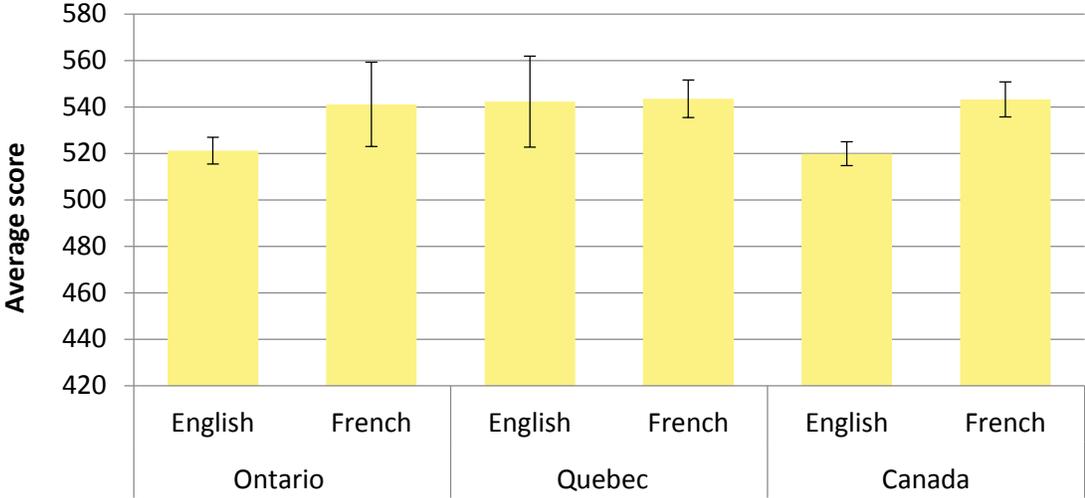
Science cognitive domain	Jurisdiction	Average score				Difference between genders*	
		Female	S.E.	Male	S.E.	Score difference	S.E.
Knowing	Ontario	509	3.0	519	3.4	-9*	3.8
	Quebec	517	5.4	538	5.6	-21*	4.2
	Canada	512	2.3	524	3.0	-12*	2.8
Applying	Ontario	526	2.8	525	2.9	1	3.0
	Quebec	518	4.8	531	5.4	-13*	4.4
	Canada	524	2.4	527	2.6	-3	2.4
Reasoning	Ontario	533	3.1	531	3.0	2	3.0
	Quebec	530	4.7	541	5.3	-11*	4.2
	Canada	533	2.6	534	2.5	-1	2.5

*Statistically significant difference

There were notable differences in mathematics achievement by language of the school system

The performance of Canadian students in overall mathematics revealed differences by language of the school system. Students at the Grade 8 level in the French-language school system performed better in mathematics than their English-language counterparts in Canada overall (by 23 points) and in Ontario (by 20 points), but not in Quebec, where scores were statistically the same (Chart 2.9, Appendix B.2.11).

CHART 2.9 Grade 8 results in mathematics by language of the school system



Turning to content domain in mathematics, TIMSS found that Grade 8 students in the French-language school systems performed better than those in the English-language systems in all four domains in Canada overall, as well as outperforming their anglophone counterparts in Ontario in the domains of *number*, *algebra*, and *geometry* (Table 2.6).

TABLE 2.6 Grade 8 results in mathematics by content domain and language of the school system

Mathematics content domain	Jurisdiction	Average score				Difference between systems*	
		English	S.E.	French	S.E.	Score difference	S.E.
Number	Ontario	528	3.1	550	10.6	-22*	11.1
	Quebec	558	10.8	557	4.7	1	11.8
	Canada	528	2.8	556	4.4	-28*	5.2
Algebra	Ontario	506	3.1	528	8.6	-22*	9.2
	Quebec	527	10.6	531	4.5	-3	10.9
	Canada	505	2.7	530	4.2	-25*	5.2
Geometry	Ontario	522	3.6	554	11.6	-32*	12.1
	Quebec	534	12.3	541	4.6	-7	13.1
	Canada	519	3.2	542	4.3	-23*	5.4
Data and chance	Ontario	531	3.9	540	12.2	-9	12.3
	Quebec	554	12.4	545	5.4	9	13.4
	Canada	529	3.5	545	5.0	-16*	5.9

*Statistically significant difference

In the cognitive domains in mathematics, results revealed some differences in performance by language of the school system. In Ontario and in Canada overall, students in the French-language school systems performed better than their English-language counterparts in *knowing* and *applying*, while there were no differences in any jurisdiction in *reasoning* (Table 2.7).

TABLE 2.7 Grade 8 results in mathematics by cognitive domain and language of the school system

Mathematics cognitive domain	Jurisdiction	Average score				Difference between systems*	
		English	S.E.	French	S.E.	Score difference	S.E.
Knowing	Ontario	512	3.1	536	8.9	-25*	9.4
	Quebec	539	10.9	541	4.5	-2	11.6
	Canada	511	2.8	540	4.2	-30*	5.2
Applying	Ontario	521	2.9	541	9.4	-20*	9.6
	Quebec	547	10.0	546	4.3	1	10.8
	Canada	520	2.7	546	4.1	-26*	5.0
Reasoning	Ontario	534	3.2	549	10.3	-15	10.6
	Quebec	542	10.9	538	4.8	4	12.6
	Canada	532	2.9	539	4.5	-7	5.5

*Statistically significant difference

There were notable differences in science achievement by language of the school system

As noted in Chapter 1, the TIMSS results in Grade 4 revealed large differences in achievement in overall science between the English- and French-language school systems in Alberta and Ontario (Chart 1.10). By contrast, the findings in Grade 8 reveal no statistically significant differences in overall science by language of the school system (Chart 2.10). In Grade 4, there were large differences in favour of students in the English-language school systems in all content and cognitive domains in Alberta and Ontario (Tables 1.8 and 1.9). In Grade 8, some differences are evident in the content and cognitive domains in Canada overall, but not in the provinces. For the content domains in Canada overall, students in English-language school systems performed better in *biology* than their French-language counterparts, whereas those in French-language school systems performed better in *chemistry* and *Earth science*. There were no differences at the provincial level (Table 2.8). For the three cognitive domains, no difference was evident in the language systems, with one exception: in the *knowing* domain, students in the French-language school systems performed better than those in the English-language systems by 11 points in Canada overall (Table 2.9).

CHART 2.10 Grade 8 results in overall science by language of the school system

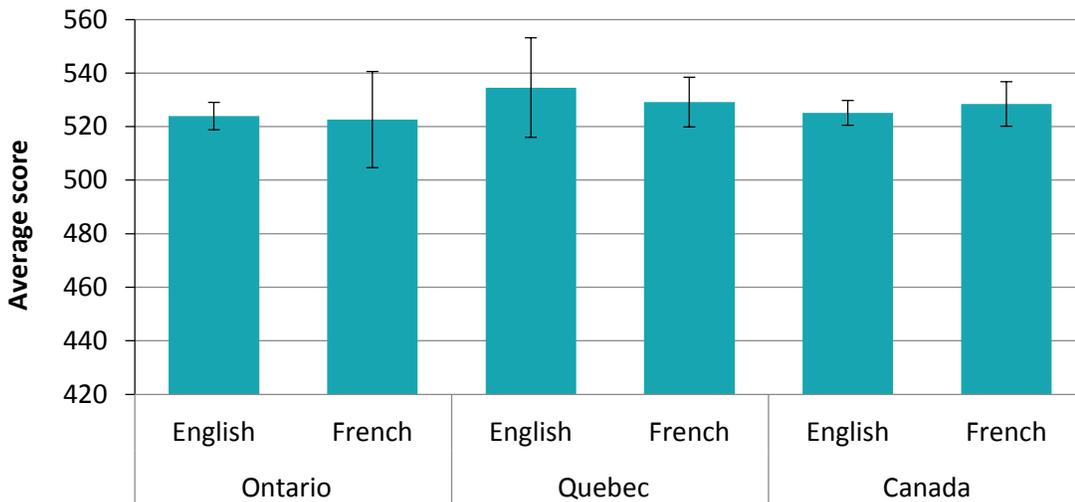


TABLE 2.8 Grade 8 results in science by content domain and language of the school system

Science content domain	Jurisdiction	Average score				Difference between systems*	
		English	S.E.	French	S.E.	Score difference	S.E.
Biology	Ontario	538	2.9	528	8.3	10	8.3
	Quebec	533	9.6	526	4.7	7	10.6
	Canada	538	2.7	527	4.3	11*	4.9
Chemistry	Ontario	503	2.8	504	8.3	-1	9.0
	Quebec	530	10.6	531	4.9	0	11.3
	Canada	505	2.5	528	4.5	-23*	5.2
Physics	Ontario	522	3.0	518	9.4	3	9.6
	Quebec	526	9.5	519	5.1	7	10.4
	Canada	521	2.6	519	4.7	3	5.6
Earth science	Ontario	526	3.3	526	8.3	1	8.6
	Quebec	546	9.7	542	4.4	4	10.3
	Canada	529	2.8	540	3.9	-11*	4.8

*Statistically significant difference

Note: Score difference may be larger than expected due to rounding.

TABLE 2.9 Grade 8 results in science by cognitive domain and language of the school system

Science cognitive domain	Jurisdiction	Average score				Difference between systems*	
		English	S.E.	French	S.E.	Score difference	S.E.
Knowing	Ontario	514	2.7	514	9.1	0	9.3
	Quebec	527	10.5	527	5.4	0	11.0
	Canada	515	2.3	526	4.8	-11*	5.0
Applying	Ontario	526	2.5	517	9.0	8	9.4
	Quebec	533	8.9	523	5.0	9	10.0
	Canada	527	2.2	523	4.5	4	4.9
Reasoning	Ontario	532	2.7	530	8.2	2	8.5
	Quebec	539	9.4	535	4.9	-4	10.4
	Canada	533	2.4	534	4.5	-2	4.9

*Statistically significant difference

Note: Score difference may be larger than expected due to rounding.

Over the past 20 years, provincial results have fluctuated at the Grade 8 level in both subject areas

Even though Canada participated in previous cycles of TIMSS in 1995 and 1999, no comparisons over time are made here for the country as a whole at the Grade 8 level, owing to the large gap in data between 1999 and 2015. The continuity of data for Ontario and Quebec, however, does permit comparison.

In Ontario, results in mathematics improved between 1995 and 1999 and remained relatively stable thereafter. In Quebec, by contrast, scores peaked in 1999 (at a higher level than Ontario's) and then declined, although they began to rise again after 2007 (Table 2.10).

TABLE 2.10 Results over time in Grade 8 mathematics

	1995		1999		2003		2007		2011		2015	
	Average	S.E.										
Ontario	501	3.0	517	3.0	521	3.1	517	3.6	512	2.4	522	2.9
Quebec	556	6.0	566	4.8	543	3.1	528	3.5	532	2.4	543	3.9

Turning to science, TIMSS saw an improvement at the Grade 8 level in Ontario between 1995 and 2015, with very stable results recorded over the last three cycles. In Quebec, a peak was reached in 1999, followed by a marked decrease in score in 2007. Since then, results have improved noticeably (Table 2.11).

TABLE 2.11 Results over time in Grade 8 science

	1995		1999		2003		2007		2011		2015	
	Average	S.E.										
Ontario	496	3.8	518	3.1	533	2.7	526	3.6	521	2.4	524	2.5
Quebec	510	7.0	540	4.9	531	3.0	507	3.0	520	2.6	530	4.4

CHAPTER 3

Background questionnaire results

TIMSS 2015 developed a compendium, *TIMSS 2015 Encyclopedia* (Mullis, Martin, Goh & Cotter, 2016),¹² 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 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 four areas in Canada and internationally:

- system-level data at the provincial and territorial level
- the school context
- what happens in the classroom on a daily basis
- the individual context of children at home.

School Questionnaire

To enhance understanding about the school context in which the assessment was completed, TIMSS produced a School Questionnaire, which was completed by principals or their designates.¹³ It covered seven areas of interest: School Enrolment and Characteristics; Instructional Time; Resources and Technology; School Emphasis on Academic Success; School Discipline and Safety; Teachers in Your School; and Principal Experience and Education.

Across Canada, 421 principals of schools that participated in the Grade 4 study and 255 principals of schools that participated in the Grade 8 study responded to the School Questionnaire, for a Canadian response rate of 95 per cent and 92 per cent, respectively.¹⁴ Of the 46 countries that responded to the School Questionnaire at the Grade 4 level and 38 at the Grade 8 level, only one Grade 4 country (United Arab Emirates) and two Grade 8 countries (United Arab Emirates and Morocco) had larger samples. This chapter presents data from the Grade 4 School Questionnaires for Alberta, Ontario, Quebec, and Canada overall, and from the Grade 8 questionnaires for Ontario, Quebec, and Canada overall. The sample size was not sufficiently large in Manitoba and Newfoundland and Labrador to be reported reliably, but these provinces are included in the Canadian results. Although the questionnaires cover many relevant areas, only a select number of results

¹² Available at <http://timssandpirls.bc.edu/timss2015/encyclopedia/>

¹³ The international versions of the TIMSS 2015 Questionnaires are available at <https://timssandpirls.bc.edu/timss2015/questionnaires/index.html>

¹⁴ In this report, questionnaire results are weighted by the proportional representation of each student/teacher/school in the provincial/national sample.

are presented here for illustrative purposes. More detailed analysis of these questionnaires will be presented in other reports and publications from CMEC in the future.

School socioeconomic status

The provision of free meals for students has been used as an indicator of the socioeconomic status of schools (Rumberger & Palardy, 2005; Sirin, 2005). Principals were asked whether their schools provide free meals for students. At Grade 4, 13 per cent of Canadian schools provide free breakfast for all their students, 20 per cent for some students, and 67 per cent for no students. On average, students in schools where breakfast was not provided to any student scored 41 points higher in science and 51 points higher in mathematics than students in schools where breakfast was provided to all students (Chart 3.1, Appendix B.3.1).

At Grade 8, the proportion of Canadian schools where breakfast was provided was similar to that in Grade 4 but the achievement gap between students in relation to the provision of breakfast was much smaller (Chart 3.2, Appendix B.3.2). This suggests that achievement is more influenced by the socioeconomic status of the school in the early grades than in later grades.

Figures for the provision of breakfast to all students are lower at the international level (5 per cent at Grade 4, and 7 per cent at Grade 8). At the provincial level, 15 per cent of schools at Grade 4 and 17 per cent of schools at Grade 8 in Ontario provided a free breakfast to all students; the percentages were much lower in Quebec, at 6 per cent and 4 per cent, respectively.

CHART 3.1 Relationship between providing free breakfast and Grade 4 achievement

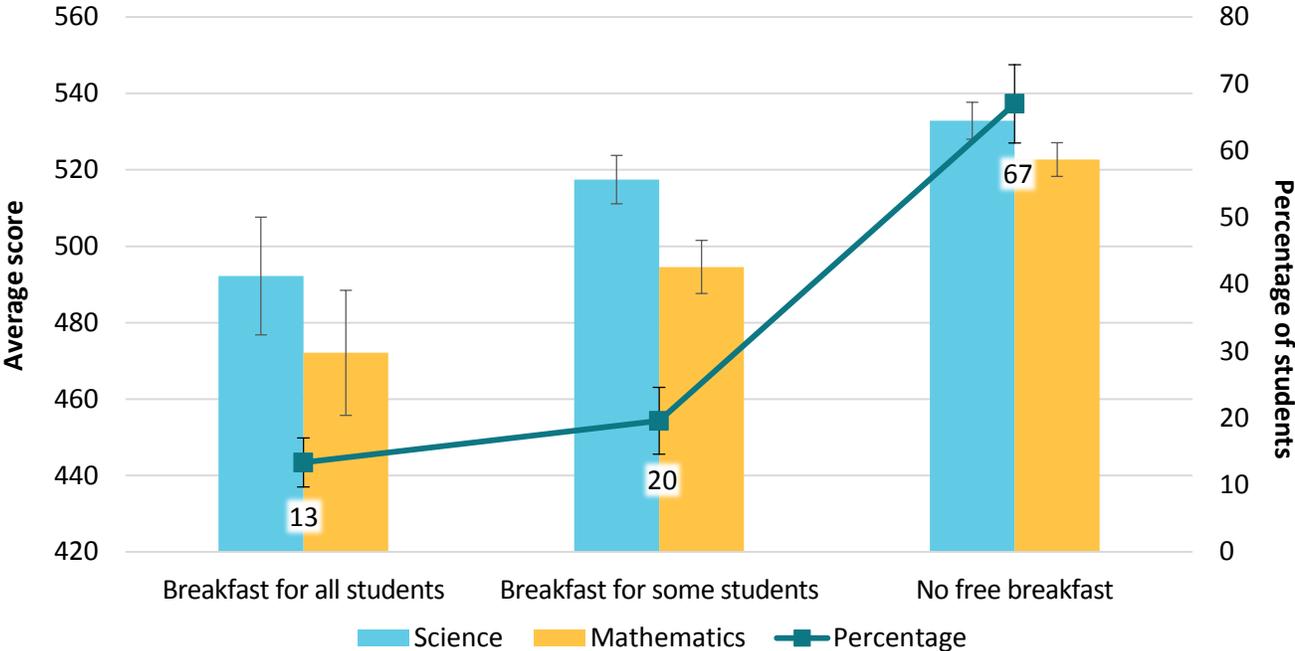
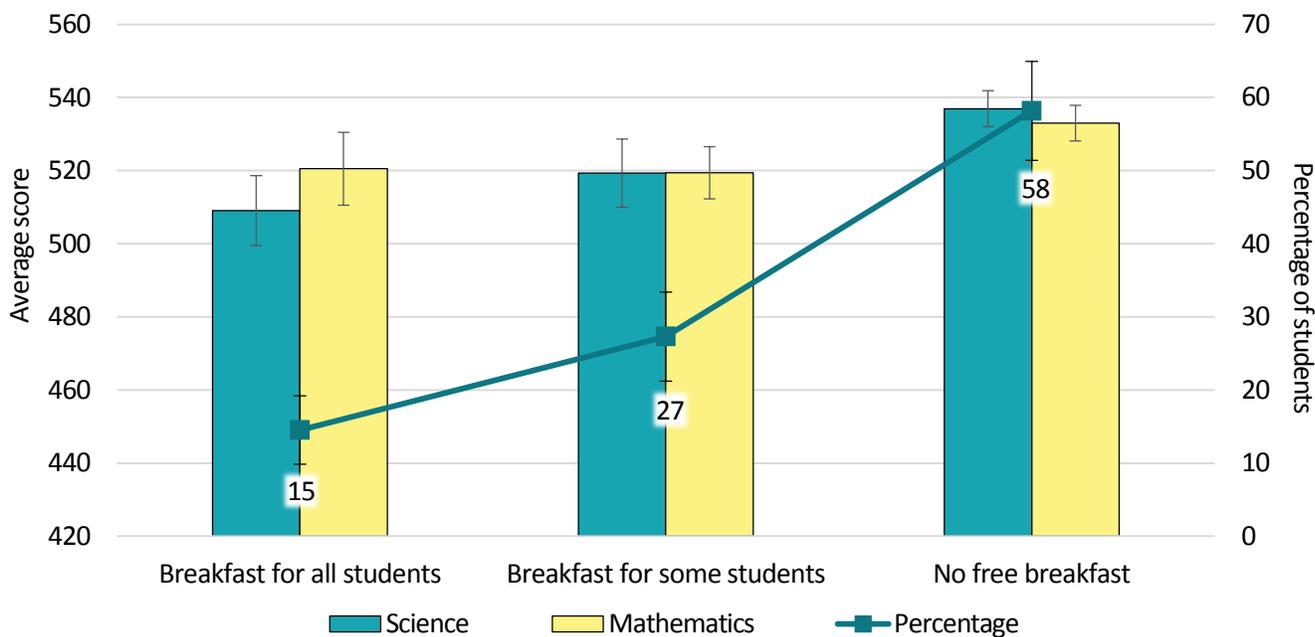


CHART 3.2 Relationship between providing free breakfast and Grade 8 achievement



Students' resources at home

Another aspect of socioeconomic status relates to the home environment. TIMSS 2015 looked at the educational resources available at home for students and classified them into three groups (many resources, some resources, and few resources), based on a number of variables, including the following:

- number of books in the home
- number of home study supports
- number of children's books in the home
- parental level of education
- parental occupation

At Grade 4, this information was acquired through a Home Questionnaire completed by parents, while at Grade 8 the information was obtained directly from students through a Student Questionnaire.

At Grade 4, on average at the international level, 19 per cent of students were classified as having many resources and 8 per cent had few resources available at home. In Canada, 32 per cent had many resources and 0 per cent had few resources.

At Grade 8, on average at the international level, 13 per cent of students had many resources, 72 per cent had some resources, and 15 per cent had few resources available at home. In Canada, these proportions were 21 per cent, 76 per cent, and 2 per cent, respectively.

The relationship between availability of home resources and student achievement was less strong in Canada than internationally at both grade levels and for both subject areas. At the provincial level, the gap in achievement in relation to home educational resources is smaller in Quebec than in the other provinces.

Charts 3.3 (Appendix B.3.3) and 3.4 (Appendix B.3.4) show these relationships for Canada and the provinces.

CHART 3.3 Relationship between home educational resources and Grade 4 achievement

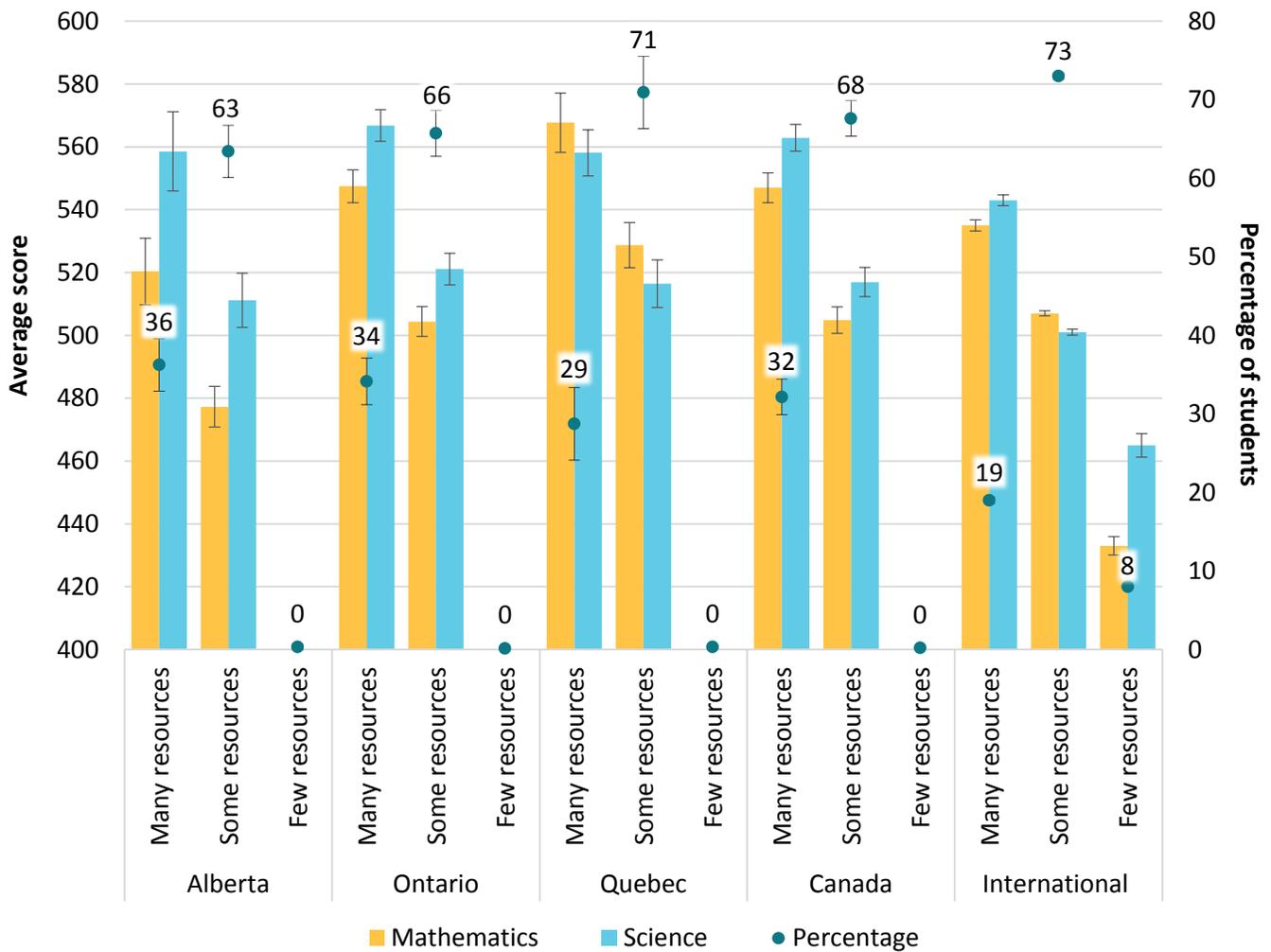
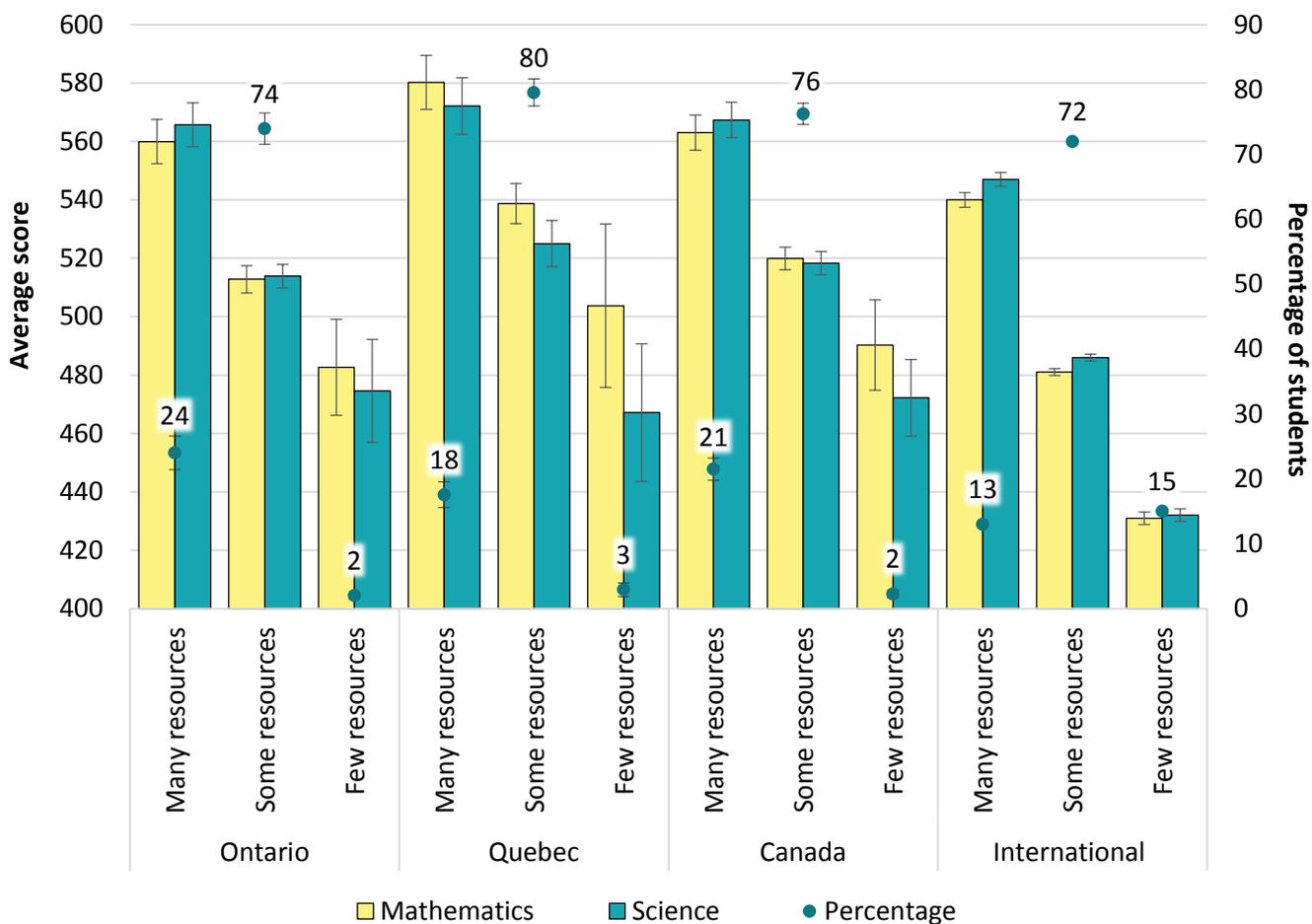


