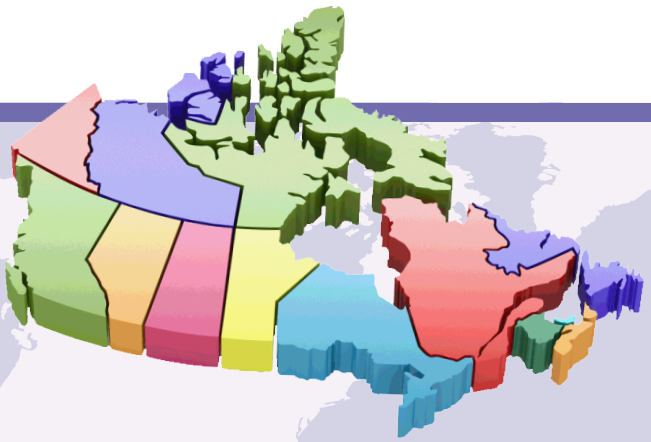
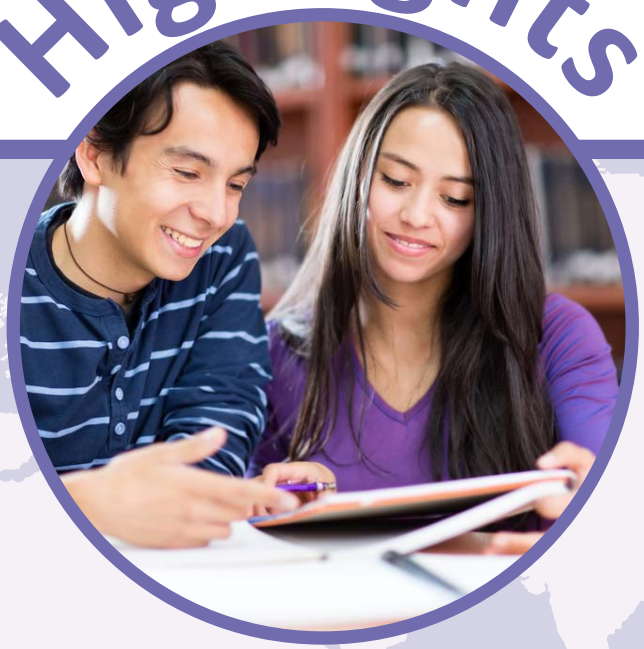
Measuring up: Canadian Results of the OECD PISA 2018 Study

The Performance of Canadian 15-Year-Olds in Reading, Mathematics, and Science

Highlights





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Canada

What is PISA?

The Programme for International Student Assessment (PISA) was initiated by the member countries of the Organisation for Economic Co-operation and Development (OECD) to provide policy-oriented international indicators of the skills and knowledge of 15-year-old students and to shed light on a range of factors that contribute to successful students, schools, education systems, and learning environments. It measures skills that are generally recognized as key outcomes of the educational process as well as young people's ability to use their knowledge and skills to meet real-life challenges.

The study has been conducted every three years since 2000. PISA assesses reading, mathematical, and scientific literacy and provides a more detailed look at one of those domains in the years when it is the major focus. The major focus of PISA 2018 was reading, while mathematics and science were tested as minor domains, with global competence as an innovative domain and financial literacy as an optional minor domain.

For the reading assessment, a multi-stage adaptive test design was introduced this cycle, which provides a more efficient and precise measurement of ability across the proficiency scales. PISA reports on reading literacy as well as three cognitive process subscales and two text structure subscales. The cognitive process subscales comprise three elements:

- **locating information**
  - ✓ scanning and locating/accessing and retrieving information within a text
  - ✓ searching for and selecting relevant text
- **understanding**
  - ✓ representing literal meaning
  - ✓ integrating and generating references
- **evaluating and reflecting**
  - ✓ assessing quality and credibility
  - ✓ reflecting on content and form
  - ✓ corroborating/detecting and handling conflict

The text structure subscales comprise two elements:

- **single-source texts**
  - ✓ texts with a definite author or group of authors, publication date, or reference title or number
- **multiple-source texts**
  - ✓ texts with different authors or groups of authors, publication dates, and/or reference titles or numbers

The distinction between the major domain (reading) and the two minor domains (mathematics and science) are less prominent in PISA 2018 than in previous administrations. The test design in 2018 provided full coverage of the constructs for all three domains, although about one-half of the total testing time was dedicated to the major domain. PISA 2018 was a computer-based assessment.