CHART 3.4 Relationship between home educational resources and Grade 8 achievement



Speaking the language of the test at home

In Canada, many students are educated in a language that is different from their first language. In Canada overall, 19 per cent of principals of schools that participated in the Grade 4 study and 18 per cent of principals of schools that participated in the Grade 8 study estimate that 50 per cent or fewer of their students wrote the test in their mother tongue (Appendix B.3.5). In Grade 4, Ontario had the highest proportion of students for whom the test was not in their first language, at 24 per cent; Quebec had the highest level of such students at Grade 8, with 19 per cent.

Science laboratories in schools

Principals of schools participating in TIMSS were asked whether their school had a science laboratory that could be used by students. In Canada, only 11 per cent of principals of schools that participated in the Grade 4 study responded positively, compared to an international average of 38 per cent. The Canadian figures ranged from a low of 7 per cent in Ontario to a high of 13 per cent in Alberta (Appendix B.3.6). As can be expected, more principals indicated that their school had a science laboratory for Grade 8 students.

The Canadian average was 69 per cent, compared to the international average of 85 per cent, with figures of 54 per cent in Ontario and 100 per cent in Quebec. Canadian schools where principals responded that their Grade 8 students had a laboratory had an average science score of 532, compared to 517 for schools with no laboratory.

Principals were also asked whether their school's capacity to provide instruction was affected by the absence or inadequacy of a science laboratory, science equipment, or materials for experiments. Over half (55 per cent) of principals of schools participating in the Grade 4 study in Canada indicated that such factors affected their school's capacity to some extent or a lot, compared to an international average of 45 per cent. There were only small interprovincial variations in responses to this question. At the Grade 8 level, the situation was different, with only 27 per cent of principals in Canada, versus 45 per cent internationally, responding that their school's capacity to provide instruction was affected to some extent or a lot by these factors. Provincial differences were more notable at the Grade 8 level, with 37 per cent of principals in Ontario and 10 per cent in Quebec expressing this view.

School discipline and safety

TIMSS also asked principals their views about the extent to which a number of discipline and safety issues among students at the target grade (Grade 4 or Grade 8) were a problem in their school. The following issues were investigated:

- arriving late in school
- absenteeism
- classroom disturbance
- cheating
- profanity
- vandalism
- theft
- intimidation or verbal abuse among students
- physical fights among students
- intimidation or verbal abuse of teachers or staff

In comparison to the international average, a lower proportion of Canadian principals categorized many of these issues (i.e., cheating, profanity, vandalism, theft, physical fights among students, and intimidation or verbal abuse of teachers or staff) as a moderate or serious problem. However, as can be seen from Charts 3.5 and 3.6 (and Appendices B.3.8 and B.3.9), for four of these issues, the Canadian average was comparable to the international value.

In Ontario and Quebec, the proportion of principals who perceived that arriving late at school was a moderate or serious issue ranged, respectively, between 21 per cent and 10 per cent in Grade 4, and between 28 per cent and 19 per cent in Grade 8. Student absenteeism was also perceived more likely to be as a moderate or serious issue in Grade 8 than in Grade 4, both in Canada and across provinces: it ranged between 19 per cent (Ontario) and 7 per cent (Quebec) in Grade 4, and between 23 per cent (Ontario) and 19 per

cent (Quebec) in Grade 8. Interestingly, a higher percentage of principals in Ontario and Quebec (26 per cent and 17 per cent, respectively) perceived classroom disturbance as a moderate or serious problem in Grade 4 compared to Grade 8 (20 per cent and 10 per cent, respectively).

Finally, the issue of intimidation and verbal abuse among students was perceived as a moderate or serious issue by almost one out of ten Canadian principals at Grade 4 and by almost two out of ten at Grade 8. This is consistent with findings from the Student Questionnaire, which included questions to students about their experience of bullying behaviours in schools. It is also consistent with previous findings from the 2011 Progress in International Reading Literacy Study assessment in Grade 4 (Labrecque et al., 2012).

CHART 3.5 Proportion of Grade 4 schools with moderate to serious school discipline and safety problems

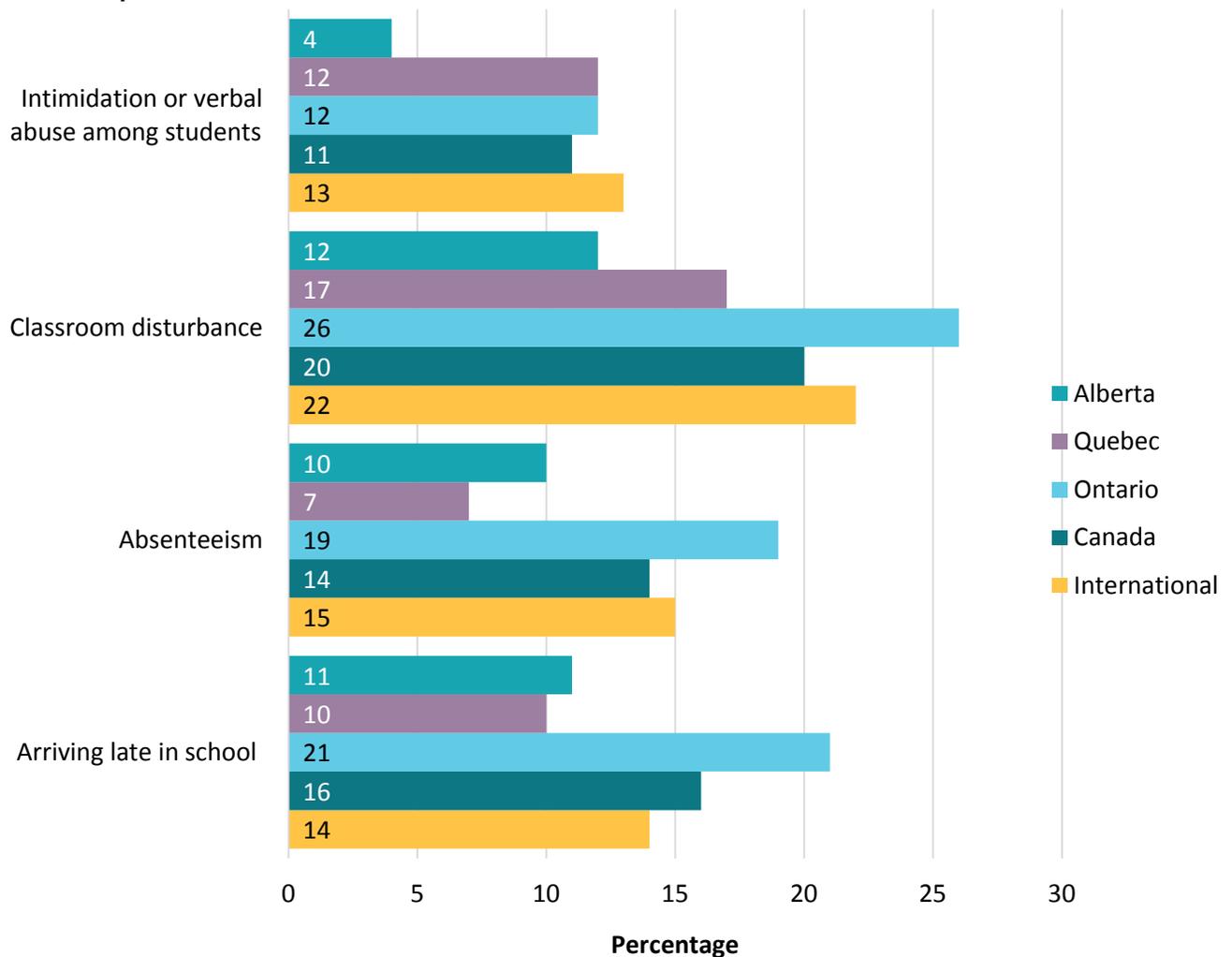
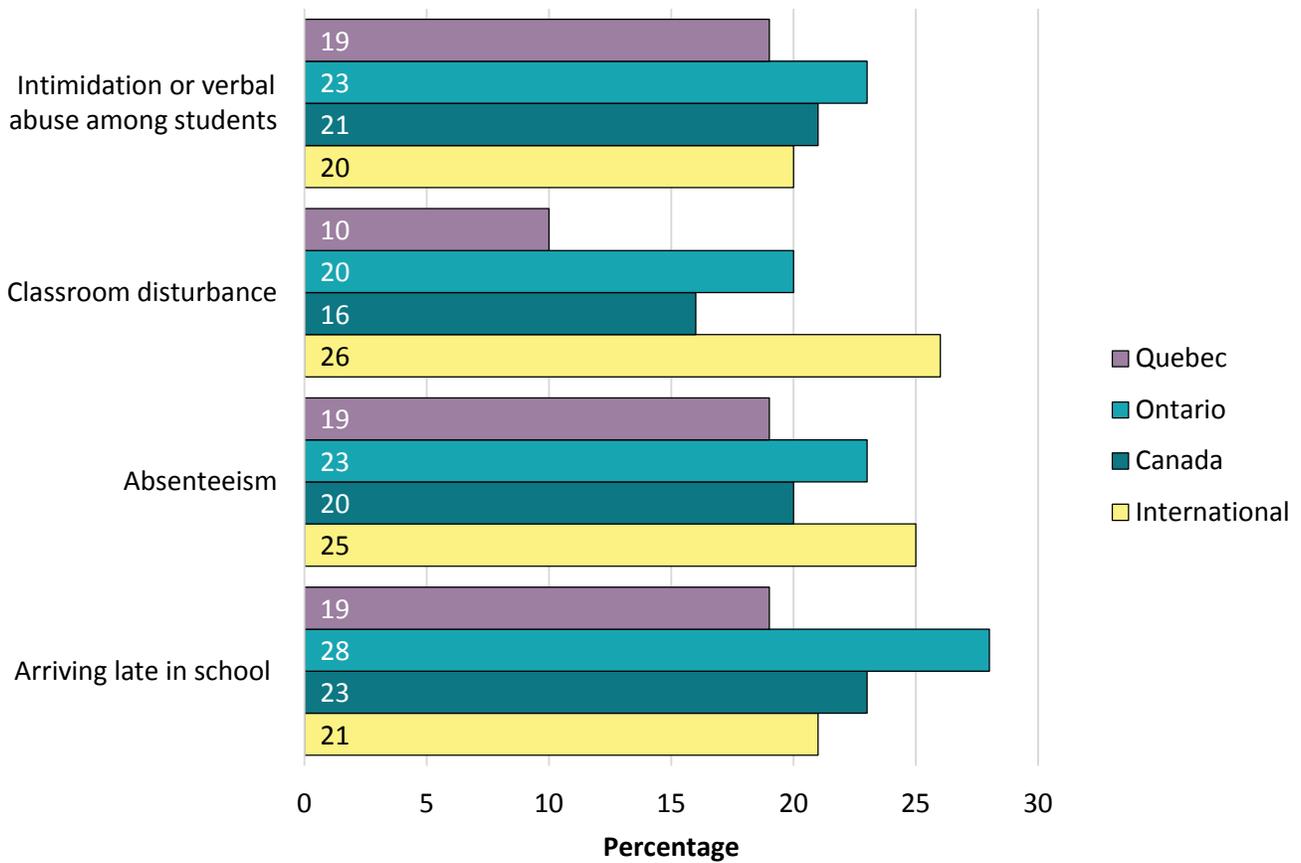


CHART 3.6 Proportion of Grade 8 schools with moderate to serious school discipline and safety problems



As seen in Charts 3.7 and 3.8 (and Appendices B.3.10 and B.3.11), there is a negative relationship between the severity of disciplinary problems in schools and achievement in mathematics and science at both grade levels. Provincially, the proportion of students in schools with moderate to severe discipline and safety problems was very low: 4 per cent in Ontario, 1 per cent in Alberta, and 0 per cent in Quebec at the Grade 4 level; and 2 per cent in Ontario and 1 per cent in Quebec at the Grade 8 level.

CHART 3.7 Relationship between school discipline problems and Grade 4 achievement

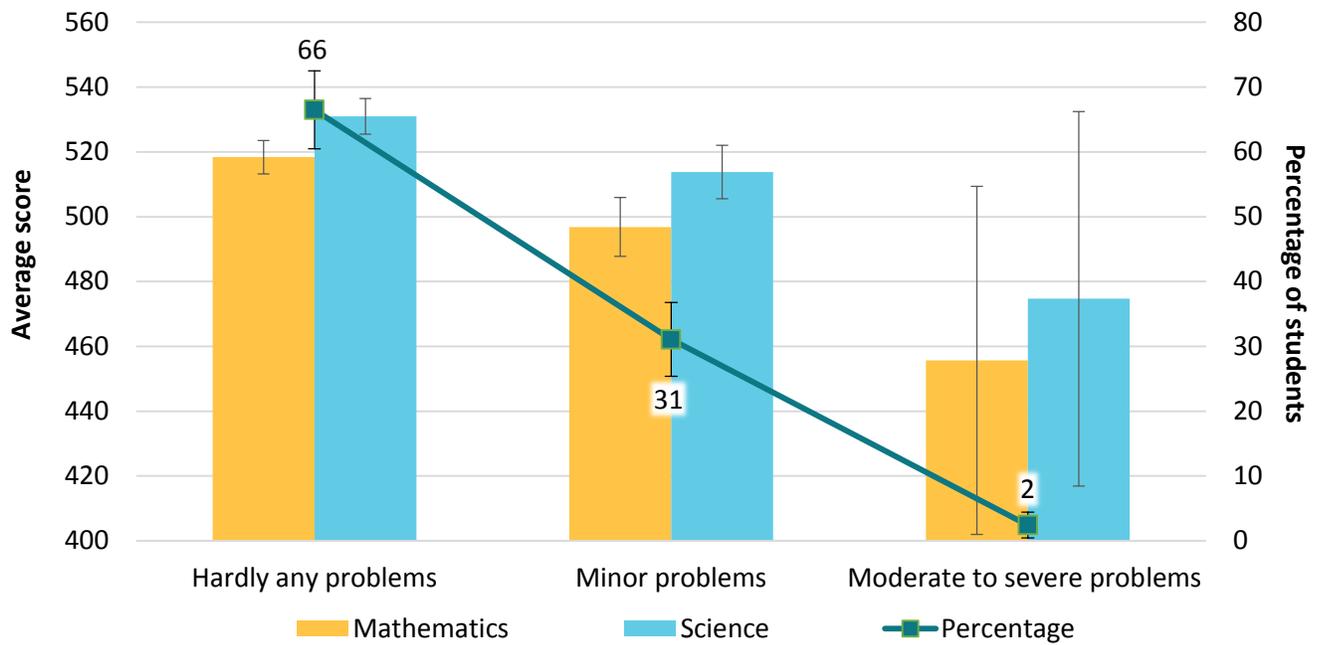
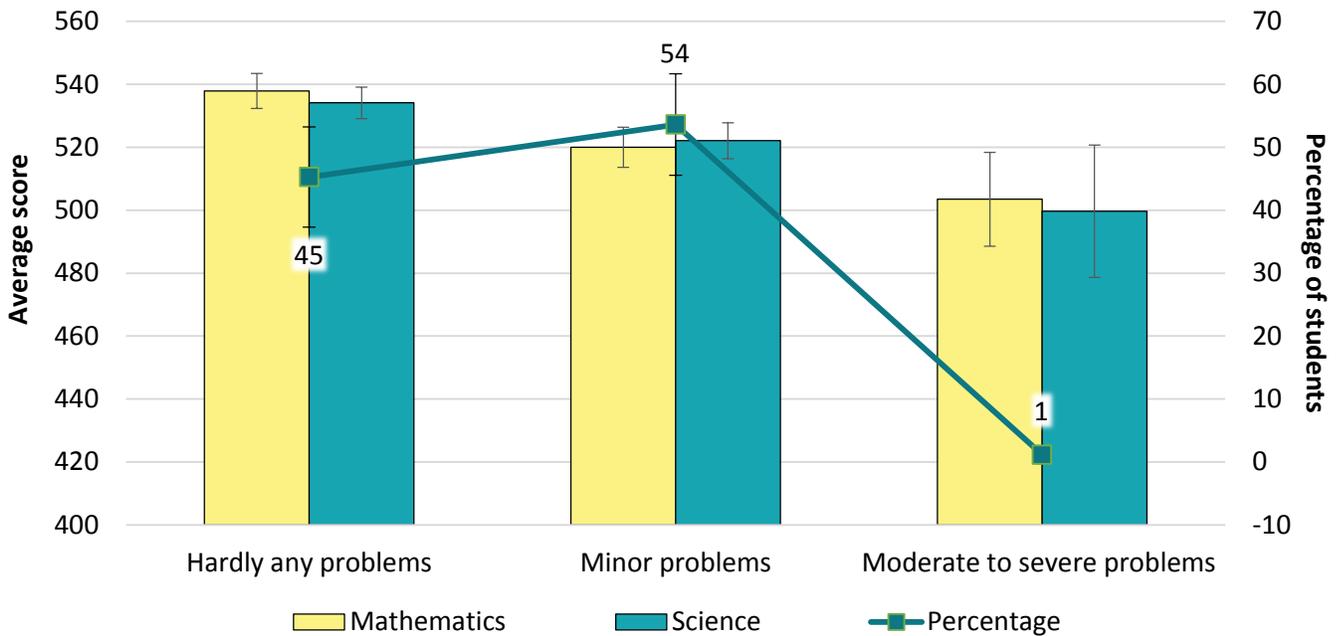


CHART 3.8 Relationship between school discipline problems and Grade 8 achievement



Mathematics and science teachers and instruction

Further contextual information was provided by a Teacher Questionnaire that was completed by Grade 4 and Grade 8 mathematics and science teachers from the selected classrooms. It examined generic information about the classroom context of both mathematics and science teachers (teacher preparation and experience; classroom instructional resources and technology; instructional time; instructional engagement; and classroom assessment) and the intended (as distinct from the actually implemented) TIMSS mathematics and science curricula. Across Canada, 841 Grade 4 and 440 Grade 8 teachers responded to the questionnaire, but the participation rate this represents cannot be determined, as we do not know the actual number of teachers at the target grade levels in participating schools.¹⁵ As such, results should be interpreted with caution, as they may not generalize to the entire population of schools. As is the case with the School Questionnaire, only a select number of results are presented here for illustrative purposes.

Teacher preparation and experience

Both internationally and in Canada, there is a much higher proportion of female teachers at Grade 4 compared to Grade 8 (Appendix B.3.12). In Canada, about 83 per cent of Grade 4 teachers are female, as are 62 per cent of mathematics teachers and 52 per cent of science teachers in Grade 8. The proportion of female teachers is higher in Quebec in both Grade 4 (about 90 per cent) and Grade 8 (70 per cent in mathematics and 58 per cent in science).

Teachers were asked to indicate their highest completed level of education, and responses were classified into four categories: less than a bachelor's degree, bachelor's degree, master's degree, and doctoral degree. In Canada, Grade 4 and Grade 8 teachers in the TIMSS sample generally had a bachelor's degree or higher (Appendices B.3.13 and B.3.14). Internationally, 15 per cent of Grade 4 teachers, as well as 10 per cent of mathematics teachers and 9 per cent of science teachers at Grade 8, did not have this level of education. However, the proportion of teachers with a master's or doctoral degree is much lower in Canada than internationally, with about 13 per cent in Canada versus 27 per cent internationally at Grade 4; 20 per cent among Canadian Grade 8 science teachers versus 28 per cent internationally; and 17 per cent among Canadian Grade 8 mathematics teachers versus 25 per cent internationally.

Provincially, higher proportions of Grade 4 teachers have a masters' or doctoral degree in Ontario and in Alberta (both more than 14 per cent) than in Quebec (less than 8 per cent) (Appendix B.3.13). In Grade 8, 25 per cent of science teachers in Ontario and 12 per cent in Quebec are educated to this level, whereas in mathematics the proportions are 25 per cent in Ontario and 10 per cent in Quebec (Appendix B.3.14).

Internationally, results show a small positive relationship between a teacher's level of education and student achievement, although only at the Grade 8 level. Such a correlation is not evident in Canada, with one exception: Grade 8 science students whose teachers hold a master's degree (but not a doctorate) achieved higher results than those with teachers holding a bachelor's degree.

TIMSS asked teachers to estimate the number of hours they have spent on formal professional development activities (e.g., workshops, seminars, etc.) over the past two years. In general, Canadian teachers spent more time in mathematics professional development activities than the international average at both grade levels. Ontario teachers take more professional development in mathematics than the Canadian average and Quebec

¹⁵ The difference in the sample size between the two grades can be explained by the fact that Alberta participated in TIMSS 2015 at the Grade 4 level only.

teachers less. In science the situation is different, with Canadian teachers at both grade levels spending less time on science-related professional development activities than the international average. Internationally as well as across provinces, Grade 8 teachers spend more time on science-related professional development than do Grade 4 teachers. In Quebec, Grade 8 science teachers tend to spend more time on such activities than do teachers in the other provinces (Tables 3.1 and 3.2). On average, at the international level as well as in Canada, there is no relationship between attending formal professional development activities and student achievement at either grade level or in either subject area.

TABLE 3.1 Frequency of mathematics-specific professional development activities

	Grade 4					Grade 8				
	None	Less than 6 hours	6–15 hours	16–35 hours	More than 35 hours	None	Less than 6 hours	6–15 hours	16–35 hours	More than 35 hours
Alberta	15.0	35.0	27.7	17.1	5.2	---	---	---	---	---
Ontario	5.9	22.9	26.3	24.9	19.9	3.4	21.0	28.5	28.7	18.5
Quebec	18.3	27.7	30.2	19.4	4.3	12.1	24.9	34.5	20.7	7.8
Canada	11.0	27.9	28.2	21.3	11.6	6.8	22.4	31.3	25.6	13.8
International average	27.2	22.5	24.4	14.1	11.8	15.2	16.4	25.4	20.4	22.6

TABLE 3.2 Frequency of science-specific professional development activities

	Grade 4					Grade 8				
	None	Less than 6 hours	6–15 hours	16–35 hours	More than 35 hours	None	Less than 6 hours	6–15 hours	16–35 hours	More than 35 hours
Alberta	35.2	43.8	14.2	5.7	1.2	---	---	---	---	---
Ontario	59.8	23.1	10.5	2.5	4.0	47.8	22.3	22.6	4.3	3.1
Quebec	54.8	34.7	4.5	1.7	4.3	18.0	21.8	36.3	15.0	9.0
Canada	54.5	29.9	9.6	2.7	3.3	35.7	21.6	28.3	9.0	5.4
International average	40.7	23.8	19.2	8.7	7.6	17.4	17.1	25.0	18.2	22.3

Students' backgrounds and attitudes towards mathematics and science

The way students perceive their own competence in mathematics and science may influence and be influenced by their actual knowledge and skills in these subject areas. Consequently, the ability of the school environment to improve students' perception of their own understanding of mathematics and science may have a positive effect on their actual performance (Craven & Marsh, 2008). To investigate this idea, TIMSS 2015 asked students how confident they felt about their own competence in mathematics and science and then related the students' responses to their actual performance on the test. Students were categorized according to their degree of agreement with nine statements on the Students Confident in Mathematics (and Science) Scale. Based on

an international average of 10 on this scale, as established in 2011, students were categorized as not confident in mathematics/science, confident in mathematics/science, or very confident in mathematics/science.

In Grade 4, the proportion of Canadian students who felt very confident in these fields (33 per cent in mathematics and 39 per cent in science) was within one percentage point of the international average. At the provincial level, 38 per cent of Grade 4 students in Quebec felt very confident in mathematics, compared to 31 per cent in Ontario and 30 per cent in Alberta. In science, 44 per cent of students in Alberta felt very confident, compared to 38 per cent in both Ontario and Quebec.

As seen in Chart 3.9 and Appendix B.3.15, the relationship between confidence in mathematics and achievement is strong and positive. The 23 per cent of Canadian Grade 4 students who were not confident in mathematics achieved an average score of 467; the 44 per cent of students who said they were confident achieved an average of 506; and the 33 per cent of students stating that they were very confident achieved a score of 552, or 85 points more than those with no confidence. In science, the relationship is also positive but less strong: the 39 per cent of Canadian students stating that they were very confident in science scored an average of 51 points more than the 18 per cent of students stating that they were not confident (Chart 3.10, Appendix B.3.16).

CHART 3.9 Relationship between confidence in mathematics and Grade 4 achievement

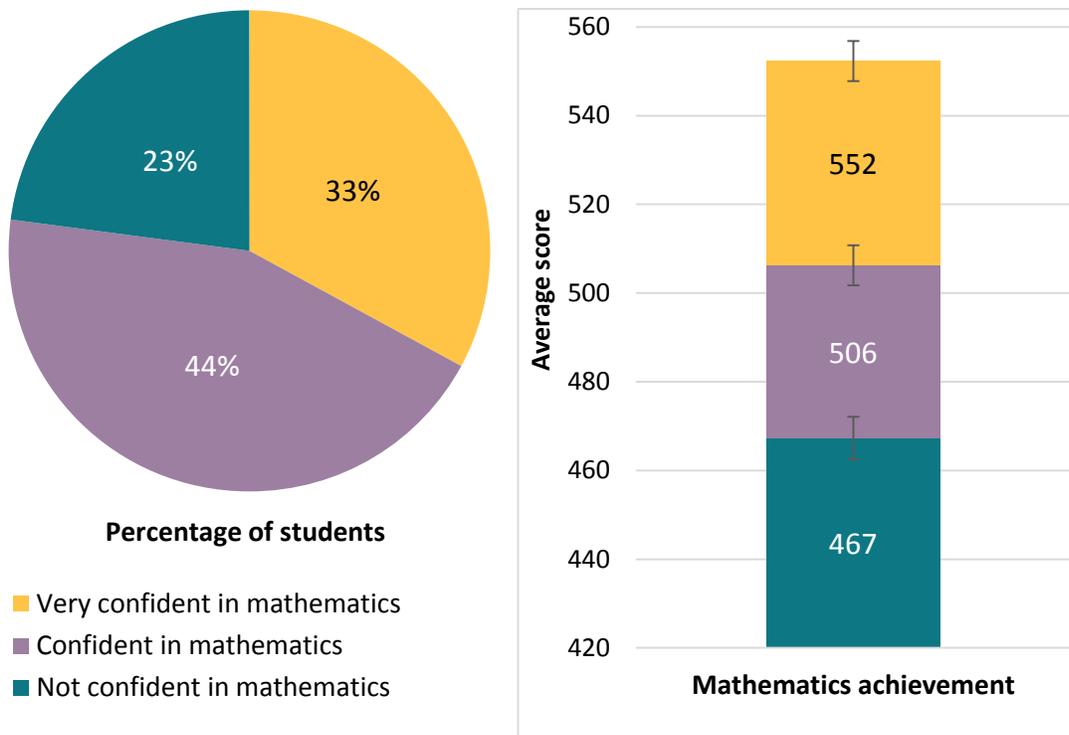
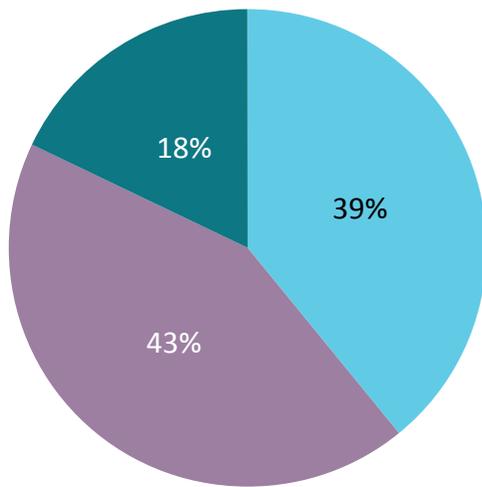
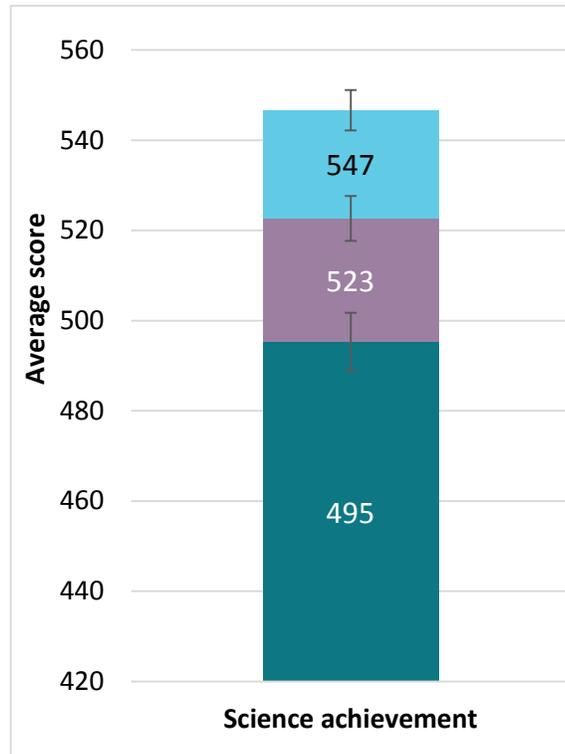


CHART 3.10 Relationship between confidence in science and Grade 4 achievement



Percentage of students

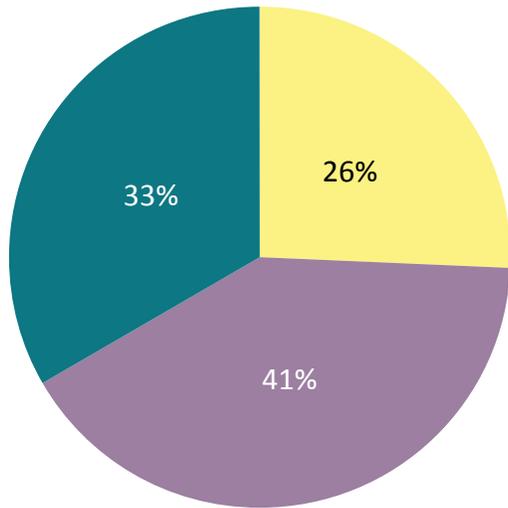
- Very confident in science
- Confident in science
- Not confident in science



Canada had the highest proportion of students at Grade 8 in any country who felt very confident in mathematics: 26 per cent, versus the international average of 14 per cent. Among provinces, 29 per cent of students in Ontario and 19 per cent in Quebec felt very confident in mathematics. In science, the proportions of students feeling very confident were closer to the international average (of about one in four students) for Canada overall and for Ontario and Quebec.

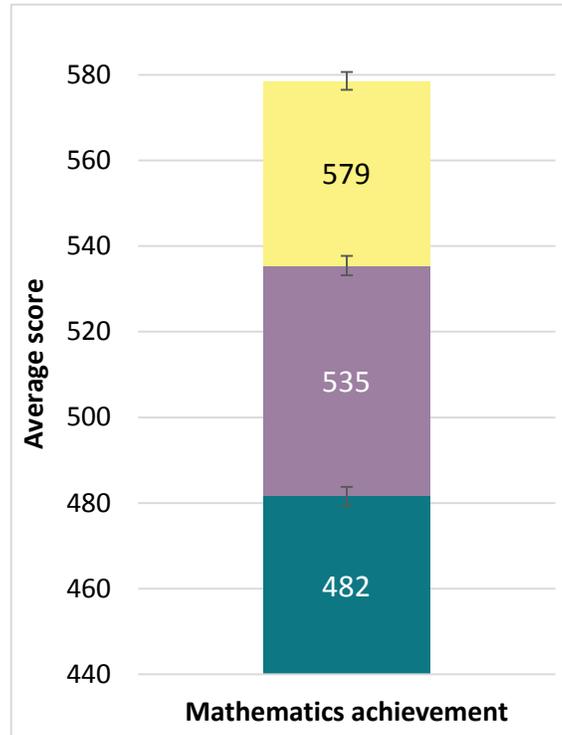
As was the case with Grade 4 students, the relationship between student's confidence in mathematics and mathematics achievement is strong, with a difference of 97 points between students who were not confident and those who felt very confident (Chart 3.11, Appendix B.3.15). The relationship between confidence and achievement in science is also strong, but less so than in mathematics: students feeling very confident in science scored 65 points more on average than those feeling not confident (Chart 3.12, Appendix B.3.16).

CHART 3.11 Relationship between confidence in mathematics and Grade 8 achievement



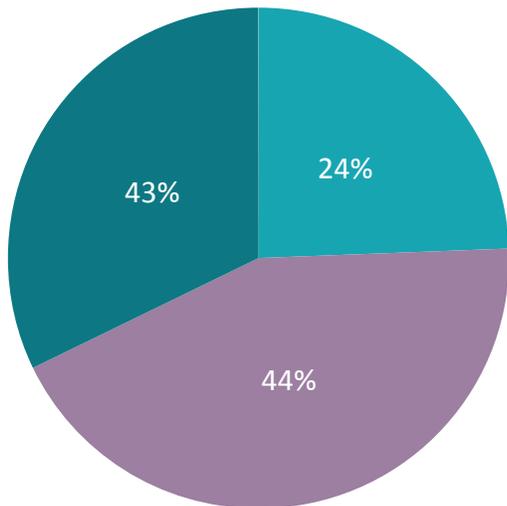
Percentage of students

- Very confident in mathematics
- Confident in mathematics
- Not confident in mathematics



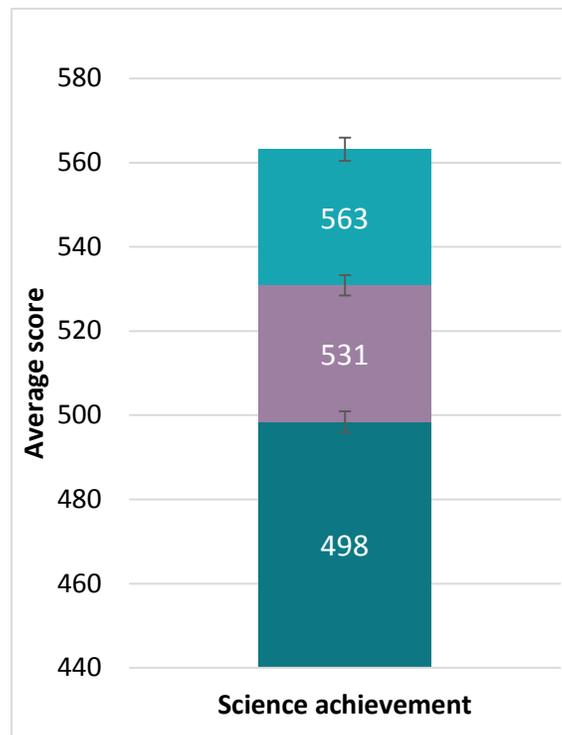
Mathematics achievement

CHART 3.12 Relationship between confidence in science and Grade 8 achievement



Percentage of students

- Very confident in science
- Confident in science
- Not confident in science

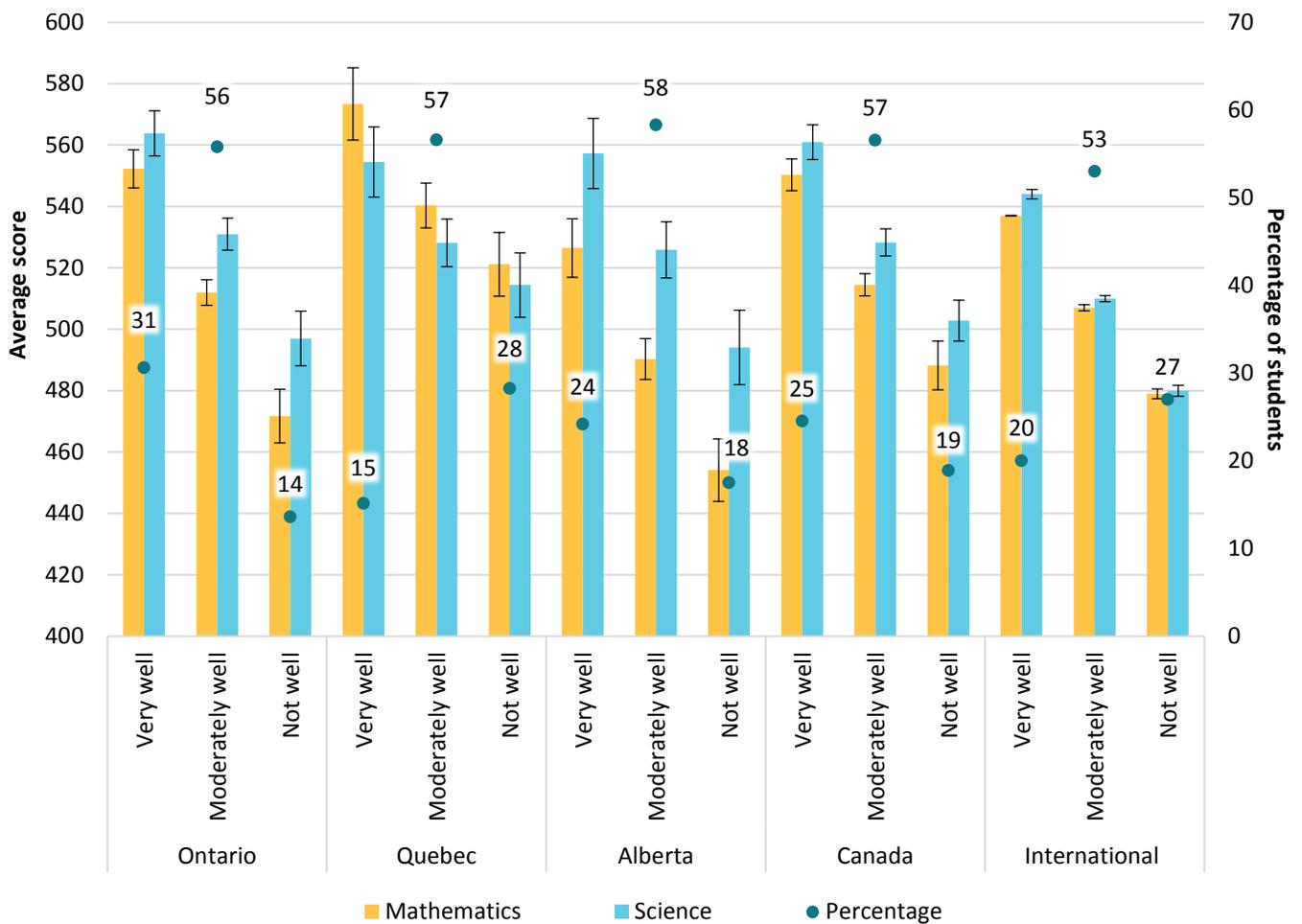


Science achievement

Information about self-reported student confidence was complemented by a Home Questionnaire, part of which asked parents of Grade 4 students to state how well their child was able to perform a number of literacy and numeracy tasks when they began primary school. Answers were classified as very well, moderately well, or not well, depending on the number of tasks children were able to perform and how well they could perform them. The classifications were then related to achievement in mathematics and science. Internationally, 20 per cent of Grade 4 students could do the literacy and numeracy tasks very well, 53 per cent could do them moderately well, and 27 per cent could do them not well. In Canada, these figures were 25 per cent, 57 per cent, and 19 per cent, respectively.

The international figures involved very wide variations across countries, with over half of Grade 4 students able to do the early literacy and numeracy tasks very well in Korea and Ireland, while fewer than 10 per cent could do so in ten countries, including New Zealand, Germany, and Denmark. Based on parental responses at the provincial level, the proportion of students who could perform these early numeracy and literacy tasks very well was highest in Ontario (31 per cent) and lowest in Quebec (15 per cent). However, the difference in achievement between students who could do the tasks very well and those who could do them not well was lowest in Quebec (52 points in mathematics and 40 points in science), while it was the highest in Ontario (81 points in mathematics and 67 points in science) (Chart 3.13, Appendix B.3.17).

CHART 3.13 Relationship between early literacy and numeracy tasks and Grade 4 achievement



Homework

The evidence regarding the benefits of homework on student achievement suggests a complex relationship. Depending on the subject area studied, the grade level, and the duration or frequency of the homework, research findings often appear to be contradictory (CMEC, 2014). TIMSS 2015 looked at the amount of time Grade 8 students spent on mathematics and science homework daily and how this related to achievement, based on six categories: no homework, 1 to 15 minutes, 16 to 30 minutes, 31 to 60 minutes, 61 to 90 minutes, and more than 90 minutes.

Despite findings from some other studies, TIMSS found that the relationship between homework and achievement is quite consistent across provinces, in Canada, and internationally. It is also consistent with past findings based on the Programme for International Student Assessment for 15-year-old students (CMEC, 2014). For illustrative purposes, Canadian results are shown in Chart 3.14 (mathematics) and Chart 3.15 (science) (see also Appendix B.3.18). Very few Canadian students are at the two extremes of the distributions for the two subjects (i.e., having no homework and spending more than 90 minutes); among the rest, the highest scores were achieved by Canadian students who did up to 30 minutes of homework in mathematics and up to 60 in science, with declines occurring thereafter.

CHART 3.14 Relationship between homework and Grade 8 mathematics achievement in Canada

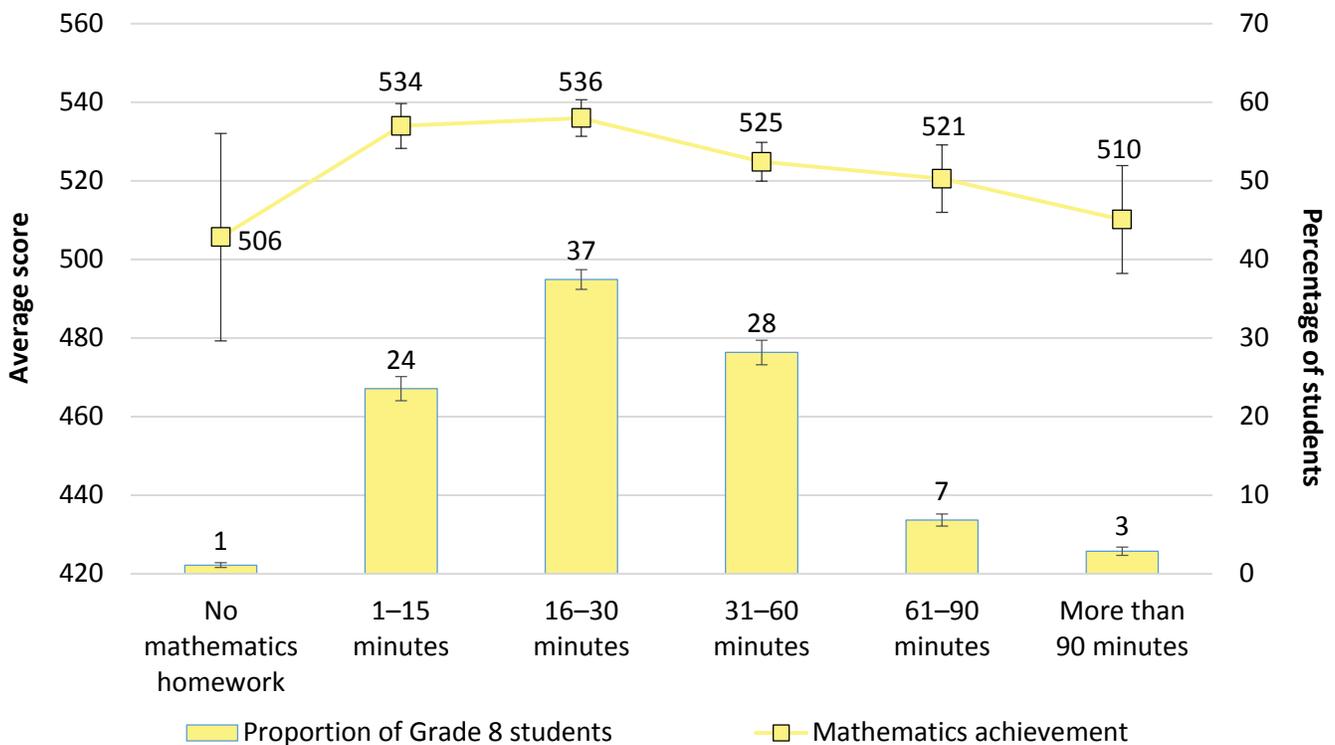
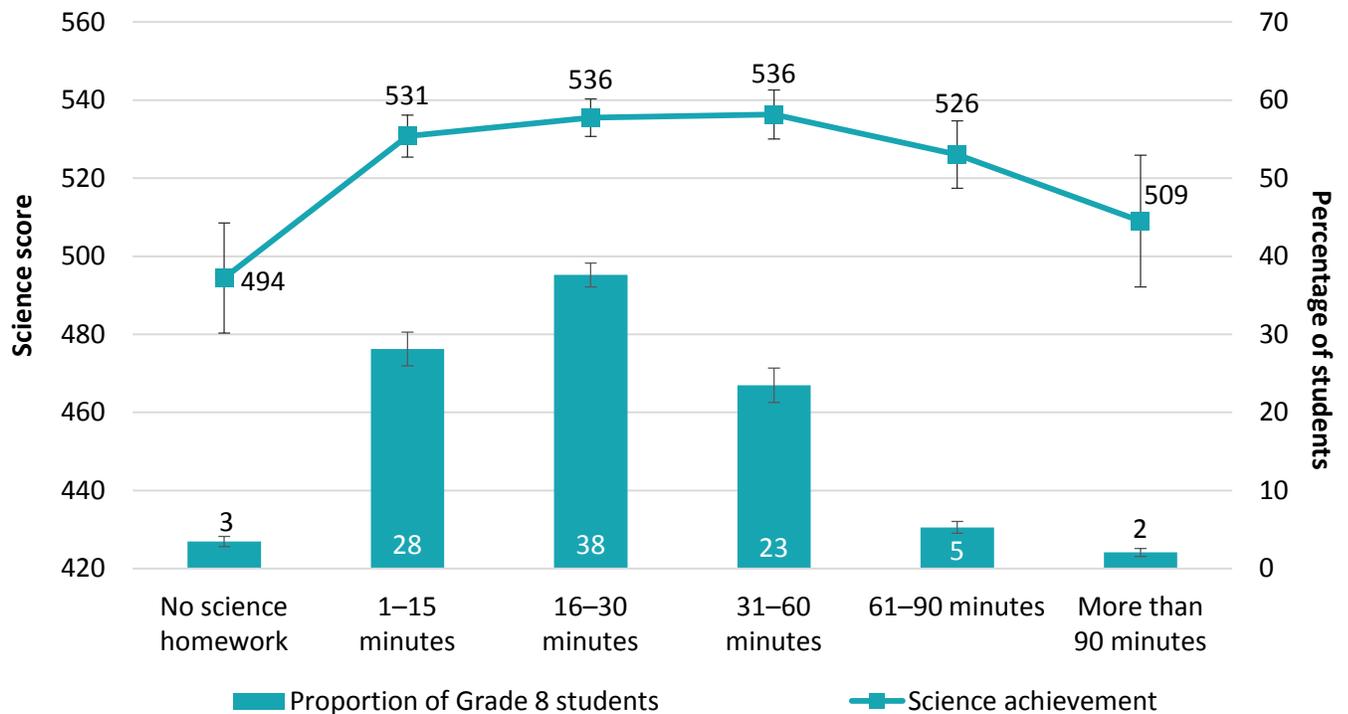


CHART 3.15 Relationship between homework and Grade 8 science achievement in Canada



Intended curriculum

An important element of TIMSS is its ability to identify what proportion of the topics covered by the test have been taught. Classroom teachers were asked to describe when students in their classes were taught each topic 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. The TIMSS findings are reported below for Alberta (Grade 4 only), Ontario, and Quebec. Because, in Canada, curriculum is under the exclusive jurisdiction of provinces and territories, we have not compared the results across participating provinces.