Seven provinces also participated in the financial literacy option (Newfoundland and Labrador, Prince Edward Island, Nova Scotia, New Brunswick, Ontario, Manitoba, and British Columbia). Results from the financial literacy and global competence components will be released at a later date.

As part of the assessment, students and their school principals also completed questionnaires that were designed to provide contextual information to aid in the interpretation of the performance results.

Seventy-nine countries participated in PISA 2018, including all 37 OECD countries. Typically, between 5,000 and 10,000 15-year-old students from at least 150 schools were tested in each country. In Canada, over 22,500 students from approximately 800 schools participated across the 10 provinces. The large Canadian sample was required to produce reliable estimates representative of each province and for both French- and English-language school systems in Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba, Alberta, and British Columbia. In Canada, PISA was administered in English and in French, depending on the school system in which students were enrolled.

Canadian Results of the OECD PISA 2018 Study

Highlights

Results in reading

Canada continues to perform well in reading, with 86 per cent of Canadian students reaching the baseline level of reading proficiency required to participate fully in modern society (Level 2), while almost one in six students reached Level 5 or 6.

Overall, Canadian 15-year-old students achieved a mean score of 520 in reading, which is 33 points over the OECD average. Globally, Canada ranked first (along with Estonia, Finland, Ireland, and Korea) among OECD countries and fourth among all participating countries in reading on average. Canada was outperformed by only three countries (B-S-J-Z (China), Singapore, and Macao (China)).

Canadian students achieved strong results in each of the three reading cognitive process subscales reported by PISA, as well as in the two text structure subscales. (See the text box "What is PISA?" above for definitions of the subscales.)

Equity in Canada

The gap that exists between students with the highest and those with the lowest levels of performance is an important indicator of the equity of education outcomes. For Canada overall, those in the highest decile scored 259 points higher in reading than those in the lowest decile, which is similar to the gap across OECD countries. At the provincial level, the smallest gaps (greater equity) are found in Quebec and Saskatchewan, while the largest gaps (less equity) can be observed in Prince Edward Island, New Brunswick, and British Columbia.

Comparison of provincial results in reading achievement

Across provinces, the percentage of Canadian students at or above the baseline level (Level 2) of performance in reading ranges from 78 per cent in New Brunswick to 88 per cent in Quebec and Alberta. At the higher end of the PISA reading scale, 15 per cent of Canadian students performed at Level 5 or above compared to 9 per cent performing at this level on average across OECD countries. At the provincial level, more than 10 per cent of students in Newfoundland and Labrador, Prince Edward Island, Nova Scotia, Quebec, Ontario, Alberta, and British Columbia achieved a proficiency level of 5 or higher in reading. At the lower end of the PISA scale, 14 per cent of Canadian students did not reach the baseline level in reading, compared to the OECD average of 23 per cent; however, more than 60 countries had a higher proportion of students performing below Level 2 compared to Canada.

With respect to achievement scores, students in Newfoundland and Labrador, Nova Scotia, Quebec, Ontario, and British Columbia had scores that were similar to the average for Canada overall. Students

in four provinces (Prince Edward Island, New Brunswick, Manitoba, and Saskatchewan) scored below the Canadian average; students in Alberta achieved a higher score than the Canadian average, placing them among the top-performing participants globally. All provinces performed above the OECD average with the exception of Prince Edward Island and New Brunswick, which scored at the OECD average. There was also variation across provinces on the cognitive process and text structure subscales. Alberta and Ontario students scored above the Canadian average on two or more of the subscales.

Results in mathematics and science

In PISA 2018, 84 per cent of Canadian students and 76 per cent of students in the OECD countries performed at or above Level 2 in mathematics, which the OECD defines as the baseline level of mathematical proficiency that is required to participate fully in modern society. In contrast, 16 per cent of Canadian students did not reach the baseline level in mathematics, compared to an average of 24 per cent across the OECD countries. At the higher end of the scale, in Canada, 15 per cent of students performed at Level 5 or above, compared to an average of 11 per cent across the OECD countries.