TIMSS curriculum topics covered in Alberta

In Grade 4 mathematics, Alberta students were taught most topics in the *number* and *data display* subdomains. However, over 70 per cent of teachers claimed three topics in *geometric shapes and measures* subdomain had not yet been taught to students: *comparing and drawing angles*, *using informal coordinate systems to locate points in a plane*, and *reflections and rotations* (Appendix B.3.19). In science, most topics in the *physical science* and *Earth science* subdomains were not taught at Grade 4 (Appendix B.3.20). In addition, three *life science* topics were not taught to half or more of the students: *major body structures and their functions in humans, other animals, and plants*; *understanding that some characteristics are inherited and some are the result of the environment*; and *human health*.

TIMSS curriculum topics covered in Ontario

In Grade 4, according to teachers' responses, Ontario students were taught the majority of the mathematics topics in the three subdomains. However, there were two topics that had not yet been taught to half the

students in the *number* subdomain (*adding and subtracting with fractions, comparing and ordering fractions and concepts of decimals, including place value and ordering, adding, and subtracting with decimals*) and *geometric shapes and measures* subdomain (*using informal coordinate systems to locate points in a plane and relationships between two-dimensional and three-dimensional shapes*) (Appendix B.3.21). In science, most Ontario students had been taught most topics in *life science* but not in *physical science* or *Earth science*. More specifically, there were five topics in *physical science* that had not yet been taught to more than half of the students and three such topics in *Earth science* (Appendix B.3.22).

In Grade 8, Ontario students had been taught 85 per cent or more of three of the four mathematics subdomains. In *algebra*, 64 per cent of the topics had been taught; two *algebra* topics had not been taught to more than half of students: *simultaneous equations* and *properties of functions* (Appendix B.3.23). In science, the fewest topics had been taught in *chemistry*, where half of the topics had not been taught or had just been introduced to over 70 per cent of students (Appendix B.3.24).

TIMSS curriculum topics covered in Quebec

At Grade 4, teachers reported that only two topics in mathematics had not been taught or had just been introduced to more than half of students in Quebec: *adding and subtracting with fractions, comparing and ordering fractions* and *reflections and rotations* (Appendix B.3.25). In Grade 4 science, many *physical science* topics had not yet been taught to a majority of students in Quebec. In addition, two topics in *life science* (*understanding that some characteristics are inherited and some are the result of the environment and human health*) and one topic in *Earth science* (*understanding what fossils are and what they can tell us about past conditions on Earth*) had not yet been taught to a majority of students (Appendix B.3.26).

At the Grade 8 level, two mathematics topics related to *algebra* had not yet been taught to over 90 per cent of students in Quebec: *simultaneous equations* and *properties of functions*. In addition, two of the three *data and chance* topics had not yet been taught to a majority of students (Appendix B.3.27). In science, over 70 per cent of students had not yet been taught two *biology* topics (*major organs and organ systems in humans and other organisms* and *human health and the importance of diet and exercise in maintaining health*), one *chemistry* topic (*the role of electrons in chemical bonds*), and two *physics* topics (*basic properties/behaviours of light and sound* and *electric circuits and properties and uses of permanent magnets and electromagnets*) (Appendix B.3.28).

SUMMARY

TIMSS is an international assessment that measures trends in mathematics and science achievement at what in Canada are the Grade 4 and Grade 8/Secondary II levels. It has been carried out every four years since 1995. TIMSS 2015, which marks the survey's sixth assessment cycle, evaluated the skills of over 580,000 students from 57 countries, including students from seven benchmarking participants. At the Grade 4 level, Canada was represented by Alberta, Manitoba, Ontario, Quebec, and Newfoundland and Labrador, and at the Grade 8/Secondary II level by Manitoba, Ontario, Quebec, and Newfoundland and Labrador. Ontario and Quebec also participated as benchmarking participants at both the Grade 4 and Grade 8 levels.

Mathematics and science have been chosen as the two domains to be measured in TIMSS. Both are universal to school children across the world, and both are critical to further education for individuals as well as economic and social development for societies. TIMSS assesses skills in these subjects in two dimensions: a *content* dimension specifying subject matter, and a *cognitive* dimension specifying thinking processes. The content domains differ by subject and, to some extent, by grade, but the cognitive dimensions are the same throughout. The survey also measures a number of contextual factors that are related to student learning.

Results at the Grade 4 level

At the Grade 4 level, over 90 per cent of Canadian students reached at least the basic (low) level of achievement in mathematics. Sixty-nine per cent reached at least the intermediate level, compared to 75 per cent for the international average, while within Canada, this proportion ranged from 55 per cent in Alberta to 82 per cent in Quebec. In science, more than 90 per cent of Canadian students also reached at least the basic (low) level of achievement, and 77 per cent reached at least the intermediate level—a proportion that was the same as that achieved internationally. Among provinces, Ontario had the most students (79 per cent) reaching the intermediate level, while Alberta (73 per cent) had the fewest. Canada's mean scores in both domains were above the international average.

While there was no gender difference in overall mathematics achievement internationally, in Canada boys performed better than girls by 9 points. In science, there was no difference in achievement by gender.

In mathematics, Canadian students in the French-language school systems outperformed those in the English-language systems, driven largely by the strong performance of French-language students in Quebec. In science, students from English-language school systems performed better than students in French-language school systems in Ontario and in Alberta but not in Quebec, where there was no significant difference between the two systems.

Results at the Grade 8 level

At the Grade 8 level, more than 90 per cent of Canadian students command at least basic (low) proficiency in both science and mathematics. Furthermore, 78 per cent of Canadian students reached at least the intermediate benchmark in both subjects, a figure that is well above the international median of 62 per cent for mathematics and 64 per cent for science. The Canadian average score was 527 in mathematics, compared to the international average of 500, while in science it was 526, compared to the international average of 500.

There was no gender gap in mathematics at the international level; this was also true in Ontario. In Canada overall and in Quebec, boys performed better than girls in mathematics. In science there was no gender gap in Canada or in Ontario, but in Quebec boys once again outperformed girls.

In mathematics, students in the French-language school systems performed better than their English counterparts in Canada overall and in Ontario but not in Quebec, where there was no difference between the two language systems. In science, there were no differences between the systems in any jurisdiction.

Contextual factors influencing scores

Information collected by TIMSS revealed a relationship between the socioeconomic status of a school—measured by whether or not it provided a free breakfast to students—and students' scores. Grade 4 students in schools with a comparatively high socioeconomic status scored higher in both mathematics and science than those in schools with a lower socioeconomic status. By the Grade 8 level, however, this gap in achievement had diminished considerably.

TIMSS used an additional indicator of socioeconomic status—a composite derived from a number of factors, such as the quantity of books in the home and the level of parents' education—to measure performance, and found that the relationship between home resources and achievement was weaker in Canada than it was internationally.

Canadian school principals report slightly more disciplinary and safety issues than the international average, but for many of these issues Canadian principals were less likely than their international counterparts to deem them moderate or serious problems.

The majority of teachers surveyed in TIMSS were female, both in Canada and internationally. Almost all teachers in Canada had at least a bachelor's degree, whereas significant proportions of teachers in other countries did not. On the other hand, Canadian teachers were less likely than their international counterparts to hold a master's degree or a doctorate. Canadian teachers generally spend more time on professional development in mathematics than the international average, and less time than the international average on such activities in science. There is, however, little correlation internationally or in Canada between the amount of time spent on professional development and student scores.

A final contextual element in student achievement is the degree of confidence that students feel about their abilities. In Grade 4, the proportions of Canadian students who feel very confident in their abilities in mathematics and science are within one percentage point of the international average. At the Grade 8 level, the proportion who felt very confident in science was again close to the international average, whereas in mathematics it was higher in Canada than in any other country. There is a strong relationship between feelings of confidence in mathematics or science and scores in these fields.

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APPENDIX A

Exclusion and response rates in Canada

As with any other large-scale survey, TIMSS 2015 endeavoured to ensure the international comparability of results. 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 (Mullis et al., 2016). 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 the province of Quebec). However, school-entry age varies across countries. Therefore, in order to avoid testing very young students, age is also taken into consideration when selecting the target grades.

All countries participating in TIMSS 2015 were encouraged to do everything possible to maximize coverage of their national population. In Canada, the national target population did not include all the TIMSS international target population (79 per cent for Grade 4 and 67 per cent for Grade 8) because five provinces (British Columbia, Saskatchewan, New Brunswick, Nova Scotia, and Prince Edward Island) and the three territories did not participate in the study, and one province, Alberta, participated only at the Grade 4 level. In two of the participating provinces (Manitoba and Newfoundland and Labrador), a minimal number of students participated to ensure adequate national geographic coverage, whereas the other three participating provinces (Alberta (Grade 4 only), Ontario, Quebec) had a large enough sample to provide robust provincial results. The total weighted rate of school-level exclusions in Canada was 2.5 per cent for both grade levels (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.

The total weighted rate of student-level exclusions in Canada was 3.6 per cent in Grade 4 and in Grade 8 (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 participate 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 by other qualified staff, to have intellectual disabilities and/or who had been psychologically tested as such. This included students who were emotionally or mentally unable to follow 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.

TABLE A.1 TIMSS 2015 exclusion rates by type of exclusion

		School-level exclusions (%)	Student-level exclusions (%)	Overall (%)
Grade 4	Alberta	0.0	4.4	4.4
	Ontario	2.2	1.3	3.4
	Quebec	3.2	2.2	5.4
	Canada*	2.5	3.6	6.1
Grade 8	Ontario	2.2	1.3	3.4
	Quebec	3.2	2.2	5.4
	Canada**	2.5	3.6	6.1

* The Canadian Grade 4 average comprises students from Alberta, Manitoba, Ontario, Quebec, and Newfoundland and Labrador.

** The Canadian Grade 8 average comprises students from Manitoba, Ontario, Quebec, and Newfoundland and Labrador.

Note: The national defined population covers 90% to 95% of the national target population. Non-participating jurisdictions 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 and students. At the national level, the minimum acceptable participation rates are 85 per cent of both schools (including both sampled schools and replacement schools) and students, or an overall rate (the product of school and student participation) of 75 per cent. In Canada overall, the weighted school participation rate was 86 per cent in Grade 4 and 85 per cent in Grade 8, and the weighted student participation rate was 94 per cent in Grade 4 and 93 per cent in Grade 8. The total weighted participation rate for Canada (at both school and student levels) was 80 per cent in Grade 4 and 78 per cent in Grade 8. Thus, the international standards for participation in the assessment were successfully maintained in Canada. Tables A.2 and A.3 show school and student sample sizes, and Table A.4 shows participation rates across those participating provinces with large enough sample sizes to provide robust provincial results.

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).

TABLE A.2 School sample sizes and school participation rates

		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	Alberta	168	166	136	18	154
	Ontario	160	158	151	0	151
	Quebec	176	174	101	20	121
	Canada	520	513	403	38	441
Grade 8	Ontario	152	147	135	3	138
	Quebec	176	174	102	20	122
	Canada	344	337	253	23	276

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

** This number includes participating and not participating schools.

*** School participation rate is based on originally sampled schools.

TABLE A.3 Student sample sizes in participating schools and student participation rates

		Number of sampled students in participating schools*	Number of eligible students in the sample**	Number of students absent	Number of students assessed
Grade 4	Alberta	5354	5123	461	4662
	Ontario	4938	4827	253	4574
	Quebec	3012	2945	147	2798
	Canada	13583	13171	888	12283
Grade 8	Ontario	4883	4841	321	4520
	Quebec	4403	4263	313	3950
	Canada	9618	9409	652	8757

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

** This number includes participating and not participating students.

The TIMSS guidelines for sample participation rates were not met in the province of Quebec (Table A.4). Therefore, results for the province of Quebec in this report should be treated with caution because of a possible non-response bias.

TABLE A.4 Participation rates (weighted)

		School participation (%)		Class participation (%)	Student participation (%)	Overall participation (%)	
		Before replacement	After replacement			Before replacement	After replacement
Grade 4	Alberta	78	92	96	91	68	80
	Ontario	95	95	100	95	90	90
	Quebec*	48	62	100	95	46	59
	Canada	80	86	99	94	74	80
Grade 8	Ontario	93	94	99	93	85	87
	Quebec*	50	63	99	92	46	58
	Canada	80	85	99	93	73	78

* Did not satisfy TIMSS guidelines for sample participation rates.

APPENDIX B — TIMSS 2015 data tables

TABLE B.1.1 Percentage of Grade 4 students reaching the international discrete benchmarks in 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
Singapore	50.1	(2.1)	29.9	(1.7)	13.4	(1.1)	5.2	(0.7)	1.4	(0.3)
Hong Kong SAR	44.8	(2.0)	39.5	(1.5)	13.5	(1.1)	2.0	(0.4)	0.2	(0.1)
Korea	40.9	(1.3)	40.3	(1.1)	15.6	(0.8)	2.8	(0.4)	0.3	(0.1)
Chinese Taipei	35.3	(1.5)	40.4	(1.3)	19.1	(0.9)	4.7	(0.4)	0.5	(0.2)
Japan	32.2	(1.1)	42.2	(0.8)	20.7	(0.9)	4.4	(0.4)	0.5	(0.1)
Northern Ireland	27.4	(1.3)	34.0	(1.0)	24.5	(1.2)	11.0	(1.0)	3.1	(0.6)
Russian Federation	19.8	(1.8)	39.0	(1.6)	30.1	(1.3)	9.3	(0.9)	1.7	(0.4)
England	16.8	(1.2)	31.8	(1.2)	31.4	(1.1)	15.7	(1.1)	4.3	(0.7)
Kazakhstan	16.1	(1.8)	30.8	(1.6)	32.7	(1.6)	16.8	(1.4)	3.5	(0.5)
United States	14.2	(0.8)	32.4	(0.7)	32.0	(0.7)	16.1	(0.6)	5.2	(0.5)
Ireland	14.1	(1.0)	36.9	(1.3)	32.9	(1.7)	13.1	(1.0)	3.0	(0.4)
Norway (5)	14.0	(1.1)	36.2	(1.3)	35.6	(1.1)	12.2	(0.9)	2.1	(0.4)
Hungary	12.6	(0.9)	31.2	(1.3)	31.1	(1.3)	16.8	(0.9)	8.2	(0.9)
Portugal	12.3	(0.9)	33.7	(1.1)	35.8	(0.9)	15.4	(0.9)	2.8	(0.4)
Denmark	12.0	(0.9)	33.7	(1.3)	34.6	(1.3)	15.6	(0.9)	4.1	(0.6)
Serbia	10.0	(0.8)	27.0	(1.1)	34.6	(1.2)	19.0	(0.9)	9.4	(1.2)
Bulgaria	9.8	(1.3)	30.5	(1.7)	34.8	(1.4)	16.8	(1.3)	8.1	(1.3)
Lithuania	9.7	(1.0)	34.3	(1.1)	36.7	(1.2)	15.7	(0.9)	3.7	(0.5)
Poland	9.6	(0.7)	34.0	(1.3)	36.2	(0.9)	16.4	(0.9)	3.8	(0.4)
Belgium (Flemish)	9.6	(0.8)	37.8	(1.1)	40.4	(1.1)	11.1	(0.8)	1.0	(0.3)
Cyprus	9.5	(0.7)	29.3	(1.2)	34.9	(1.0)	18.9	(1.1)	7.4	(0.6)
Australia	9.2	(0.9)	27.0	(1.2)	34.0	(1.2)	21.1	(0.9)	8.6	(0.9)
Quebec	8.7	(1.3)	32.9	(1.9)	40.6	(1.6)	15.6	(1.6)	2.2	(0.6)
Finland	8.2	(0.7)	34.6	(1.3)	39.4	(1.0)	15.1	(0.8)	2.7	(0.4)
Czech Republic	7.8	(0.7)	30.5	(1.2)	40.1	(1.1)	17.7	(0.9)	3.9	(0.5)
New Zealand	5.9	(0.5)	20.5	(0.7)	32.3	(0.9)	25.3	(1.0)	16.0	(0.9)
Slovenia	5.7	(0.5)	28.7	(1.3)	41.1	(1.2)	19.7	(1.2)	4.8	(0.5)
Ontario	5.7	(0.6)	25.2	(1.1)	39.4	(1.2)	23.1	(1.0)	6.7	(0.6)
Canada	5.6	(0.5)	24.9	(0.8)	38.9	(0.9)	22.9	(0.7)	7.6	(0.8)
Germany	5.3	(0.5)	28.7	(1.3)	42.7	(1.1)	19.6	(0.9)	3.7	(0.6)
Sweden	5.2	(0.5)	28.5	(1.3)	41.2	(1.3)	19.8	(1.2)	5.3	(0.8)
United Arab Emirates	4.7	(0.4)	13.5	(0.6)	24.2	(0.6)	25.9	(0.7)	31.7	(0.9)
Turkey	4.7	(0.5)	20.5	(0.9)	31.9	(1.0)	24.3	(1.0)	18.6	(1.1)
Italy	4.2	(0.6)	23.8	(1.3)	40.7	(1.1)	23.8	(1.1)	7.5	(0.8)
Slovak Republic	4.0	(0.4)	22.2	(1.0)	38.9	(1.2)	23.3	(1.0)	11.7	(0.9)
The Netherlands	3.8	(0.6)	33.5	(1.3)	45.7	(1.3)	15.8	(1.0)	1.2	(0.3)
Spain	3.4	(0.4)	23.6	(1.0)	40.4	(0.9)	25.5	(1.0)	7.0	(0.9)
Croatia	2.7	(0.4)	21.7	(1.0)	43.1	(1.1)	25.8	(1.1)	6.8	(0.6)
Qatar	2.6	(0.5)	9.9	(0.9)	23.8	(1.1)	28.8	(1.0)	34.8	(1.4)
France	2.5	(0.3)	18.5	(1.2)	37.1	(1.3)	29.4	(1.2)	12.5	(1.0)
Alberta	2.4	(0.5)	16.5	(1.5)	36.4	(1.5)	31.5	(1.4)	13.2	(1.4)
Georgia	2.0	(0.6)	13.4	(1.1)	31.9	(1.4)	30.3	(1.3)	22.4	(1.6)
Oman	2.0	(0.3)	8.7	(0.5)	21.5	(0.7)	28.4	(0.8)	39.5	(1.0)
South Africa (5)	1.3	(0.3)	4.1	(0.5)	11.6	(0.7)	21.7	(0.8)	61.4	(1.4)
Bahrain	1.3	(0.3)	10.1	(0.6)	28.6	(1.0)	32.7	(1.1)	27.4	(1.0)
Iran, Islamic Republic of	1.2	(0.3)	8.5	(0.8)	23.1	(1.3)	28.5	(1.5)	38.7	(1.8)
Chile	1.1	(0.2)	9.3	(0.6)	31.3	(1.1)	36.5	(1.2)	21.8	(1.5)
Morocco	0.3	(0.2)	3.1	(0.8)	12.2	(1.0)	24.5	(1.2)	59.8	(1.8)
Saudi Arabia	0.3	(0.2)	3.1	(0.7)	12.8	(0.9)	27.1	(1.1)	56.7	(1.7)
Indonesia	0.3	(0.1)	3.0	(0.4)	14.3	(1.1)	28.4	(1.6)	54.1	(2.3)
Jordan	0.3	(0.1)	4.3	(0.6)	16.8	(0.8)	28.6	(0.9)	50.0	(1.2)
Kuwait	0.2	(0.1)	2.1	(0.4)	9.4	(0.9)	20.4	(1.1)	67.9	(1.8)
International average	10.3		24.6		30.5		19.6		15.0	

Note: Countries and provinces have been sorted by the total percentage of students who reached the advanced benchmark (625). The participating grade is identified in parentheses after the country name when it is not Grade 4.

TABLE B.1.2 Percentage of Grade 4 students reaching the international discrete benchmarks in 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
Singapore	36.7	(2.0)	34.8	(1.5)	18.8	(1.1)	7.2	(0.7)	2.5	(0.5)
Korea	29.1	(1.6)	45.9	(1.2)	20.7	(1.0)	4.1	(0.5)	0.3	(0.1)
Russian Federation	20.0	(1.5)	41.8	(1.6)	29.0	(1.4)	7.8	(0.9)	1.5	(0.3)
Japan	19.2	(0.9)	44.1	(1.2)	29.2	(1.1)	6.5	(0.5)	1.0	(0.2)
Kazakhstan	18.6	(1.7)	30.6	(1.5)	32.0	(1.6)	15.0	(1.2)	3.7	(0.6)
Hong Kong SAR	16.2	(1.2)	39.3	(1.3)	32.4	(1.4)	10.3	(0.9)	1.9	(0.4)
Bulgaria	16.0	(1.5)	33.6	(1.4)	27.6	(1.3)	13.1	(1.1)	9.7	(1.5)
United States	15.8	(0.8)	34.9	(0.9)	30.7	(0.8)	13.9	(0.6)	4.6	(0.5)
Chinese Taipei	14.4	(0.7)	41.2	(1.2)	32.3	(0.9)	10.2	(0.7)	1.9	(0.3)
Hungary	14.2	(1.1)	36.1	(1.2)	30.2	(1.1)	13.9	(1.3)	5.6	(0.9)
Finland	12.6	(0.9)	41.7	(1.1)	34.8	(1.1)	9.4	(0.7)	1.5	(0.4)
Poland	12.1	(0.9)	38.7	(1.1)	34.5	(1.0)	12.1	(1.1)	2.6	(0.4)
Sweden	11.1	(1.1)	36.2	(1.6)	35.0	(1.4)	13.7	(1.1)	4.0	(0.8)
Slovenia	10.8	(0.9)	37.7	(1.1)	35.5	(1.0)	12.9	(0.7)	3.1	(0.5)
England	9.6	(0.8)	33.0	(1.3)	38.5	(1.5)	15.8	(1.0)	3.0	(0.5)
Slovak Republic	8.7	(0.6)	30.8	(1.2)	34.6	(1.1)	16.8	(0.9)	9.0	(0.8)
Czech Republic	8.7	(0.7)	34.2	(1.2)	37.9	(1.1)	15.6	(0.8)	3.5	(0.6)
Ontario	8.5	(0.9)	32.7	(1.1)	37.3	(1.3)	17.0	(1.0)	4.4	(0.6)
Serbia	8.4	(0.7)	32.1	(1.2)	36.2	(1.3)	16.0	(1.0)	7.4	(1.1)
Australia	7.9	(0.7)	31.0	(1.2)	36.6	(1.0)	18.3	(0.9)	6.3	(0.8)
Germany	7.6	(0.6)	32.0	(1.6)	38.9	(1.0)	17.6	(1.0)	4.0	(0.6)
Alberta	7.4	(1.0)	29.4	(1.6)	36.0	(1.4)	19.4	(1.3)	7.7	(1.3)
Canada	7.4	(0.5)	30.8	(0.9)	38.3	(1.0)	18.2	(0.9)	5.3	(0.7)
Norway	7.3	(0.9)	36.8	(1.3)	40.4	(1.4)	13.2	(1.0)	2.3	(0.6)
Ireland	6.9	(0.9)	33.3	(1.3)	39.1	(1.3)	16.4	(1.1)	4.4	(0.6)
Lithuania	6.7	(0.8)	32.6	(1.3)	38.7	(1.1)	17.6	(1.0)	4.3	(0.5)
Denmark	6.6	(0.6)	32.1	(1.6)	39.4	(1.3)	17.7	(1.0)	4.2	(0.5)
New Zealand	6.3	(0.6)	25.9	(0.9)	34.7	(1.0)	21.2	(1.0)	11.9	(0.9)
United Arab Emirates	6.3	(0.4)	16.0	(0.6)	23.3	(0.6)	21.2	(0.6)	33.2	(0.9)
Croatia	6.3	(0.7)	34.5	(1.1)	42.3	(1.2)	14.7	(1.0)	2.2	(0.4)
Quebec	5.8	(0.9)	29.5	(1.9)	42.6	(1.3)	19.1	(1.7)	3.0	(0.6)
Northern Ireland	5.4	(0.6)	28.9	(1.2)	41.3	(1.3)	18.9	(1.1)	5.4	(0.6)
Spain	5.2	(0.5)	28.7	(1.2)	40.5	(0.9)	20.5	(1.2)	5.2	(0.7)
Oman	4.3	(0.4)	11.9	(0.7)	21.6	(1.0)	23.4	(0.8)	38.8	(1.0)
Bahrain	4.2	(0.4)	15.2	(1.0)	28.1	(0.9)	25.0	(0.9)	27.5	(1.0)
Turkey	4.1	(0.5)	19.8	(1.0)	34.5	(1.0)	24.1	(1.1)	17.6	(1.2)
Italy	4.0	(0.5)	27.9	(1.2)	42.8	(1.3)	20.1	(1.3)	5.2	(0.7)
Qatar	3.2	(0.5)	12.2	(1.0)	23.9	(1.6)	24.6	(1.1)	36.1	(1.6)
The Netherlands	2.8	(0.4)	27.5	(1.4)	45.9	(1.1)	20.5	(1.2)	3.3	(0.6)
Belgium (Flemish)	2.6	(0.4)	24.9	(1.3)	45.8	(1.1)	22.6	(1.1)	4.1	(0.6)
France	2.1	(0.3)	18.0	(1.1)	37.9	(1.3)	29.8	(1.1)	12.2	(1.1)
Portugal	2.1	(0.3)	22.5	(1.2)	46.9	(0.9)	24.5	(1.2)	4.0	(0.6)
Cyprus	2.0	(0.3)	16.3	(1.0)	37.7	(1.2)	29.8	(0.9)	14.3	(1.0)
Chile	1.7	(0.2)	14.8	(1.2)	36.2	(1.1)	32.4	(1.1)	14.9	(1.2)
Georgia	1.4	(0.6)	10.4	(1.0)	29.4	(1.3)	32.9	(1.1)	26.0	(1.7)
Saudi Arabia	1.3	(0.3)	6.7	(0.8)	16.6	(0.9)	23.8	(1.0)	51.6	(1.8)
Iran, Islamic Republic of	0.8	(0.3)	8.0	(0.7)	24.5	(1.4)	28.2	(1.2)	38.6	(1.7)
Morocco	0.7	(0.3)	4.2	(0.7)	12.2	(1.0)	18.1	(1.1)	64.8	(1.8)
Indonesia	0.6	(0.2)	5.2	(0.6)	18.0	(1.3)	26.8	(1.2)	49.4	(2.1)
Kuwait	0.6	(0.2)	3.6	(0.6)	10.8	(1.0)	17.7	(1.0)	67.3	(1.9)
International average	8.4		27.4		33.0		18.2		12.9	

Note: Countries and provinces have been sorted by the total percentage of students who reached the advanced benchmark (625).

TABLE B.1.3 Grade 4 achievement scores in mathematics

Country or province	Average score	Standard error	Confidence interval – 95% lower limit	Confidence interval – 95% upper limit
Singapore	618	(3.8)	611	625
Hong Kong SAR	615	(2.9)	609	621
Korea	608	(2.2)	604	612
Chinese Taipei	597	(1.9)	593	601
Japan	593	(2.0)	589	597
Northern Ireland	570	(2.9)	564	576
Russian Federation	564	(3.4)	557	571
Norway (5)	549	(2.5)	544	554
Ireland	547	(2.1)	543	551
England	546	(2.8)	541	551
Belgium (Flemish)	546	(2.1)	542	550
Kazakhstan	544	(4.5)	535	553
Portugal	541	(2.2)	537	545
United States	539	(2.3)	534	544
Denmark	539	(2.7)	534	544
Quebec	536	(4.0)	528	544
Lithuania	535	(2.5)	530	540
Finland	535	(2.0)	531	539
Poland	535	(2.1)	531	539
The Netherlands	530	(1.7)	527	533
Hungary	529	(3.2)	523	535
Czech Republic	528	(2.2)	524	532
Bulgaria	524	(5.3)	514	534
Cyprus	523	(2.7)	518	528
Germany	522	(2.0)	518	526
Slovenia	520	(1.9)	516	524
Sweden	519	(2.8)	514	524
Serbia	518	(3.5)	511	525
Australia	517	(3.1)	511	523
Ontario	512	(2.3)	507	517
Canada	511	(2.3)	506	516
Italy	507	(2.6)	502	512
Spain	505	(2.5)	500	510
Croatia	502	(1.8)	498	506
Slovak Republic	498	(2.5)	493	503
New Zealand	491	(2.3)	486	496
France	488	(2.9)	482	494
Alberta	484	(3.7)	477	491
Turkey	483	(3.1)	477	489
Georgia	463	(3.6)	456	470
Chile	459	(2.4)	454	463
United Arab Emirates	452	(2.4)	447	456
Bahrain	450	(2.1)	446	454
Qatar	439	(3.4)	432	446
Oman	425	(2.5)	421	430
Iran, Islamic Republic of	424	(4.1)	416	432
Indonesia	389	(4.2)	381	397
Jordan	388	(3.1)	382	394
Saudi Arabia	383	(4.1)	376	391
Morocco	379	(3.8)	372	387
South Africa (5)	376	(3.5)	369	383
Kuwait	351	(4.8)	342	361

Note: The international TIMSS scale centrepoin was 500. The participating grade is identified in parentheses after the country name when it is not Grade 4.

TABLE B.1.4 Grade 4 achievement scores in science

Country or province	Average score	Standard error	Confidence interval – 95% lower limit	Confidence interval – 95% upper limit
Singapore	590	(3.7)	583	597
Korea	589	(2.0)	585	593
Japan	569	(1.8)	565	573
Russian Federation	567	(3.2)	561	573
Hong Kong SAR	557	(2.9)	551	563
Chinese Taipei	555	(1.8)	551	559
Finland	554	(2.3)	549	559
Kazakhstan	550	(4.4)	541	559
Poland	547	(2.4)	542	552
United States	546	(2.2)	542	550
Slovenia	543	(2.4)	538	548
Hungary	542	(3.3)	536	548
Sweden	540	(3.6)	533	547
Norway (5)	538	(2.6)	533	543
England	536	(2.4)	531	541
Bulgaria	536	(5.9)	524	548
Czech Republic	534	(2.4)	529	539
Croatia	533	(2.1)	529	537
Ontario	530	(2.5)	525	535
Ireland	529	(2.4)	524	534
Germany	528	(2.4)	523	533
Lithuania	528	(2.5)	523	533
Denmark	527	(2.1)	523	531
Canada	525	(2.6)	520	530
Serbia	525	(3.7)	518	532
Quebec	525	(4.1)	517	533
Australia	524	(2.9)	518	530
Slovak Republic	520	(2.6)	515	525
Northern Ireland	520	(2.2)	516	524
Alberta	519	(4.6)	510	528
Spain	518	(2.6)	513	523
The Netherlands	517	(2.7)	512	522
Italy	516	(2.6)	511	521
Belgium (Flemish)	512	(2.3)	507	517
Portugal	508	(2.2)	504	512
New Zealand	506	(2.7)	501	511
France	487	(2.7)	482	492
Turkey	483	(3.3)	477	489
Cyprus	481	(2.6)	476	486
Chile	478	(2.7)	473	483
Bahrain	459	(2.6)	454	464
Georgia	451	(3.7)	444	458
United Arab Emirates	451	(2.8)	446	456
Qatar	436	(4.1)	428	444
Oman	431	(3.1)	425	437
Iran, Islamic Rep. of	421	(4.0)	413	429
Indonesia	397	(4.8)	388	406
Saudi Arabia	390	(4.9)	380	400
Morocco	383	(5.0)	373	393
Kuwait	376	(5.1)	366	386

Note: The international TIMSS scale centrepont was 500. The participating grade is identified in parentheses after the country name when it is not Grade 4.

TABLE B.1.5 Grade 4 achievement scores in mathematics by content domain

	Canada and provinces	Average score	Standard error	Confidence interval – 95% lower limit	Confidence interval – 95% upper limit
Number	Canada	503	(2.4)	498	508
	Alberta	481	(3.9)	474	489
	Ontario	500	(2.6)	495	505
	Quebec	533	(4.2)	525	541
Geometric shapes and measures	Canada	517	(2.5)	512	522
	Alberta	474	(3.9)	467	482
	Ontario	526	(2.9)	521	532
	Quebec	542	(4.6)	533	551
Data display	Canada	528	(2.7)	523	533
	Alberta	505	(4.7)	495	514
	Ontario	536	(2.6)	531	541
	Quebec	541	(5.0)	531	551

TABLE B.1.6 Grade 4 achievement scores in mathematics by cognitive domain

	Canada and provinces	Average score	Standard error	Confidence interval – 95% lower limit	Confidence interval – 95% upper limit
Knowing	Canada	505	(2.4)	501	510
	Alberta	472	(3.9)	464	480
	Ontario	505	(2.5)	500	510
	Quebec	542	(4.3)	534	550
Applying	Canada	510	(2.3)	505	515
	Alberta	484	(3.9)	476	492
	Ontario	513	(2.3)	508	518
	Quebec	533	(4.1)	525	541
Reasoning	Canada	521	(2.4)	516	526
	Alberta	502	(4.0)	494	510
	Ontario	524	(2.6)	519	529
	Quebec	536	(4.9)	526	546

TABLE B.1.7 Grade 4 achievement scores in science by content domain

	Canada and provinces	Average score	Standard error	Confidence interval – 95% lower limit	Confidence interval – 95% upper limit
Life science	Canada	536	(2.8)	530	541
	Alberta	527	(4.8)	517	536
	Ontario	544	(2.6)	539	549
	Quebec	533	(4.3)	524	541
Physical science	Canada	518	(2.7)	512	523
	Alberta	512	(4.6)	503	521
	Ontario	522	(2.5)	517	527
	Quebec	519	(4.9)	510	529
Earth science	Canada	513	(3.1)	507	519
	Alberta	513	(4.8)	504	522
	Ontario	515	(3.7)	508	522
	Quebec	515	(4.4)	506	524

TABLE B.1.8 Grade 4 achievement scores in science by cognitive domain

	Canada and provinces	Average score	Standard error	Confidence interval – 95% lower limit	Confidence interval – 95% upper limit
Knowing	Canada	523	(3.1)	516	529
	Alberta	517	(5.3)	507	527
	Ontario	527	(2.8)	522	533
	Quebec	524	(4.3)	516	532
Applying	Canada	528	(2.6)	523	533
	Alberta	522	(4.4)	513	531
	Ontario	534	(2.5)	530	539
	Quebec	525	(4.5)	517	534
Reasoning	Canada	524	(2.6)	519	530
	Alberta	518	(4.4)	509	526
	Ontario	529	(2.8)	524	534
	Quebec	526	(4.6)	517	535

TABLE B.1.9 Grade 4 achievement scores in mathematics by gender

	Females		Males		Difference (female-male)	
	Average score	Standard error	Average score	Standard error	Difference	Standard error
Canada and provinces						
Canada	506	(2.5)	515	(2.6)	-9*	(2.1)
Alberta	476	(4.2)	492	(3.9)	-16*	(3.2)
Ontario	509	(2.6)	516	(2.8)	-7*	(2.9)
Quebec	531	(3.9)	541	(4.8)	-11*	(3.8)

* Statistically significant differences.

TABLE B.1.10 Grade 4 achievement scores in science by gender

	Females		Males		Difference (female-male)	
	Average score	Standard error	Average score	Standard error	Difference	Standard error
Canada and provinces						
Canada	526	(2.8)	524	(3.0)	2	(2.2)
Alberta	517	(5.6)	521	(4.3)	-5	(3.3)
Ontario	533	(2.9)	528	(3.1)	5	(3.2)
Quebec	525	(3.6)	524	(5.3)	1	(4.0)

TABLE B.1.11 Grade 4 achievement scores in mathematics by language of the school system

	Anglophone school system		Francophone school system		Difference between systems	
	Average score	Standard error	Average score	Standard error	Difference	Standard error
Canada and provinces						
Canada	503	(2.8)	533	(4.1)	-31*	(4.9)
Alberta	484	(3.7)	478	(3.2)	6	(4.7)
Ontario	513	(2.4)	494	(9.4)	20*	(9.7)
Quebec	521	(4.7)	538	(4.4)	-16*	(6.4)

* Statistically significant differences.

TABLE B.1.12 Grade 4 achievement scores in science by language of the school system

	Anglophone school system		Francophone school system		Difference between systems	
	Average score	Standard error	Average score	Standard error	Difference	Standard error
Canada and provinces						
Canada	526	(3.1)	520	(4.1)	6	(5.0)
Alberta	519	(4.7)	485	(3.8)	34*	(6.3)
Ontario	533	(2.6)	479	(7.4)	53*	(7.6)
Quebec	523	(5.0)	525	(4.5)	-2	(6.3)

* Statistically significant differences.

TABLE B.2.1 Percentage of Grade 8 students reaching the international discrete benchmarks in 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
Singapore	54.3	(1.8)	27.0	(1.3)	12.3	(1.0)	5.4	(0.8)	1.1	(0.2)
Chinese Taipei	44.4	(1.2)	27.6	(0.8)	15.8	(0.7)	8.8	(0.5)	3.4	(0.4)
Korea, Republic of	43.5	(1.4)	31.8	(0.8)	17.4	(0.9)	6.0	(0.5)	1.3	(0.2)
Hong Kong SAR	36.9	(2.3)	38.1	(1.3)	17.0	(1.2)	5.9	(0.9)	2.0	(0.6)
Japan	33.9	(1.2)	33.2	(0.8)	22.0	(1.0)	8.6	(0.7)	2.3	(0.3)
Kazakhstan	14.9	(1.7)	26.4	(1.6)	29.8	(1.6)	19.6	(1.6)	9.2	(1.1)
Russian Federation	14.2	(1.4)	31.8	(1.6)	31.6	(1.4)	17.2	(1.3)	5.2	(0.8)
Israel	12.9	(1.0)	25.4	(1.2)	27.0	(1.0)	19.2	(0.9)	15.6	(1.2)
Hungary	11.7	(1.2)	25.3	(1.1)	29.9	(1.1)	21.5	(1.3)	11.7	(1.1)
United States	9.7	(0.9)	26.9	(1.0)	33.0	(0.9)	21.8	(1.0)	8.5	(0.7)
England	9.7	(1.1)	26.1	(2.0)	32.9	(2.0)	24.5	(1.8)	6.9	(1.2)
Quebec	9.3	(1.1)	38.0	(2.0)	38.3	(2.0)	12.5	(1.9)	1.9	(0.7)
Canada	7.0	(0.6)	32.3	(1.1)	38.3	(1.0)	18.0	(0.9)	4.3	(0.5)
Australia	6.9	(0.8)	23.6	(1.0)	34.0	(1.1)	25.0	(1.0)	10.6	(1.0)
Ireland	6.8	(0.8)	31.5	(1.2)	37.7	(1.3)	18.0	(1.0)	6.0	(0.8)
Ontario	6.3	(0.7)	30.6	(1.4)	38.1	(1.3)	19.8	(1.1)	5.1	(0.6)
New Zealand	6.2	(0.8)	20.9	(0.9)	31.3	(1.0)	26.5	(0.7)	15.1	(1.2)
Turkey	6.1	(0.9)	13.9	(0.9)	22.3	(0.9)	27.5	(1.0)	30.1	(1.6)
Lithuania	6.1	(0.8)	27.1	(1.2)	34.7	(1.1)	23.7	(1.0)	8.3	(0.8)
Slovenia	5.6	(0.6)	26.5	(1.0)	40.4	(1.5)	22.4	(1.0)	5.0	(0.6)
United Arab Emirates	4.8	(0.4)	15.6	(0.5)	26.1	(0.7)	27.0	(0.7)	26.6	(0.7)
Malta	4.7	(0.4)	24.0	(0.6)	33.0	(0.9)	22.8	(0.7)	15.6	(0.5)
Norway	4.5	(0.5)	25.3	(1.0)	40.5	(1.2)	23.5	(1.1)	6.1	(0.5)
Sweden	3.3	(0.6)	23.1	(1.4)	38.5	(1.2)	26.3	(1.3)	8.8	(1.1)
Qatar	3.2	(0.5)	11.0	(0.7)	21.8	(0.9)	26.9	(1.1)	37.1	(1.4)
Malaysia	3.1	(0.4)	14.6	(0.9)	27.6	(1.2)	30.5	(1.7)	24.2	(1.9)
Italy	3.1	(0.5)	20.5	(1.2)	38.8	(1.4)	26.8	(1.5)	10.8	(1.0)
Thailand	2.6	(0.7)	7.2	(1.0)	19.4	(1.4)	32.9	(1.6)	38.0	(2.2)
Iran, Islamic Republic of	2.5	(0.7)	9.4	(1.0)	22.2	(1.3)	29.2	(1.0)	36.7	(1.9)
Georgia	2.2	(0.4)	12.9	(1.1)	26.7	(1.1)	30.0	(1.3)	28.2	(1.6)
Bahrain	1.9	(0.3)	9.7	(0.5)	27.8	(0.8)	35.1	(0.9)	25.5	(0.9)
Oman	0.7	(0.1)	5.4	(0.4)	17.3	(0.7)	28.7	(0.8)	48.0	(1.2)
Kuwait	0.7	(0.3)	4.3	(1.0)	13.3	(1.1)	26.6	(1.2)	55.1	(1.9)
Chile	0.6	(0.2)	5.9	(0.6)	21.3	(1.1)	35.2	(1.3)	36.9	(2.0)
South Africa	0.6	(0.2)	2.6	(0.6)	9.6	(1.3)	21.5	(1.4)	65.7	(2.3)
Egypt	0.5	(0.1)	4.9	(0.5)	15.9	(1.0)	25.9	(0.9)	52.8	(1.8)
Lebanon	0.4	(0.2)	7.2	(0.7)	27.2	(1.5)	35.8	(1.5)	29.5	(2.0)
Saudi Arabia	0.3	(0.2)	1.8	(0.6)	9.0	(0.8)	22.9	(1.3)	65.9	(1.8)
Jordan	0.3	(0.1)	3.1	(0.4)	14.5	(0.8)	26.9	(1.0)	55.3	(1.5)
Botswana	0.1	(0.0)	1.8	(0.2)	13.6	(0.8)	31.8	(1.0)	52.6	(1.1)
Morocco	0.1	(0.0)	2.1	(0.3)	11.9	(0.6)	26.7	(0.8)	59.3	(1.1)
International average	9.4		18.9		25.9		23.0		22.7	

Note: Countries and provinces have been sorted by the total percentage of students who reached the advanced benchmark (625).

TABLE B.2.2 Percentage of Grade 8 students reaching the international discrete benchmarks in 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
Singapore	41.9	(1.4)	32.1	(1.2)	16.1	(1.1)	7.3	(0.9)	2.6	(0.5)
Chinese Taipei	26.6	(1.1)	36.5	(1.1)	23.4	(0.9)	10.0	(0.5)	3.6	(0.3)
Japan	24.2	(1.0)	39.1	(1.2)	26.1	(1.0)	8.8	(0.6)	1.8	(0.2)
Korea	18.8	(1.0)	35.5	(0.8)	30.5	(1.1)	12.5	(0.7)	2.7	(0.4)
Slovenia	16.7	(1.0)	35.4	(1.0)	31.7	(0.9)	13.2	(0.9)	3.1	(0.4)
Kazakhstan	15.1	(1.5)	26.8	(1.4)	32.4	(1.4)	18.8	(1.2)	6.9	(0.8)
England	14.0	(1.2)	31.3	(1.5)	31.5	(1.5)	18.1	(1.4)	5.1	(0.8)
Russian Federation	13.9	(1.2)	34.6	(1.4)	32.9	(1.4)	14.8	(1.3)	3.8	(0.6)
Israel	12.2	(1.0)	24.7	(1.1)	27.5	(1.1)	19.6	(1.0)	16.0	(1.2)
Hungary	12.0	(1.1)	29.7	(1.1)	32.4	(1.5)	18.2	(1.3)	7.6	(0.9)
United States	11.7	(0.9)	30.9	(1.0)	32.5	(0.8)	18.4	(0.9)	6.5	(0.7)
Hong Kong SAR	11.5	(1.3)	39.7	(1.3)	33.9	(1.4)	11.3	(1.0)	3.6	(0.8)
Ireland	10.5	(0.7)	32.5	(1.1)	34.3	(1.3)	16.4	(1.0)	6.4	(0.9)
Sweden	10.3	(1.0)	29.5	(1.4)	33.7	(1.1)	18.0	(1.1)	8.5	(1.0)
New Zealand	10.0	(0.9)	25.9	(1.2)	31.4	(1.0)	21.2	(0.9)	11.5	(1.0)
Turkey	7.9	(0.9)	20.7	(1.1)	30.5	(0.9)	24.3	(1.1)	16.6	(1.1)
Lithuania	7.9	(0.9)	28.5	(1.0)	35.6	(1.2)	21.0	(1.1)	7.1	(0.8)
Australia	7.5	(0.6)	26.1	(0.9)	35.3	(0.9)	21.8	(0.8)	9.4	(0.8)
Quebec	7.4	(1.1)	31.9	(1.8)	40.1	(2.2)	17.4	(1.9)	3.2	(1.0)
Malta	7.4	(0.6)	20.2	(0.8)	29.1	(0.9)	22.0	(0.9)	21.4	(0.7)
Canada	7.1	(0.5)	31.0	(1.1)	39.5	(1.4)	18.2	(0.9)	4.2	(0.5)
Ontario	6.9	(0.7)	30.0	(1.3)	39.6	(1.5)	18.6	(1.1)	4.8	(0.7)
United Arab Emirates	6.9	(0.5)	19.3	(0.8)	26.8	(0.7)	23.4	(0.6)	23.6	(0.8)
Norway	5.9	(0.6)	25.0	(1.1)	37.5	(1.1)	22.9	(1.0)	8.7	(0.9)
Qatar	5.7	(0.6)	15.8	(0.8)	24.3	(1.0)	23.8	(0.9)	30.5	(1.3)
Bahrain	5.6	(0.5)	16.8	(0.7)	26.4	(0.9)	24.7	(0.8)	26.6	(1.1)
Italy	4.0	(0.5)	21.8	(1.3)	38.5	(1.2)	25.0	(1.0)	10.6	(1.1)
Malaysia	3.3	(0.3)	17.7	(1.1)	30.6	(1.4)	25.7	(1.2)	22.7	(1.9)
Iran, Islamic Republic of	2.8	(0.7)	12.0	(1.1)	27.4	(1.3)	31.0	(1.2)	26.7	(1.5)
Oman	2.7	(0.2)	14.1	(0.7)	27.8	(0.8)	27.5	(0.9)	28.0	(1.2)
Thailand	2.0	(0.6)	10.1	(1.2)	28.5	(1.5)	34.1	(1.3)	25.2	(1.8)
Kuwait	1.9	(0.6)	8.1	(0.9)	19.2	(1.0)	25.9	(1.3)	44.9	(1.9)
Chile	1.4	(0.3)	10.5	(0.7)	28.6	(1.2)	34.1	(1.1)	25.4	(1.6)
Jordan	1.2	(0.3)	8.2	(0.5)	24.8	(0.9)	28.5	(0.9)	37.3	(1.4)
South Africa	1.1	(0.4)	3.8	(0.7)	9.6	(1.2)	17.8	(1.1)	67.7	(2.3)
Georgia	0.9	(0.3)	9.2	(0.9)	28.0	(1.2)	32.0	(1.2)	29.9	(1.6)
Saudi Arabia	0.7	(0.3)	4.8	(0.8)	16.3	(1.1)	27.5	(1.4)	50.7	(1.9)
Lebanon	0.7	(0.2)	5.9	(0.7)	17.4	(1.2)	26.3	(1.1)	49.7	(2.2)
Botswana	0.4	(0.1)	5.0	(0.4)	18.0	(0.8)	27.6	(1.0)	48.9	(1.1)
Egypt	0.4	(0.1)	4.7	(0.5)	14.5	(0.9)	22.5	(0.8)	57.9	(1.6)
Morocco	0.1	(0.1)	3.0	(0.3)	14.2	(0.6)	29.4	(0.9)	53.2	(1.2)
International average	8.5		21.7		28.3		21.5		20.1	

Note: Countries and provinces have been sorted by the total percentage of students who reached the advanced benchmark (625).

TABLE B.2.3 Grade 8 achievement scores in mathematics

Country or province	Average score	Standard error	Confidence interval – 95% lower limit	Confidence interval – 95% upper limit
Singapore	621	(3.2)	615	627
Korea	606	(2.6)	601	611
Chinese Taipei	599	(2.4)	594	604
Hong Kong SAR	594	(4.6)	585	603
Japan	586	(2.3)	581	591
Quebec	543	(3.9)	535	551
Russian Federation	538	(4.7)	529	547
Kazakhstan	528	(5.3)	518	538
Canada	527	(2.2)	523	531
Ireland	523	(2.7)	518	528
Ontario	522	(2.9)	516	528
United States	518	(3.1)	512	524
England	518	(4.2)	510	526
Slovenia	516	(2.1)	512	520
Hungary	514	(3.8)	507	521
Norway (9)	512	(2.3)	507	517
Lithuania	511	(2.8)	506	516
Israel	511	(4.1)	503	519
Australia	505	(3.1)	499	511
Sweden	501	(2.8)	496	506
Italy	494	(2.5)	489	499
Malta	494	(1.0)	492	496
New Zealand	493	(3.4)	486	500
Malaysia	465	(3.6)	458	472
United Arab Emirates	465	(2.0)	461	469
Turkey	458	(4.7)	449	467
Bahrain	454	(1.4)	451	457
Georgia	453	(3.4)	446	460
Lebanon	442	(3.6)	435	449
Qatar	437	(3.0)	431	443
Iran, Islamic Rep. of	436	(4.6)	427	445
Thailand	431	(4.8)	422	440
Chile	427	(3.2)	421	433
Oman	403	(2.4)	398	408
Kuwait	392	(4.6)	383	401
Egypt	392	(4.1)	384	400
Botswana (9)	391	(2.0)	387	395
Jordan	386	(3.2)	380	392
Morocco	384	(2.3)	379	389
South Africa (9)	372	(4.5)	363	381
Saudi Arabia	368	(4.6)	359	377

Note: The international TIMSS scale centrepoint was 500. The participating grade is identified in parentheses after the country name when it is not Grade 8.

TABLE B.2.4 Grade 8 achievement scores in science

Country or province	Average score	Standard error	Confidence interval – 95% lower limit	Confidence interval – 95% upper limit
Singapore	597	(3.2)	591	603
Japan	571	(1.8)	567	575
Chinese Taipei	569	(2.1)	565	573
Korea	556	(2.2)	552	560
Slovenia	551	(2.4)	546	556
Hong Kong SAR	546	(3.9)	538	554
Russian Federation	544	(4.2)	536	552
England	537	(3.8)	530	544
Kazakhstan	533	(4.4)	524	542
Ireland	530	(2.8)	525	535
United States	530	(2.8)	525	535
Quebec	530	(4.4)	521	539
Hungary	527	(3.4)	520	534
Canada	526	(2.2)	522	530
Ontario	524	(2.5)	519	529
Sweden	522	(3.4)	515	529
Lithuania	519	(2.8)	514	524
New Zealand	513	(3.1)	507	519
Australia	512	(2.7)	507	517
Norway (9)	509	(2.8)	504	514
Israel	507	(3.9)	499	515
Italy	499	(2.4)	494	504
Turkey	493	(4.0)	485	501
Norway	489	(2.4)	484	494
Malta	481	(1.6)	478	484
United Arab Emirates	477	(2.3)	472	482
Malaysia	471	(4.1)	463	479
Bahrain	466	(2.2)	462	470
Qatar	457	(3.0)	451	463
Iran, Islamic Rep. of	456	(4.0)	448	464
Thailand	456	(4.2)	448	464
Oman	455	(2.7)	450	460
Chile	454	(3.1)	448	460
Georgia	443	(3.1)	437	449
Jordan	426	(3.4)	419	433
Kuwait	411	(5.2)	401	421
Lebanon	398	(5.3)	388	408
Saudi Arabia	396	(4.5)	387	405
Morocco	393	(2.5)	388	398
Botswana (9)	392	(2.7)	387	397
Egypt	371	(4.3)	363	379
South Africa (9)	358	(5.6)	347	369

Note: The international TIMSS scale centrepoin was 500. The participating grade is identified in parentheses after the country name when it is not Grade 8.

TABLE B.2.5 Grade 8 achievement scores in mathematics by content domain

	Canada and provinces	Average score	Standard error	Confidence interval – 95% lower limit	Confidence interval – 95% upper limit
Number	Canada	537	(2.4)	532	542
	Ontario	530	(3.0)	524	536
	Quebec	557	(4.3)	548	565
Algebra	Canada	513	(2.3)	509	518
	Ontario	507	(3.0)	502	513
	Quebec	530	(4.4)	522	539
Geometry	Canada	527	(2.6)	521	532
	Ontario	524	(3.5)	517	531
	Quebec	540	(4.3)	532	549
Data and chance	Canada	534	(2.9)	528	540
	Ontario	531	(3.9)	524	539
	Quebec	546	(5.0)	536	556

TABLE B.2.6 Grade 8 achievement scores in mathematics by cognitive domain

	Canada and provinces	Average score	Standard error	Confidence interval – 95% lower limit	Confidence interval – 95% upper limit
Knowing	Canada	520	(2.3)	516	525
	Ontario	513	(3.0)	507	519
	Quebec	541	(4.2)	532	549
Applying	Canada	528	(2.2)	524	532
	Ontario	522	(2.8)	517	528
	Quebec	546	(4.0)	539	554
Reasoning	Canada	534	(2.4)	529	539
	Ontario	534	(3.1)	528	541
	Quebec	538	(4.2)	530	546

TABLE B.2.7 Grade 8 achievement scores in science by content domain

	Canada and provinces	Average score	Standard error	Confidence interval – 95% lower limit	Confidence interval – 95% upper limit
Biology	Canada	534	(2.4)	530	539
	Ontario	538	(2.9)	532	543
	Quebec	527	(4.3)	519	535
Chemistry	Canada	512	(2.2)	508	517
	Ontario	503	(2.7)	498	508
	Quebec	531	(4.6)	521	540
Physics	Canada	521	(2.2)	516	525
	Ontario	521	(2.9)	516	527
	Quebec	520	(4.7)	510	529
Earth science	Canada	532	(2.3)	528	537
	Ontario	526	(3.2)	520	532
	Quebec	542	(4.2)	534	550

TABLE B.2.8 Grade 8 achievement scores in science by cognitive domain

	Canada and provinces	Average score	Standard error	Confidence interval – 95% lower limit	Confidence interval – 95% upper limit
Knowing	Canada	518	(2.3)	514	523
	Ontario	514	(2.6)	509	519
	Quebec	527	(5.1)	517	537
Applying	Canada	526	(2.1)	521	530
	Ontario	525	(2.4)	521	530
	Quebec	524	(4.6)	515	533
Reasoning	Canada	533	(2.2)	529	538
	Ontario	532	(2.6)	527	537
	Quebec	535	(4.5)	526	544

TABLE B.2.9 Grade 8 achievement scores in mathematics by gender

	Females		Males		Difference (female-male)	
	Average score	Standard error	Average score	Standard error	Difference	Standard error
Canada and provinces						
Canada	525	(2.0)	530	(2.7)	-4*	(2.0)
Ontario	521	(2.9)	523	(3.3)	-2	(2.6)
Quebec	538	(3.8)	550	(5.1)	-12*	(4.6)

* Statistically significant differences.

TABLE B.2.10 Grade 8 achievement scores in science by gender

	Females		Males		Difference (female-male)	
	Average score	Standard error	Average score	Standard error	Difference	Standard error
Canada and provinces						
Canada	524	(2.2)	529	(2.7)	-5	(2.3)
Ontario	523	(2.8)	524	(3.0)	-1	(3.1)
Quebec	523	(4.4)	537	(5.5)	-13*	(4.8)

* Statistically significant differences.

TABLE B.2.11 Grade 8 achievement scores in mathematics by language of the school system

	Anglophone school system		Francophone school system		Difference between systems	
	Average score	Standard error	Average score	Standard error	Difference	Standard error
Canada and provinces						
Canada	520	(2.6)	543	(3.8)	-23*	(4.6)
Ontario	521	(2.9)	541	(9.3)	-20*	(9.7)
Quebec	542	(10.0)	543	(4.1)	-1	(10.8)

* Statistically significant differences.

TABLE B.2.12 Grade 8 achievement scores in science by language of the school system

	Anglophone school system		Francophone school system		Difference between systems	
	Average score	Standard error	Average score	Standard error	Difference	Standard error
Canada and provinces						
Canada	525	(2.3)	528	(4.3)	-3	(4.7)
Ontario	524	(2.6)	523	(9.1)	1	(9.6)
Quebec	535	(9.5)	529	(4.7)	5	(10.5)

TABLE B.3.1 Relationship between providing a free breakfast and Grade 4 student achievement

Canada, provinces, and international average	Breakfast for all students				Breakfast for some students				No free breakfast			
	%	Standard error	Average score	Standard error	%	Standard error	Average score	Standard error	%	Standard error	Average score	Standard error
Mathematics												
Canada	13.4	(1.9)	472	(8.3)	19.6	(2.5)	495	(3.6)	67.0	(3.0)	523	(2.3)
Alberta	11.7	(2.4)	453	(15.4)	22.6	(4.4)	468	(5.0)	15.3	(3.1)	494	(5.1)
Ontario	15.3	(3.1)	494	(5.1)	22.3	(4.1)	498	(4.3)	5.5	(2.6)	484	(6.0)
Quebec	5.5	(2.6)	484	(6.0)	9.2	(3.2)	520	(5.0)	85.2	(4.1)	542	(4.2)
International average	5.4	–	495	–	29.4	–	500	–	65.1	–	514	–
Science												
Canada	13.4	(1.9)	492	(7.8)	19.6	(2.5)	517	(3.2)	67.0	(3.0)	533	(2.5)
Alberta	11.7	(2.4)	487	(21.9)	22.6	(4.4)	505	(5.9)	65.7	(4.5)	531	(6.1)
Ontario	15.3	(3.1)	512	(6.6)	22.3	(4.1)	519	(4.2)	62.4	(4.7)	537	(3.3)
Quebec	5.5	(2.6)	470	(10.0)	9.2	(3.2)	516	(4.5)	85.2	(4.1)	530	(4.2)
International average	5.4	–	495	–	29.4	–	495	–	65.1	–	511	–

TABLE B.3.2 Relationship between providing a free breakfast and Grade 8 student achievement

Canada, provinces, and international average	Breakfast for all students				Breakfast for some students				No free breakfast			
	%	Standard error	Average score	Standard error	%	Standard error	Average score	Standard error	%	Standard error	Average score	Standard error
Mathematics												
Canada	14.5	(2.4)	509	(4.9)	27.3	(3.1)	519	(4.8)	58.2	(3.5)	537	(2.5)
Ontario	16.7	(3.5)	509	(6.2)	32.5	(4.8)	516	(5.4)	50.8	(5.5)	528	(3.2)
Quebec	4.4	(1.2)	543	(10.5)	20.3	(5.4)	539	(7.1)	75.4	(5.5)	552	(3.7)
International average	8.3	–	444	–	28.1	–	474	–	63.6	–	490	–
Science												
Canada	14.5	(2.4)	521	(5.1)	27.3	(3.1)	519	(3.6)	58.2	(3.5)	533	(2.5)
Ontario	16.7	(3.5)	515	(6.1)	32.5	(4.8)	519	(4.8)	50.8	(5.5)	528	(3.1)
Quebec	4.4	(1.2)	547	(12.6)	20.3	(5.4)	521	(6.7)	75.4	(5.5)	539	(4.0)
International average	8.3	–	453	–	28.1	–	479	–	63.6	–	495	–

TABLE B.3.3 Relationship between home educational resources and Grade 4 student achievement

Canada, provinces, and international average	Many resources				Some resources				Few resources			
	%	Standard error	Average score	Standard error	%	Standard error	Average score	Standard error	%	Standard error	Average score	Standard error
Mathematics												
Canada	32.2	(1.2)	547	(2.4)	67.6	(1.2)	505	(2.1)	0.2	(0.1)	466	(20.8)
Alberta	36.2	(1.7)	520	(5.4)	63.4	(1.7)	477	(3.3)	0.3	(0.2)	448	(48.5)
Ontario	34.1	(1.5)	547	(2.6)	65.7	(1.5)	504	(2.4)	0.1	(0.1)	419	(38.0)
Quebec	28.7	(2.4)	568	(4.8)	70.9	(2.3)	529	(3.7)	0.3	(0.1)	509	(20.7)
International average	19.0	–	563	–	73.3	–	507	–	7.8	–	446	–
Science												
Canada	32.2	(1.2)	563	(2.2)	67.6	(1.2)	517	(2.4)	0.2	(0.1)	457	(15.5)
Alberta	36.2	(1.7)	559	(6.5)	63.4	(1.7)	511	(4.4)	0.3	(0.2)	439	(29.4)
Ontario	34.1	(1.5)	567	(2.6)	65.7	(1.5)	521	(2.6)	0.1	(0.1)	418	(28.0)
Quebec	28.7	(2.4)	558	(3.7)	70.9	(2.3)	516	(3.9)	0.3	(0.1)	495	(16.2)
International average	19.0	–	561	–	73.3	–	504	–	7.8	–	437	–

TABLE B.3.4 Relationship between home educational resources and Grade 8 student achievement

Canada, provinces, and international average	Many resources				Some resources				Few resources			
	%	Standard error	Average score	Standard error	%	Standard error	Average score	Standard error	%	Standard error	Average score	Standard error
Mathematics												
Canada	21.5	(0.9)	563	(3.1)	76.2	(0.8)	520	(2.0)	2.3	(0.3)	490	(7.9)
Ontario	24.0	(1.3)	560	(3.9)	74.0	(1.2)	513	(2.4)	2.0	(0.3)	483	(8.4)
Quebec	17.5	(1.0)	580	(4.7)	79.5	(1.1)	539	(3.5)	2.9	(0.6)	504	(14.3)
International average	13.1	–	535	–	71.5	–	481	–	15.3	–	433	–
Science												
Canada	21.5	(0.9)	567	(3.1)	76.2	(0.8)	518	(2.0)	2.3	(0.3)	472	(6.7)
Ontario	24.0	(1.3)	566	(3.9)	74.0	(1.2)	514	(2.1)	2.0	(0.3)	475	(9.0)
Quebec	17.5	(1.0)	572	(5.0)	79.5	(1.1)	525	(4.0)	2.9	(0.6)	467	(12.0)
International average	13.1	–	543	–	71.5	–	486	–	15.3	–	432	–

TABLE B.3.5 Percentage of students speaking the language of the test at home

	Canada and provinces	More than 90%		76 to 90%		51 to 75%		26 to 50%		25% or less	
		%	Standard error	%	Standard error	%	Standard error	%	Standard error	%	Standard error
Grade 4	Canada	47.1	(3.1)	19.3	(2.2)	14.5	(1.9)	12.0	(1.7)	7.2	(1.4)
	Alberta	36.5	(5.2)	23.6	(4.9)	22.6	(3.9)	10.4	(3.2)	6.9	(2.6)
	Ontario	38.8	(4.8)	22.2	(3.6)	15.4	(3.6)	15.6	(2.9)	8.0	(2.2)
	Quebec	60.5	(6.2)	11.9	(3.8)	10.8	(3.5)	9.3	(3.5)	7.6	(2.5)
Grade 8	Canada	42.7	(2.9)	24.4	(3.1)	15.2	(2.6)	10.3	(2.2)	7.3	(1.8)
	Ontario	36.9	(3.9)	28.5	(4.0)	16.9	(3.6)	10.8	(2.9)	6.9	(2.2)
	Quebec	49.0	(5.5)	19.4	(4.7)	12.6	(4.3)	9.2	(3.6)	9.9	(4.3)

TABLE B.3.6 Relationship between availability of science laboratories and student achievement in science

	Canada, provinces, and international average	Science laboratory				No science laboratory			
		%	Standard error	Average score	Standard error	%	Standard error	Average score	Standard error
Grade 4	Canada	10.8	(2.0)	521	(4.8)	89.2	(2.0)	525	(2.9)
	Alberta	13.3	(2.7)	538	(9.9)	86.7	(2.7)	518	(5.2)
	Ontario	6.6	(2.7)	511	(11.8)	93.4	(2.7)	531	(2.8)
	Quebec	12.4	(3.8)	522	(5.6)	87.6	(3.8)	525	(4.6)
	International average	37.5	–	511	–	62.5	–	507	–
Grade 8	Canada	68.8	(3.2)	532	(2.4)	31.2	(3.2)	516	(3.7)
	Ontario	53.7	(4.9)	530	(3.7)	46.3	(4.9)	514	(3.7)
	Quebec	100.0	(0.0)	535	(3.4)	0.0	(0.0)	507	(52.1)
	International average	84.7	–	489	–	15.3	–	461	–

TABLE B.3.7 Percentage of school principals reporting challenges to providing science instruction

	Canada, provinces, and international average	Not at all		A little		Some		A lot	
		%	Standard error						
Grade 4	Canada	19.4	(2.2)	25.5	(2.6)	29.9	(2.2)	25.3	(2.5)
	Alberta	29.9	(5.0)	26.0	(4.8)	31.6	(4.6)	12.5	(3.2)
	Ontario	17.8	(3.1)	25.0	(4.5)	30.3	(3.9)	26.9	(3.9)
	Quebec	18.9	(4.8)	26.4	(4.4)	29.3	(4.6)	25.5	(4.9)
	International average	21.6	–	31.7	–	28.4	–	18.4	–
Grade 8	Canada	43.4	(3.8)	29.3	(3.4)	17.6	(3.1)	9.6	(2.1)
	Ontario	28.4	(4.9)	34.8	(4.7)	24.5	(4.7)	12.4	(3.2)
	Quebec	75.8	(5.4)	14.5	(4.1)	5.3	(2.9)	4.4	(2.0)
	International average	30.2	–	26.9	–	21.6	–	21.3	–

Note: Challenges to providing science instruction are in reference to shortages with science equipment and materials for experiments.

TABLE B.3.8 Percentage of school principals reporting school discipline and safety problems in Grade 4

Canada, provinces, and international average	Not a problem		Minor problem		Moderate problem		Serious problem	
	%	Standard error	%	Standard error	%	Standard error	%	Standard error
Arriving late at school								
Canada	31.6	(2.8)	52.2	(3.0)	13.8	(1.7)	2.4	(1.2)
Alberta	29.1	(5.2)	59.5	(5.5)	10.1	(2.6)	1.3	(1.3)
Ontario	18.5	(4.0)	60.5	(4.7)	18.4	(3.1)	2.5	(1.5)
Quebec	52.6	(5.7)	37.5	(5.8)	8.0	(3.0)	1.9	(1.6)
International average	46.8	–	39.4	–	10.2	–	3.5	–
Absenteeism								
Canada	43.0	(3.0)	42.9	(3.0)	11.9	(1.9)	2.2	(1.2)
Alberta	35.4	(5.4)	54.9	(6.2)	8.4	(2.6)	1.3	(1.3)
Ontario	33.6	(4.2)	47.7	(4.3)	16.4	(3.2)	2.3	(1.4)
Quebec	66.8	(5.2)	26.0	(4.8)	5.7	(2.4)	1.5	(1.5)
International average	53.3	–	31.9	–	8.5	–	6.3	–
Classroom disturbance								
Canada	30.7	(3.2)	49.6	(3.0)	16.6	(2.7)	3.0	(1.3)
Alberta	32.1	(4.5)	56.0	(4.7)	11.9	(3.8)	0.0	(0.0)
Ontario	24.3	(5.1)	50.1	(4.5)	20.1	(3.8)	5.5	(2.7)
Quebec	47.7	(6.3)	35.8	(5.5)	15.0	(4.3)	1.5	(1.4)
International average	34.8	–	43.3	–	16.0	–	5.8	–
Cheating								
Canada	85.6	(2.0)	14.0	(1.9)	0.0	(0.0)	0.4	(0.4)
Alberta	86.3	(3.6)	13.7	(3.6)	0.0	(0.0)	0.0	(0.0)
Ontario	80.2	(4.2)	19.0	(4.1)	0.0	(0.0)	0.8	(0.8)
Quebec	95.1	(1.8)	4.9	(1.8)	0.0	(0.0)	0.0	(0.0)
International average	64.8	–	26.8	–	4.3	–	4.1	–
Profanity								
Canada	63.9	(3.3)	31.6	(3.1)	3.8	(1.0)	0.7	(0.5)
Alberta	67.0	(5.0)	32.7	(4.9)	0.3	(0.2)	0.0	(0.0)
Ontario	59.1	(5.3)	34.2	(4.9)	5.3	(2.0)	1.4	(1.0)
Quebec	69.3	(5.8)	26.3	(5.3)	4.4	(2.3)	0.0	(0.0)
International average	46.2	–	36.5	–	11.0	–	6.4	–

TABLE B.3.8 Percentage of school principals reporting school discipline and safety problems in Grade 4
(continued)

	Not a problem		Minor problem		Moderate problem		Serious problem	
	Canada, provinces, and international average	% Standard error						
Vandalism								
Canada	84.4	(2.7)	14.7	(2.5)	0.4	(0.3)	0.5	(0.4)
Alberta	76.0	(5.0)	23.4	(5.0)	0.1	(0.0)	0.5	(0.5)
Ontario	83.4	(3.9)	15.0	(3.4)	0.7	(0.7)	0.8	(0.8)
Quebec	93.0	(2.3)	7.0	(2.3)	0.0	(0.0)	0.0	(0.0)
International average	70.6	–	19.5	–	4.1	–	5.9	–
Theft								
Canada	82.6	(2.8)	16.5	(2.7)	0.8	(0.5)	0.1	(0.1)
Alberta	76.7	(4.8)	22.8	(4.8)	0.0	(0.0)	0.5	(0.5)
Ontario	81.0	(3.8)	17.4	(3.5)	1.6	(1.1)	0.0	(0.0)
Quebec	90.2	(3.2)	9.8	(3.2)	0.0	(0.0)	0.0	(0.0)
International average	75.7	–	16.3	–	2.2	–	5.8	–
Intimidation or verbal abuse among students								
Canada	37.3	(2.9)	52.0	(3.0)	9.9	(1.9)	0.8	(0.5)
Alberta	49.9	(5.0)	46.2	(5.0)	3.9	(1.9)	0.0	(0.0)
Ontario	35.9	(4.6)	51.6	(5.6)	11.7	(3.5)	0.8	(0.8)
Quebec	34.0	(5.5)	53.8	(5.3)	10.8	(3.1)	1.4	(1.4)
International average	50.8	–	36.0	–	7.5	–	5.7	–
Physical fights among students								
Canada	62.5	(3.5)	33.2	(3.2)	3.6	(1.2)	0.7	(0.5)
Alberta	62.3	(5.3)	37.6	(5.3)	0.1	(0.0)	0.0	(0.0)
Ontario	59.1	(5.7)	33.7	(4.5)	5.6	(2.2)	1.5	(1.1)
Quebec	72.1	(5.6)	26.4	(5.5)	1.5	(1.1)	0.0	(0.0)
International average	48.6	–	38.1	–	7.4	–	5.8	–
Intimidation or verbal abuse of teachers or staff								
Canada	81.7	(2.8)	16.2	(2.6)	1.6	(0.8)	0.4	(0.4)
Alberta	87.9	(3.3)	12.0	(3.3)	0.0	(0.0)	0.0	(0.0)
Ontario	82.1	(3.6)	15.5	(3.4)	1.6	(1.2)	0.8	(0.8)
Quebec	82.5	(4.7)	15.0	(4.4)	2.5	(1.8)	0.0	(0.0)
International average	81.1	–	11.5	–	2.1	–	5.3	–

TABLE B.3.9 Percentage of school principals reporting school discipline and safety problems in Grade 8

Canada, provinces, and international average	Not a problem		Minor problem		Moderate problem		Serious problem	
	%	Standard error	%	Standard error	%	Standard error	%	Standard error
Arriving late at school								
Canada	27.2	(3.1)	49.7	(4.2)	20.4	(3.4)	2.7	(1.1)
Ontario	16.0	(3.9)	56.5	(5.1)	24.8	(4.7)	2.8	(1.5)
Quebec	40.9	(5.9)	39.8	(6.0)	16.2	(4.7)	3.2	(2.1)
International average	29.0	–	50.0	–	15.7	–	5.2	–
Absenteeism								
Canada	26.0	(3.2)	54.0	(3.9)	18.6	(3.1)	1.4	(0.8)
Ontario	18.2	(4.2)	59.2	(5.1)	21.6	(4.4)	0.9	(0.9)
Quebec	36.2	(5.2)	44.7	(5.9)	16.5	(4.4)	2.6	(1.8)
International average	27.9	–	47.2	–	16.0	–	8.9	–
Classroom disturbance								
Canada	24.4	(3.1)	60.1	(3.6)	14.3	(2.5)	1.2	(0.9)
Ontario	17.9	(3.6)	62.1	(4.6)	18.2	(3.8)	1.8	(1.4)
Quebec	31.0	(5.1)	58.7	(5.7)	9.7	(3.3)	0.6	(0.5)
International average	26.7	–	46.9	–	19.4	–	6.9	–
Cheating								
Canada	66.3	(3.5)	33.2	(3.4)	0.5	(0.5)	0.0	(0.0)
Ontario	62.7	(4.3)	37.3	(4.3)	0.0	(0.0)	0.0	(0.0)
Quebec	73.4	(5.5)	25.1	(5.3)	1.5	(1.5)	0.0	(0.0)
International average	48.3	–	37.1	–	9.1	–	5.5	–
Profanity								
Canada	42.5	(3.6)	45.1	(3.5)	10.7	(2.7)	1.7	(1.0)
Ontario	45.7	(4.7)	44.2	(4.0)	9.4	(3.2)	0.6	(0.6)
Quebec	41.5	(6.3)	45.5	(6.7)	9.0	(3.6)	4.1	(2.7)
International average	38.2	–	40.0	–	14.2	–	7.6	–

TABLE B.3.9 Percentage of school principals reporting school discipline and safety problems in Grade 8
(continued)

Canada, provinces, and international average	Not a problem		Minor problem		Moderate problem		Serious problem		
	%	Standard error	%	Standard error	%	Standard error	%	Standard error	
Vandalism									
Canada	69.2	(3.2)	28.7	(3.2)	1.8	(1.0)	0.3	(0.3)	
Ontario	65.5	(4.5)	33.2	(4.4)	0.8	(0.8)	0.5	(0.5)	
Quebec	75.5	(5.1)	20.3	(4.7)	4.2	(2.7)	0.0	(0.0)	
International average	52.7	–	30.6	–	8.6	–	8.2	–	
Theft									
Canada	63.8	(3.6)	33.9	(3.5)	2.3	(1.2)	0.0	(0.0)	
Ontario	63.4	(4.8)	35.2	(4.7)	1.4	(1.1)	0.0	(0.0)	
Quebec	66.7	(5.9)	28.6	(5.8)	4.7	(3.1)	0.0	(0.0)	
International average	62.3	–	25.9	–	4.6	–	7.2	–	
Intimidation or verbal abuse among students									
Canada	19.1	(2.6)	59.7	(3.7)	19.2	(3.1)	2.0	(1.3)	
Ontario	19.1	(4.0)	57.8	(5.0)	19.7	(4.2)	3.4	(2.2)	
Quebec	21.5	(4.8)	59.8	(5.9)	18.7	(4.4)	0.0	(0.0)	
International average	34.0	–	46.0	–	13.0	–	6.9	–	
Physical fights among students									
Canada	62.1	(3.7)	36.5	(3.6)	1.4	(0.9)	0.0	(0.0)	
Ontario	54.7	(5.1)	43.1	(4.9)	2.2	(1.5)	0.0	(0.0)	
Quebec	78.2	(5.3)	21.5	(5.3)	0.3	(0.3)	0.0	(0.0)	
International average	55.7	–	31.7	–	6.4	–	6.2	–	
Intimidation or verbal abuse of teachers or staff									
Canada	68.6	(3.8)	28.8	(3.6)	2.6	(1.1)	0.0	(0.0)	
Ontario	64.2	(4.6)	33.2	(4.5)	2.6	(1.5)	0.0	(0.0)	
Quebec	71.9	(5.7)	26.2	(5.6)	1.9	(1.3)	0.0	(0.0)	
International average	68.7	–	21.7	–	4.0	–	5.7	–	

TABLE B.3.10 Relationship between school discipline problems and Grade 4 student achievement

Canada, provinces, and international average	Hardly any problems				Minor problems				Moderate problems			
	%	Standard error	Average score	Standard error	%	Standard error	Average score	Standard error	%	Standard error	Average score	Standard error
Mathematics												
Canada	66.5	(3.1)	518	(2.6)	31.1	(2.9)	497	(4.6)	2.4	(1.0)	456	(27.4)
Alberta	71.5	(5.0)	491	(4.8)	27.2	(4.8)	469	(6.8)	1.3	(1.3)	473	(3.4)
Ontario	57.8	(5.5)	518	(3.3)	38.5	(5.3)	503	(3.5)	3.7	(1.7)	484	(12.5)
Quebec	77.1	(4.8)	542	(4.3)	22.9	(4.8)	520	(6.6)	0.0	(0.0)	–	–
International average	60.8	–	516	–	29.9	–	502	–	9.3	–	483	–
Science												
Canada	66.5	(3.1)	531	(2.8)	31.1	(2.9)	514	(4.2)	2.4	(1.0)	475	(29.5)
Alberta	71.5	(5.0)	526	(6.0)	27.2	(4.8)	506	(7.9)	1.3	(1.3)	520	(5.5)
Ontario	57.8	(5.5)	535	(4.1)	38.5	(5.3)	523	(3.8)	3.7	(1.7)	499	(17.5)
Quebec	77.1	(4.8)	530	(4.3)	22.9	(4.8)	508	(6.6)	0.0	(0.0)	–	–
International average	60.8	–	513	–	29.9	–	498	–	9.3	–	482	–

TABLE B.3.11 Relationship between school discipline problems and Grade 8 student achievement

Canada, provinces, and international average	Hardly any problems				Minor problems				Moderate problems			
	%	Standard error	Average score	Standard error	%	Standard error	Average score	Standard error	%	Standard error	Average score	Standard error
Mathematics												
Canada	45.3	(4.1)	538	(2.8)	53.6	(4.1)	520	(3.2)	1.1	(0.7)	503	(7.6)
Ontario	39.3	(5.3)	529	(3.7)	59.2	(5.2)	516	(4.1)	1.5	(1.1)	505	(9.1)
Quebec	55.7	(6.1)	556	(4.1)	43.5	(6.1)	541	(5.8)	0.8	(0.6)	499	(45.3)
International average	43.3	–	495	–	45.2	–	473	–	11.5	–	453	–
Science												
Canada	45.3	(4.1)	534	(2.6)	53.6	(4.1)	522	(2.9)	1.1	(0.7)	500	(10.7)
Ontario	39.3	(5.3)	528	(3.5)	59.2	(5.2)	520	(3.7)	1.5	(1.1)	502	(13.3)
Quebec	55.7	(6.1)	541	(4.7)	43.5	(6.1)	529	(6.3)	0.8	(0.6)	489	(38.3)
International average	43.3	–	501	–	45.2	–	478	–	11.5	–	458	–

TABLE B.3.12 Percentage of Grade 4 and Grade 8 teachers by gender

	Canada, provinces, and international average	Females		Males	
		%	Standard error	%	Standard error
Grade 4	Canada	83.5	(2.2)	16.5	(2.2)
	Alberta	82.3	(3.8)	17.7	(3.8)
	Ontario	80.7	(3.5)	19.3	(3.5)
	Quebec	89.0	(3.9)	11.0	(3.9)
	International average	81.5	–	18.5	–
Grade 8	Canada	53.0	(3.8)	47.0	(3.8)
	Ontario	53.1	(5.4)	46.9	(5.4)
	Quebec	57.3	(6.2)	42.7	(6.2)
	International average	59.3	–	40.7	–

TABLE B.3.13 Relationship between teachers' highest level of formal education and Grade 4 student achievement

Canada, provinces, and international average	Bachelor's degree				Master's degree				Doctoral degree			
	%	Standard error	Average score	Standard error	%	Standard error	Average score	Standard error	%	Standard error	Average score	Standard error
Mathematics												
Canada	87.2	(2.2)	511	(2.8)	12.5	(2.1)	509	(5.5)	0.3	(0.2)	528	(6.0)
Alberta	82.6	(3.7)	483	(4.6)	17.4	(3.7)	486	(7.3)	0.0	–	–	–
Ontario	85.6	(3.6)	513	(2.4)	14.0	(3.6)	519	(9.2)	0.4	(0.4)	529	(7.1)
Quebec	93.5	(2.3)	536	(4.4)	6.2	(2.3)	532	(9.1)	0.4	(0.4)	528	(2.8)
International average	57.7	–	–	–	26.6	–	–	–	0.4	–	–	–
Science												
Canada	87.2	(2.2)	524	(3.2)	12.5	(2.1)	529	(5.5)	0.3	(0.2)	517	(23.5)
Alberta	82.6	(3.7)	516	(5.8)	17.4	(3.7)	525	(7.1)	0.0	–	–	–
Ontario	85.6	(3.6)	530	(2.8)	14.0	(3.6)	536	(8.7)	0.4	(0.4)	505	(11.0)
Quebec	93.5	(2.3)	524	(4.2)	6.2	(2.3)	518	(13.6)	0.4	(0.4)	544	(6.8)
International average	56.8	–	–	–	27.2	–	–	–	0.6	–	–	–

Note: A negligible percentage of teachers in Canada and the provinces hold less than a bachelor's degree.

TABLE B.3.14 Relationship between teachers' highest level of formal education and Grade 8 student achievement

Canada, provinces, and international average	Bachelor's degree				Master's degree				Doctoral degree			
	%	Standard error	Average score	Standard error	%	Standard error	Average score	Standard error	%	Standard error	Average score	Standard error
Mathematics												
Canada	80.7	(2.7)	526	(2.6)	18.8	(2.7)	539	(4.9)	0.5	(0.4)	545	(21.8)
Ontario	75.2	(4.0)	520	(3.5)	24.8	(4.0)	541	(5.7)	0.0	–	–	–
Quebec	89.9	(3.3)	544	(3.9)	9.0	(3.1)	544	(5.7)	1.1	(1.1)	559	(4.6)
International average	65.8	–	–	–	23.8	–	–	–	0.7	–	–	–
Science												
Canada	80.7	(2.7)	526	(2.4)	18.8	(2.7)	541	(4.8)	0.5	(0.4)	532	(6.1)
Ontario	75.2	(4.0)	522	(3.0)	24.8	(4.0)	543	(5.4)	0.0	–	–	–
Quebec	89.9	(3.3)	532	(4.5)	9.0	(3.1)	531	(10.2)	1.1	(1.1)	531	(2.2)
International average	63.8	–	–	–	26.0	–	–	–	1.5	–	–	–

Note: A negligible percentage of teachers in Canada and the provinces hold less than a bachelor's degree.

TABLE B.3.15 Relationship between confidence in mathematics and student achievement in mathematics

	Canada, provinces, and international average	Very confident				Confident				Not confident			
		%	Standard error	Average score	Standard error	%	Standard error	Average score	Standard error	%	Standard error	Average score	Standard error
Grade 4	Canada	32.9	(0.7)	552	(2.3)	44.1	(0.6)	506	(2.3)	22.9	(0.7)	467	(2.5)
	Alberta	30.4	(1.0)	526	(4.6)	43.8	(1.0)	480	(4.4)	25.8	(0.9)	445	(3.4)
	Ontario	31.1	(1.0)	556	(2.7)	44.2	(0.7)	508	(2.4)	24.7	(0.8)	470	(3.4)
	Quebec	38.1	(1.4)	567	(4.7)	44.5	(1.4)	528	(4.0)	17.5	(1.2)	491	(5.9)
	International average	31.6	–	537	–	45.0	–	503	–	23.3	–	474	
Grade 8	Canada	25.7	(0.7)	579	(2.1)	41.0	(0.8)	535	(2.3)	33.4	(0.9)	482	(2.2)
	Ontario	29.5	(1.0)	576	(2.3)	40.2	(1.0)	526	(2.9)	30.3	(1.1)	469	(2.4)
	Quebec	19.0	(1.0)	594	(3.1)	41.8	(1.4)	559	(2.9)	39.3	(1.7)	507	(4.0)
	International average	14.1	–	554	–	42.5	–	494	–	43.4	–	449	–

TABLE B.3.16 Relationship between confidence in science and student achievement in science

	Canada, provinces, and international average	Very confident				Confident				Not confident			
		%	Standard error	Average score	Standard error	%	Standard error	Average score	Standard error	%	Standard error	Average score	Standard error
Grade 4	Canada	39.1	(0.9)	547	(2.3)	43.0	(0.7)	523	(2.5)	17.9	(0.6)	495	(3.3)
	Alberta	44.2	(1.1)	544	(4.5)	40.9	(0.9)	511	(5.3)	15.0	(0.8)	483	(6.5)
	Ontario	38.0	(1.3)	551	(3.1)	42.0	(0.8)	528	(3.1)	20.0	(1.0)	501	(3.2)
	Quebec	37.6	(1.5)	542	(4.2)	46.6	(1.4)	522	(4.8)	15.8	(1.2)	496	(5.2)
	International average	40.2	–	532	–	42.0	–	501	–	17.8	–	464	–
Grade 8	Canada	24.4	(0.7)	563	(2.8)	43.4	(0.8)	531	(2.4)	32.2	(0.9)	498	(2.5)
	Ontario	24.9	(1.1)	561	(3.6)	40.8	(1.1)	528	(2.8)	34.4	(1.2)	497	(3.1)
	Quebec	23.6	(1.2)	563	(4.2)	48.2	(1.0)	536	(3.8)	28.2	(1.3)	503	(3.9)
	International average	21.6	–	538	–	38.9	–	490	–	39.6	–	452	–

TABLE B.3.17 Relationship between performing early literacy and numeracy tasks and Grade 4 student achievement

Canada, provinces, and international average	Very well				Moderately well				Not well			
	%	Standard error	Average score	Standard error	%	Standard error	Average score	Standard error	%	Standard error	Average score	Standard error
Mathematics												
Canada	24.5	(0.9)	550	(2.6)	56.6	(0.9)	514	(1.8)	18.9	(0.6)	488	(4.0)
Alberta	24.2	(1.1)	526	(4.9)	58.3	(0.9)	490	(3.4)	17.5	(0.9)	454	(5.2)
Ontario	30.6	(1.6)	552	(3.2)	55.8	(1.6)	512	(2.1)	13.6	(0.6)	472	(4.5)
Quebec	15.2	(1.0)	573	(6.0)	56.6	(1.4)	540	(3.7)	28.3	(1.2)	521	(5.3)
International average	20.2	–	544	–	52.8	–	510	–	27.0	–	480	–
Science												
Canada	24.5	(0.9)	561	(2.9)	56.6	(0.9)	528	(2.3)	18.9	(0.6)	503	(3.4)
Alberta	24.2	(1.1)	557	(5.8)	58.3	(0.9)	526	(4.7)	17.5	(0.9)	494	(6.2)
Ontario	30.6	(1.6)	564	(3.7)	55.8	(1.6)	531	(2.7)	13.6	(0.6)	497	(4.5)
Quebec	15.2	(1.0)	554	(5.8)	56.6	(1.4)	528	(4.0)	28.3	(1.2)	514	(5.4)
International average	20.2	–	537	–	52.8	–	507	–	27.0	–	479	–

TABLE B.3.18 Relationship between daily time spent doing homework and Grade 8 student achievement

	Canada, provinces, and international average	Mathematics				Science			
		%	Standard error	Average score	Standard error	%	Standard error	Average score	Standard error
No homework	Canada	1.1	(0.2)	506	(13.5)	3.5	(0.3)	492	(7.2)
	Ontario	1.4	(0.2)	497	(15.9)	4.1	(0.4)	492	(7.3)
	Quebec	0.5	(0.1)	499	(13.4)	2.1	(0.5)	483	(23.1)
	International average	3.8	–	–	–	4.2	–	–	–
1 to 15 minutes	Canada	23.6	(0.8)	534	(2.9)	28.1	(1.1)	530	(2.8)
	Ontario	24.4	(1.0)	531	(3.4)	24.3	(1.5)	523	(3.6)
	Quebec	19.5	(1.5)	553	(5.3)	33.9	(1.7)	540	(3.8)
	International average	29.5	–	–	–	31.1	–	–	–
16 to 30 minutes	Canada	37.5	(0.6)	536	(2.4)	37.6	(0.8)	534	(2.4)
	Ontario	37.8	(0.9)	531	(2.9)	36.8	(1.1)	532	(2.8)
	Quebec	37.6	(1.3)	553	(3.2)	41.0	(1.3)	537	(4.1)
	International average	32.6	–	–	–	30.5	–	–	–
31 to 60 minutes	Canada	28.2	(0.8)	525	(2.5)	23.5	(1.1)	536	(3.2)
	Ontario	26.9	(1.1)	519	(3.5)	25.5	(1.6)	534	(4.0)
	Quebec	31.5	(1.3)	541	(3.8)	18.8	(1.5)	537	(4.6)
	International average	20.6	–	–	–	17.6	–	–	–
61 to 90 minutes	Canada	6.8	(0.4)	521	(4.4)	5.3	(0.4)	526	(4.4)
	Ontario	7.0	(0.6)	510	(5.9)	6.5	(0.5)	528	(5.0)
	Quebec	7.3	(0.7)	544	(6.8)	3.3	(0.5)	525	(8.9)
	International average	5.1	–	–	–	4.6	–	–	–
More than 90 minutes	Canada	2.9	(0.3)	510	(7.0)	2.1	(0.3)	504	(8.6)
	Ontario	2.5	(0.4)	517	(11.8)	2.7	(0.4)	507	(10.1)
	Quebec	3.7	(0.4)	505	(7.3)	0.9	(0.2)	506	(10.4)
	International average	4.0	–	–	–	3.1	–	–	–

TABLE B.3.19 Percentage of school teachers reporting TIMSS curriculum topics covered in Grade 4 mathematics for 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	45.9	(4.3)	53.8	(4.3)	0.4	(0.4)
Adding, subtracting, multiplying, and/or dividing with whole numbers	15.8	(2.8)	83.4	(2.9)	0.8	(0.6)
Concepts of multiples and factors; odd and even numbers	32.6	(3.6)	51.9	(3.7)	15.5	(2.6)
Concepts of fractions (fractions as parts of a whole or of a collection, or as a location on a number line)	12.0	(2.7)	56.1	(4.4)	32.0	(4.6)
Adding and subtracting with fractions, comparing and ordering fractions	2.1	(1.3)	30.2	(3.0)	67.7	(2.9)
Concepts of decimals, including place value and ordering, adding and subtracting with decimals	4.4	(1.9)	49.5	(4.3)	46.1	(3.9)
Number sentences (finding the missing number, modelling simple situations with number sentences)	23.6	(3.5)	64.5	(4.0)	11.9	(2.8)
Number patterns (extending number patterns and finding missing terms)	36.0	(4.5)	60.2	(4.7)	3.8	(1.4)
Geometric shapes and measures						
Lines: measuring, estimating length of parallel and perpendicular lines	13.8	(2.8)	26.9	(3.5)	59.3	(3.2)
Comparing and drawing angles	3.0	(1.8)	14.4	(2.2)	82.6	(2.7)
Using informal coordinate systems to locate points in a plane	7.9	(2.6)	14.6	(2.7)	77.5	(3.4)
Elementary properties of common geometric shapes	35.2	(4.1)	36.5	(3.2)	28.3	(4.6)
Reflections and rotations	4.3	(1.7)	20.9	(3.8)	74.7	(3.8)
Relationships between two-dimensional and three-dimensional shapes	18.5	(2.9)	39.9	(4.4)	41.6	(4.2)
Finding and estimating areas, perimeters, and volumes	7.9	(2.4)	40.4	(4.1)	41.7	(3.5)
Data display						
Reading and representing data from tables, pictographs, bar graphs, or pie charts	25.2	(3.3)	56.9	(4.2)	17.9	(3.0)
Drawing conclusions from data displays	21.9	(3.6)	55.1	(4.5)	22.9	(3.4)

TABLE B.3.20 Percentage of school teachers reporting TIMSS curriculum topics covered in Grade 4 science for Alberta

	Mostly taught before this year		Mostly taught this year		Not yet taught or just introduced	
	%	Standard error	%	Standard error	%	Standard error
Life science						
Characteristics of living things and the major groups of living things (e.g., mammals, birds, insects, flowering plants)	63.3	(3.9)	21.1	(3.6)	15.6	(3.1)
Major body structures and their functions in humans, other animals, and plants	21.0	(3.0)	22.4	(2.9)	56.6	(3.7)
Life cycles of common plants and animals (e.g., humans, butterflies, frogs, flowering plants)	44.4	(4.0)	34.9	(5.0)	20.8	(3.5)
Understanding that some characteristics are inherited and some are the result of the environment	17.4	(2.9)	20.8	(3.6)	61.8	(4.1)
How physical features and behaviours help living things survive in their environments	37.3	(3.9)	36.8	(4.0)	25.9	(2.6)
Relationships in communities and ecosystems (e.g., simple food chains, predator-prey relationships, human impacts on the environment)	21.8	(3.7)	40.5	(4.1)	37.8	(4.4)
Human health (transmission and prevention of diseases, symptoms of health and illness, importance of healthy diet and exercise)	18.3	(3.3)	31.4	(3.8)	50.3	(3.8)
Physical science						
States of matter (solid, liquid, gas) and properties of the states of matter (volume, shape); how the state of matter changes by heating or cooling	43.5	(4.1)	6.4	(2.2)	50.2	(4.6)
Classifying materials based on physical properties (e.g., weight/mass, volume, conducting heat, conducting electricity, magnetic attraction)	20.8	(3.1)	5.0	(1.8)	74.2	(3.4)
Mixtures and how to separate a mixture into its components (e.g., sifting, filtering, evaporation, using a magnet)	24.7	(3.8)	2.6	(1.2)	72.7	(3.8)
Chemical changes in everyday life (e.g., decaying, burning, rusting, cooking)	10.9	(2.9)	8.7	(2.1)	80.5	(3.6)
Common sources of energy (e.g., the Sun, electricity, wind) and uses of energy (heating and cooling homes, providing light)	9.4	(1.8)	58.5	(3.4)	32.0	(3.2)
Light and sound in everyday life (e.g., understanding shadows and reflection, understanding that vibrating objects make sound)	10.6	(2.2)	78.8	(4.2)	10.6	(3.7)
Electricity and simple circuits (e.g., identifying materials that are conductors, recognizing that electricity can be changed to light or sound, knowing that a circuit must be complete to work correctly)	4.4	(1.9)	3.8	(1.6)	91.9	(2.4)
Properties of magnets (e.g., knowing that like poles repel and opposite poles attract, recognizing that magnets can attract some objects)	55.0	(3.7)	3.1	(1.3)	42.0	(3.8)
Forces that cause objects to move (e.g., gravity, pushing/pulling)	7.6	(2.1)	57.2	(4.2)	35.2	(3.8)

TABLE B.3.20 Percentage of school teachers reporting TIMSS curriculum topics covered in Grade 4 science for Alberta (continued)

	Mostly taught before this year		Mostly taught this year		Not yet taught or just introduced	
	%	Standard error	%	Standard error	%	Standard error
Earth science						
Common features of the Earth's landscape (e.g., mountains, plains, deserts, rivers, oceans) and their relationship to human use (farming, irrigation, land development)	19.7	(3.0)	41.6	(3.8)	38.8	(3.8)
Where water is found on the Earth and how it moves in and out of the air (e.g., evaporation, rainfall, cloud formation, dew formation)	31.1	(3.7)	7.9	(2.4)	61.0	(3.8)
Understanding that weather can change from day to day, from season to season, and by geographic location	20.6	(3.5)	12.5	(2.5)	67.0	(4.4)
Understanding what fossils are and what they can tell us about past conditions on Earth	22.1	(3.4)	56.1	(4.0)	21.7	(3.0)
Objects in the solar system (the Sun, the Earth, the Moon, and other planets) and their movements (the Earth and other planets revolve around the Sun, the Moon revolves around the Earth)	9.0	(2.2)	4.1	(2.1)	87.0	(3.1)
Understanding how day and night result from the Earth's rotation on its axis and how the Earth's rotation results in changing shadows throughout the day	4.7	(1.5)	33.5	(3.7)	61.8	(3.6)
Understanding how seasons are related to the Earth's annual movement around the Sun	18.4	(2.5)	13.3	(2.9)	68.3	(3.6)

TABLE B.3.21 Percentage of school teachers reporting TIMSS curriculum topics covered in Grade 4 mathematics for 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	51.6	(3.7)	48.4	(3.7)	0.0	(0.0)
Adding, subtracting, multiplying, and/or dividing with whole numbers	20.9	(3.6)	76.7	(3.6)	2.4	(1.2)
Concepts of multiples and factors; odd and even numbers	34.3	(4.3)	49.8	(4.4)	15.9	(3.0)
Concepts of fractions (fractions as parts of a whole or of a collection, or as a location on a number line)	21.4	(3.2)	46.1	(3.3)	32.5	(3.3)
Adding and subtracting with fractions, comparing and ordering fractions	4.6	(1.3)	28.0	(3.9)	67.5	(4.1)
Concepts of decimals, including place value and ordering, adding and subtracting with decimals	4.7	(1.5)	44.1	(4.2)	51.2	(4.4)
Number sentences (finding the missing number, modelling simple situations with number sentences)	28.4	(3.6)	58.3	(4.7)	13.3	(3.2)
Number patterns (extending number patterns and finding missing terms)	32.9	(3.0)	63.2	(3.1)	3.8	(1.3)
Geometric shapes and measures						
Lines: measuring, estimating length of parallel and perpendicular lines	23.7	(3.8)	60.2	(4.7)	16.1	(2.5)
Comparing and drawing angles	7.9	(1.7)	69.1	(3.9)	23.0	(3.6)
Using informal coordinate systems to locate points in a plane	86.5	(14.2)	19.6	(2.4)	53.1	(3.8)
Elementary properties of common geometric shapes	41.9	(4.1)	52.9	(4.3)	5.2	(1.6)
Reflections and rotations	28.7	(3.7)	33.3	(4.0)	38.0	(3.7)
Relationships between two-dimensional and three-dimensional shapes	35.5	(9.7)	24.2	(4.0)	55.7	(4.2)
Finding and estimating areas, perimeters, and volumes	13.2	(2.5)	63.6	(3.3)	23.2	(3.5)
Data display						
Reading and representing data from tables, pictographs, bar graphs, or pie charts	30.8	(3.4)	68.5	(3.4)	0.8	(0.5)
Drawing conclusions from data displays	22.8	(3.1)	76.0	(3.1)	1.2	(0.6)

TABLE B.3.22 Percentage of school teachers reporting TIMSS curriculum topics covered in Grade 4 science for Ontario

	Mostly taught before this year		Mostly taught this year		Not yet taught or just introduced	
	%	Standard error	%	Standard error	%	Standard error
Life science						
Characteristics of living things and the major groups of living things (e.g., mammals, birds, insects, flowering plants)	52.5	(3.1)	31.5	(3.1)	16.0	(3.1)
Major body structures and their functions in humans, other animals, and plants	23.9	(2.6)	17.7	(3.0)	58.4	(3.8)
Life cycles of common plants and animals (e.g., humans, butterflies, frogs, flowering plants)	68.1	(3.9)	20.5	(2.8)	11.4	(3.0)
Understanding that some characteristics are inherited and some are the result of the environment	16.7	(3.0)	43.2	(3.5)	40.1	(4.2)
How physical features and behaviours help living things survive in their environments	10.3	(2.1)	70.7	(3.9)	19.0	(3.4)
Relationships in communities and ecosystems (e.g., simple food chains, predator-prey relationships, human impacts on the environment)	5.9	(1.7)	78.0	(3.1)	16.1	(2.8)
Human health (transmission and prevention of diseases, symptoms of health and illness, importance of healthy diet and exercise)	17.2	(2.5)	43.5	(3.9)	39.3	(3.6)
Physical science						
States of matter (solid, liquid, gas) and properties of the states of matter (volume, shape); how the state of matter changes by heating or cooling	39.2	(3.6)	7.6	(1.8)	53.2	(3.4)
Classifying materials based on physical properties (e.g., weight/mass, volume, conducting heat, conducting electricity, magnetic attraction)	22.6	(2.6)	9.3	(1.9)	68.1	(3.0)
Mixtures and how to separate a mixture into its components (e.g., sifting, filtering, evaporation, using a magnet)	21.4	(2.7)	4.8	(1.2)	73.8	(2.8)
Chemical changes in everyday life (e.g., decaying, burning, rusting, cooking)	11.3	2.22	10.73	2.45	78.0	(2.9)
Common sources of energy (e.g., the Sun, electricity, wind) and uses of energy (heating and cooling homes, providing light)	19.6	(3.3)	36.6	(3.2)	43.9	(3.6)
Light and sound in everyday life (e.g., understanding shadows and reflection, understanding that vibrating objects make sound)	4.6	(1.3)	77.3	(3.1)	18.2	(3.0)
Electricity and simple circuits (e.g., identifying materials that are conductors, recognizing that electricity can be changed to light or sound, knowing that a circuit must be complete to work correctly)	6.9	(1.7)	10.8	(2.6)	82.3	(2.9)
Properties of magnets (e.g., knowing that like poles repel and opposite poles attract, recognizing that magnets can attract some objects)	49.7	(3.8)	7.3	(1.6)	42.9	(3.6)
Forces that cause objects to move (e.g., gravity, pushing/pulling)	39.3	(3.6)	28.3	(3.1)	32.4	(4.0)

TABLE B.3.22 Percentage of school teachers reporting TIMSS curriculum topics covered in Grade 4 science for Ontario (*continued*)

	Mostly taught before this year		Mostly taught this year		Not yet taught or just introduced	
	%	Standard error	%	Standard error	%	Standard error
Earth science						
Common features of the Earth's landscape (e.g., mountains, plains, deserts, rivers, oceans) and their relationship to human use (farming, irrigation, land development)	15.4	(2.3)	54.5	(3.2)	30.1	(3.1)
Where water is found on the Earth and how it moves in and out of the air (e.g., evaporation, rainfall, cloud formation, dew formation)	47.8	(4.3)	11.6	(2.7)	40.7	(4.3)
Understanding that weather can change from day to day, from season to season, and by geographic location	49.3	(3.2)	14.9	(2.8)	35.8	(3.2)
Understanding what fossils are and what they can tell us about past conditions on Earth	9.7	(2.3)	58.9	(3.0)	31.4	(2.9)
Objects in the solar system (the Sun, the Earth, the Moon, and other planets) and their movements (the Earth and other planets revolve around the Sun, the Moon revolves around the Earth)	13.0	(3.2)	6.5	(2.2)	80.6	(2.9)
Understanding how day and night result from the Earth's rotation on its axis and how the Earth's rotation results in changing shadows throughout the day	17.7	(3.0)	18.1	(2.8)	64.2	(3.7)
Understanding how seasons are related to the Earth's annual movement around the Sun	30.0	(3.4)	11.5	(2.2)	58.5	(3.9)

TABLE B.3.23 Percentage of school teachers reporting TIMSS curriculum topics covered in Grade 8 mathematics for Ontario

	Mostly taught before this year		Mostly taught this year		Not yet taught or just introduced	
	%	Standard error	%	Standard error	%	Standard error
Number						
Computing with whole numbers	76.6	(3.9)	23.4	(3.9)	0.0	(0.0)
Comparing and ordering rational numbers	57.1	(4.0)	42.0	(4.0)	1.0	(0.7)
Computing with rational numbers (fractions, decimals, and integers)	27.6	(4.1)	68.1	(4.3)	4.3	(1.6)
Concepts of irrational numbers	12.9	(3.5)	54.3	(4.4)	32.8	(3.9)
Problem solving involving percentages or proportions	23.8	(3.4)	59.5	(4.3)	16.7	(3.1)
Algebra						
Simplifying and evaluating algebraic expressions	17.2	(3.9)	69.8	(4.1)	13.1	(2.8)
Simple linear equations and inequalities	15.0	(2.7)	59.5	(4.0)	25.5	(3.6)
Simultaneous (two variables) equations	3.8	(1.4)	40.0	(4.5)	56.2	(4.5)
Numeric, algebraic, and geometric patterns or sequences (extension, missing terms, generalization of patterns)	25.7	(4.4)	65.8	(4.9)	8.6	(2.2)
Representation of functions as ordered pairs, tables, graphs, words, or equations	17.6	(3.5)	56.5	(4.6)	25.9	(3.4)
Properties of functions (slopes, intercepts, etc.)	4.5	(0.8)	11.5	(2.2)	84.0	(2.4)
Geometry						
Geometric properties of angles and geometric shapes (triangles, quadrilaterals, and other common polygons)	45.6	(4.5)	43.4	(4.6)	11.0	(2.7)
Congruent figures and similar triangles	67.6	(5.4)	31.9	(4.6)	10.5	(2.7)
Relationship between three-dimensional shapes and their two-dimensional representations	46.5	(4.4)	36.7	(4.6)	16.8	(3.3)
Using appropriate measurement formulas for perimeters, circumferences, areas, surface areas, and volumes	29.6	(3.6)	66.8	(4.0)	3.6	(2.2)
Points on the Cartesian plane	43.8	(4.1)	34.6	(3.9)	21.6	(3.3)
Translation, reflection, and rotation	50.8	(4.1)	27.2	(3.7)	22.0	(3.5)
Data and chance						
Characteristics of data sets (mean, median, mode, and shape of distributions)	44.4	(3.7)	50.8	(3.7)	4.9	(1.3)
Interpreting data sets (e.g., draw conclusions, make predictions, and estimate values between and beyond given data points)	32.3	(3.6)	56.5	(3.8)	11.2	(2.6)
Judging, predicting, and determining the chances of possible outcomes	35.3	(4.5)	36.6	(4.2)	28.1	(3.7)

TABLE B.3.24 Percentage of school teachers reporting TIMSS curriculum topics covered in Grade 8 science for Ontario

	Mostly taught before this year		Mostly taught this year		Not yet taught or just introduced	
	%	Standard error	%	Standard error	%	Standard error
Biology						
Differences among major taxonomic groups of organisms (plants, animals, fungi, mammals, birds, reptiles, fish, amphibians)	71.9	(3.9)	18.0	(3.3)	10.1	(2.9)
Major organs and organ systems in humans and other organisms (structure/function, life processes that maintain stable bodily conditions)	33.2	(4.3)	56.2	(4.8)	10.6	(2.9)
Cells, their structure and functions, including respiration and photosynthesis as cellular processes	7.8	(2.6)	81.7	(3.4)	10.5	(2.2)
Life cycles, sexual reproduction, and heredity (passing on of traits, inherited versus acquired/learned characteristics)	22.6	(3.6)	27.2	(4.6)	50.2	(4.5)
Role of variation and adaptation in survival/extinction of species in a changing environment (including fossil evidence for changes in life on Earth over time)	51.1	(4.5)	14.0	(3.3)	34.9	(4.0)
Interdependence of populations of organisms in an ecosystem (e.g., energy flow, food webs, competition, predation) and factors affecting population size in an ecosystem	74.9	(4.6)	16.2	(4.1)	8.9	(2.6)
Human health (causes of infectious diseases, methods of infection, prevention, immunity) and the importance of diet and exercise in maintaining health	30.8	(4.5)	44.6	(4.6)	24.6	(3.6)
Chemistry						
Classification, composition, and particulate structure of matter (elements, compounds, mixtures, molecules, atoms, protons, neutrons, electrons)	27.0	(4.1)	24.9	(4.4)	48.1	(5.1)
Physical and chemical properties of matter	34.7	(4.7)	39.5	(4.4)	25.8	(4.6)
Mixtures and solutions (solvent, solute, concentration/dilution, effect of temperature on solubility)	60.9	(4.8)	31.6	(4.8)	7.5	(2.4)
Properties and uses of common acids and bases	19.3	(3.5)	8.1	(2.5)	72.6	(4.0)
Chemical change (transformation of reactants, evidence of chemical change, conservation of matter, common oxidation reactions—combustion, rusting, tarnishing)	18.6	(3.1)	6.2	(2.2)	75.2	(3.6)
The role of electrons in chemical bonds	11.8	(2.6)	4.5	(2.0)	83.7	(3.1)

TABLE B.3.24 Percentage of school teachers reporting TIMSS curriculum topics covered in Grade 8 science for Ontario (continued)

	Mostly taught before this year		Mostly taught this year		Not yet taught or just introduced	
	%	Standard error	%	Standard error	%	Standard error
Physics						
Physical states and changes in matter (explanations of properties in terms of movement and distance between particles; phase change, thermal expansion, and changes in volume and/or pressure)	27.9	(4.7)	50.9	(5.1)	21.2	(3.7)
Energy forms, transformations, heat, and temperature	55.1	(4.5)	27.4	(4.1)	17.6	(3.9)
Basic properties/behaviours of light (reflection, refraction, light and colour, simple ray diagrams) and sound (transmission through media, loudness, pitch, amplitude, frequency)	30.4	(4.0)	1.4	(0.8)	68.2	(4.0)
Electric circuits (flow of current; types of circuits—parallel/series) and properties and uses of permanent magnets and electromagnets	63.7	(4.8)	2.2	(1.3)	34.1	(4.6)
Forces and motion (types of forces, basic description of motion, effects of density and pressure)	22.7	(4.5)	58.4	(4.9)	18.9	(4.0)
Earth science						
Earth's structure and physical features (Earth's crust, mantle, and core; composition and relative distribution of water, and composition of air)	72.3	(4.7)	5.6	(2.0)	22.1	(4.3)
Earth's processes, cycles, and history (rock cycle; water cycle; weather versus climate; major geological events; formation of fossils and fossil fuels)	64.5	(3.8)	15.0	(3.4)	20.5	(3.5)
Earth's resources, their use and conservation (e.g., renewable/non-renewable resources, human use of land/soil, water resources)	49.1	(4.7)	33.4	(3.8)	17.5	(4.1)
Earth in the solar system and the universe (phenomena on Earth—day/night, tides, phases of moon, eclipses, seasons; physical features of Earth compared to other bodies)	69.2	(4.7)	3.9	(2.2)	26.9	(4.3)

TABLE B.3.25 Percentage of school teachers reporting TIMSS curriculum topics covered in Grade 4 mathematics for 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	74.1	(4.6)	26.0	(4.6)	0.0	(0.0)
Adding, subtracting, multiplying, and/or dividing with whole numbers	27.5	(5.8)	72.6	(5.8)	0.0	(0.0)
Concepts of multiples and factors; odd and even numbers	22.7	(5.0)	67.7	(5.6)	9.6	(3.3)
Concepts of fractions (fractions as parts of a whole or of a collection, or as a location on a number line)	15.7	(4.0)	78.5	(4.9)	5.8	(2.9)
Adding and subtracting with fractions, comparing and ordering fractions	3.4	(1.4)	43.7	(5.5)	52.9	(5.6)
Concepts of decimals, including place value and ordering, adding and subtracting with decimals	6.6	(2.7)	77.1	(4.3)	16.4	(2.9)
Number sentences (finding the missing number, modelling simple situations with number sentences)	47.1	(5.5)	47.7	(5.1)	5.2	(2.3)
Number patterns (extending number patterns and finding missing terms)	48.1	(5.3)	43.7	(5.5)	8.2	(3.5)
Geometric shapes and measures						
Lines: measuring, estimating length of parallel and perpendicular lines	32.9	(4.8)	63.1	(5.9)	4.1	(1.7)
Comparing and drawing angles	20.6	(5.0)	61.4	(6.0)	18.0	(4.2)
Using informal coordinate systems to locate points in a plane	35.1	(5.8)	46.7	(6.1)	18.2	(4.8)
Elementary properties of common geometric shapes	52.5	(6.2)	43.7	(6.4)	3.9	(1.8)
Reflections and rotations	16.6	(4.0)	32.7	(4.8)	50.7	(5.6)
Relationships between two-dimensional and three-dimensional shapes	7.2	(2.7)	61.9	(5.9)	30.9	(5.4)
Finding and estimating areas, perimeters, and volumes	10.9	(3.5)	69.7	(5.6)	19.4	(4.5)
Data display						
Reading and representing data from tables, pictographs, bar graphs, or pie charts	39.7	(5.5)	54.6	(6.0)	5.7	(2.8)
Drawing conclusions from data displays	30.1	(5.9)	57.6	(6.5)	12.4	(4.2)

TABLE B.3.26 Percentage of school teachers reporting TIMSS curriculum topics covered in Grade 4 science for Quebec

	Mostly taught before this year		Mostly taught this year		Not yet taught or just introduced	
	%	Standard error	%	Standard error	%	Standard error
Life science						
Characteristics of living things and the major groups of living things (e.g., mammals, birds, insects, flowering plants)	36.6	(6.0)	49.1	(6.0)	14.4	(3.8)
Major body structures and their functions in humans, other animals, and plants	23.7	(4.0)	36.6	(6.0)	39.8	(5.9)
Life cycles of common plants and animals (e.g., humans, butterflies, frogs, flowering plants)	45.7	(4.7)	23.1	(4.0)	31.3	(4.9)
Understanding that some characteristics are inherited and some are the result of the environment	16.1	(4.4)	27.5	(5.1)	56.4	(5.4)
How physical features and behaviours help living things survive in their environments	12.7	(3.8)	44.7	(6.0)	42.6	(5.0)
Relationships in communities and ecosystems (e.g., simple food chains, predator-prey relationships, human impacts on the environment)	17.6	(4.2)	55.1	(6.6)	27.3	(5.9)
Human health (transmission and prevention of diseases, symptoms of health and illness, importance of healthy diet and exercise)	6.4	(2.1)	29.4	(5.8)	64.3	(5.9)
Physical science						
States of matter (solid, liquid, gas) and properties of the states of matter (volume, shape); how the state of matter changes by heating or cooling	29.7	(5.6)	48.4	(5.4)	22.0	(5.2)
Classifying materials based on physical properties (e.g., weight/mass, volume, conducting heat, conducting electricity, magnetic attraction)	7.4	(2.9)	59.5	(5.8)	33.1	(6.0)
Mixtures and how to separate a mixture into its components (e.g., sifting, filtering, evaporation, using a magnet)	8.3	(2.9)	34.3	(6.0)	57.4	(5.3)
Chemical changes in everyday life (e.g., decaying, burning, rusting, cooking)	1.0	(0.5)	14.8	(4.7)	84.2	(4.7)
Common sources of energy (e.g., the Sun, electricity, wind) and uses of energy (heating and cooling homes, providing light)	10.8	(3.8)	47.5	(5.2)	41.8	(5.2)
Light and sound in everyday life (e.g., understanding shadows and reflection, understanding that vibrating objects make sound)	15.2	(4.5)	26.8	(5.2)	58.0	(5.6)
Electricity and simple circuits (e.g., identifying materials that are conductors, recognizing that electricity can be changed to light or sound, knowing that a circuit must be complete to work correctly)	5.4	(2.7)	11.1	(2.8)	83.5	(3.1)
Properties of magnets (e.g., knowing that like poles repel and opposite poles attract, recognizing that magnets can attract some objects)	14.4	(4.4)	27.0	(5.4)	58.5	(6.3)
Forces that cause objects to move (e.g., gravity, pushing/pulling)	5.2	(2.3)	47.3	(5.8)	47.6	(5.7)

TABLE B.3.26 Percentage of school teachers reporting TIMSS curriculum topics covered in Grade 4 science for Quebec (*continued*)

	Mostly taught before this year		Mostly taught this year		Not yet taught or just introduced	
	%	Standard error	%	Standard error	%	Standard error
Earth science						
Common features of the Earth's landscape (e.g., mountains, plains, deserts, rivers, oceans) and their relationship to human use (farming, irrigation, land development)	23.3	(4.8)	38.1	(6.0)	38.6	(5.5)
Where water is found on the Earth and how it moves in and out of the air (e.g., evaporation, rainfall, cloud formation, dew formation)	33.8	(5.4)	50.6	(6.0)	15.6	(3.4)
Understanding that weather can change from day to day, from season to season, and by geographic location	43.0	(5.4)	33.7	(4.9)	23.3	(4.5)
Understanding what fossils are and what they can tell us about past conditions on Earth	14.8	(3.8)	28.6	(4.8)	56.7	(5.8)
Objects in the solar system (the Sun, the Earth, the Moon, and other planets) and their movements (the Earth and other planets revolve around the Sun, the Moon revolves around the Earth)	25.7	(5.1)	51.5	(6.7)	22.9	(5.0)
Understanding how day and night result from the Earth's rotation on its axis and how the Earth's rotation results in changing shadows throughout the day	24.5	(5.1)	51.0	(6.6)	24.5	(5.4)
Understanding how seasons are related to the Earth's annual movement around the Sun	23.3	(4.9)	46.2	(6.1)	30.4	(5.3)

TABLE B.3.27 Percentage of school teachers reporting TIMSS curriculum topics covered in Grade 8/Secondary II mathematics for Quebec

	Mostly taught before this year		Mostly taught this year		Not yet taught or just introduced	
	%	Standard error	%	Standard error	%	Standard error
Number						
Computing with whole numbers	99.0	(1.0)	1.0	(1.0)	0.0	(0.0)
Comparing and ordering rational numbers	94.2	(2.5)	4.3	(2.1)	1.5	(1.3)
Computing with rational numbers (fractions, decimals, and integers)	91.4	(2.4)	8.6	(2.4)	0.0	(0.0)
Concepts of irrational numbers	23.2	(5.0)	25.0	(4.8)	51.8	(5.1)
Problem solving involving percentages or proportions	19.1	(4.8)	80.9	(4.8)	0.0	(0.0)
Algebra						
Simplifying and evaluating algebraic expressions	3.8	(2.3)	95.1	(2.4)	1.1	(0.7)
Simple linear equations and inequalities	0.0	(0.0)	67.6	(5.1)	32.4	(5.1)
Simultaneous (two variables) equations	0.0	(0.0)	4.3	(1.7)	95.7	(1.7)
Numeric, algebraic, and geometric patterns or sequences (extension, missing terms, generalization of patterns)	23.3	(4.9)	66.0	(5.8)	10.7	(3.6)
Representation of functions as ordered pairs, tables, graphs, words, or equations	6.0	(2.6)	65.8	(5.7)	28.2	(5.4)
Properties of functions (slopes, intercepts, etc.)	0.0	(0.0)	8.1	(1.8)	91.9	(1.8)
Geometry						
Geometric properties of angles and geometric shapes (triangles, quadrilaterals, and other common polygons)	76.0	(3.8)	23.4	(3.8)	0.7	(0.5)
Congruent figures and similar triangles	18.6	(4.0)	55.9	(4.2)	25.5	(4.6)
Relationship between three-dimensional shapes and their two-dimensional representations	5.8	(2.4)	59.9	(5.3)	34.3	(5.6)
Using appropriate measurement formulas for perimeters, circumferences, areas, surface areas, and volumes	2.1	(1.2)	88.3	(3.9)	9.6	(3.7)
Points on the Cartesian plane	66.5	(5.3)	29.7	(4.9)	3.9	(2.4)
Translation, reflection, and rotation	87.0	(3.6)	7.9	(3.0)	5.1	(2.2)
Data and chance						
Characteristics of data sets (mean, median, mode, and shape of distributions)	17.0	(3.4)	18.3	(4.2)	64.7	(5.2)
Interpreting data sets (e.g., draw conclusions, make predictions, and estimate values between and beyond given data points)	10.3	(3.8)	14.0	(4.1)	75.7	(4.9)
Judging, predicting, and determining the chances of possible outcomes	7.6	(2.0)	67.0	(4.9)	25.4	(4.7)

TABLE B.3.28 Percentage of school teachers reporting TIMSS curriculum topics covered in Grade 8/Secondary II science for Quebec

	Mostly taught before this year		Mostly taught this year		Not yet taught or just introduced	
	%	Standard error	%	Standard error	%	Standard error
Biology						
Differences among major taxonomic groups of organisms (plants, animals, fungi, mammals, birds, reptiles, fish, amphibians)	86.8	(2.7)	8.4	(1.7)	4.7	(2.2)
Major organs and organ systems in humans and other organisms (structure/function, life processes that maintain stable bodily conditions)	4.6	(2.0)	19.6	(4.9)	75.8	(5.1)
Cells, their structure and functions, including respiration and photosynthesis as cellular processes	24.2	(5.4)	69.3	(5.7)	6.6	(2.2)
Life cycles, sexual reproduction, and heredity (passing on of traits, inherited versus acquired/learned characteristics)	11.7	(4.0)	66.3	(5.8)	22.0	(3.9)
Role of variation and adaptation in survival/extinction of species in a changing environment (including fossil evidence for changes in life on Earth over time)	65.5	(6.1)	9.6	(2.6)	24.9	(5.6)
Interdependence of populations of organisms in an ecosystem (e.g., energy flow, food webs, competition, predation) and factors affecting population size in an ecosystem	58.3	(6.4)	11.2	(3.8)	30.5	(6.1)
Human health (causes of infectious diseases, methods of infection, prevention, immunity) and the importance of diet and exercise in maintaining health	2.6	(0.7)	25.0	(5.7)	72.5	(5.8)
Chemistry						
Classification, composition, and particulate structure of matter (elements, compounds, mixtures, molecules, atoms, protons, neutrons, electrons)	10.8	(3.0)	72.2	(5.4)	17.0	(4.9)
Physical and chemical properties of matter	15.6	(4.9)	77.7	(5.3)	6.7	(3.5)
Mixtures and solutions (solvent, solute, concentration/dilution, effect of temperature on solubility)	21.4	(4.4)	51.2	(6.3)	27.3	(6.0)
Properties and uses of common acids and bases	38.3	(5.3)	20.3	(4.1)	41.5	(5.1)
Chemical change (transformation of reactants, evidence of chemical change, conservation of matter, common oxidation reactions—combustion, rusting, tarnishing)	3.5	(1.7)	73.2	(5.0)	23.4	(5.1)
The role of electrons in chemical bonds	2.1	(1.6)	10.2	(3.3)	87.7	(3.7)

TABLE B.3.28 Percentage of school teachers reporting TIMSS curriculum topics covered in Grade 8/
Secondary II science for Quebec (continued)

	Mostly taught before this year		Mostly taught this year		Not yet taught or just introduced	
	%	Standard error	%	Standard error	%	Standard error
Physics						
Physical states and changes in matter (explanations of properties in terms of movement and distance between particles; phase change, thermal expansion, and changes in volume and/or pressure)	52.1	(5.8)	27.3	(5.1)	20.6	(4.5)
Energy forms, transformations, heat, and temperature	8.1	(3.1)	67.6	(5.3)	24.3	(4.9)
Basic properties/behaviours of light (reflection, refraction, light and colour, simple ray diagrams) and sound (transmission through media, loudness, pitch, amplitude, frequency)	10.9	(3.2)	5.7	(2.7)	83.5	(4.2)
Electric circuits (flow of current; types of circuits—parallel/series) and properties and uses of permanent magnets and electromagnets	0.6	(0.4)	1.0	(0.5)	98.4	(0.6)
Forces and motion (types of forces, basic description of motion, effects of density and pressure)	20.6	(4.7)	46.2	(6.0)	33.2	(4.8)
Earth science						
Earth's structure and physical features (Earth's crust, mantle, and core; composition and relative distribution of water, and composition of air)	75.3	(4.8)	18.3	(4.5)	6.4	(2.8)
Earth's processes, cycles, and history (rock cycle; water cycle; weather versus climate; major geological events; formation of fossils and fossil fuels)	23.4	(5.4)	56.7	(5.4)	19.9	(4.9)
Earth's resources, their use and conservation (e.g., renewable/non-renewable resources, human use of land/soil, water resources)	10.1	(3.5)	75.4	(5.5)	16.6	(4.1)
Earth in the solar system and the universe (phenomena on Earth—day/night, tides, phases of moon, eclipses, seasons; physical features of Earth compared to other bodies)	56.7	(6.1)	33.3	(5.7)	10.0	(3.5)