In science, 87 per cent of Canadian students and 78 per cent of students in the OECD countries performed at or above Level 2. In contrast, 13 per cent of Canadian students did not reach the baseline level in science, compared to 22 per cent of students on average across the OECD countries. At the higher end of the science achievement scale, 11 per cent of Canadian students performed at Level 5 or above, compared to an OECD average of 7 per cent.

On average, Canadian 15-year-olds performed well in mathematics and science. Canadian students had an average score of 512 in mathematics and 518 in science, well above the OECD average of 489 in both domains. Among the 79 countries that participated in PISA 2018, nine outperformed Canada in mathematics while five outperformed Canada in science. The table below shows the provinces that achieved scores at or above the Canadian average in mathematics and science. In all other provinces, scores were below the Canadian average.

Comparison of provincial achievement scores to the Canadian average in mathematics and science

	Above* the Canadian average	At the Canadian average
Mathematics		
	Quebec	Ontario, Alberta, British Columbia
Science		
	Alberta	Newfoundland and Labrador, Prince Edward Island, Nova Scotia, Quebec, Ontario, British Columbia

* Denotes significant difference

Achievement in reading by language of the school system

In Canada overall, similar proportions of students in francophone and anglophone schools (85 and 86 per cent, respectively) achieved Level 2 or above in reading. English-language school systems had a greater proportion of students attaining the highest levels of performance (Levels 5 and 6), in comparison to their French-language counterparts, while both systems had a similar proportion of students performing below Level 2.

Students in English-language schools achieved higher average scores in reading than those in French-language schools. Equity between the two language systems in overall reading scores was achieved only in Quebec.

The data reveal significant differences in achievement between anglophone and francophone school systems within the remaining six provinces where sample sizes permitted reliable estimates by language of the school system: students in English-language systems performed better than their counterparts in French-language systems, with differences ranging from 27 points in New Brunswick to 83 points in Nova Scotia.

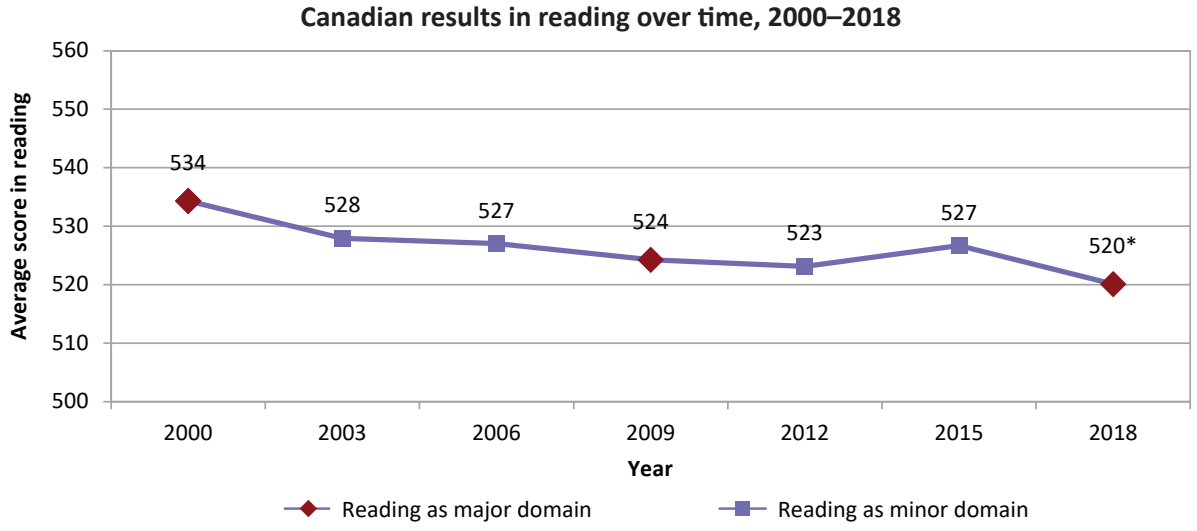
Achievement in reading by gender

As was the case in PISA 2009, the previous administration in which reading was the major domain of the assessment, girls performed significantly better than boys in PISA 2018. Eighty-two per cent of boys attained Level 2 or higher, compared with 90 per cent of girls. This type of disparity is consistent across most countries participating in PISA 2018 as well as across all Canadian provinces. A higher proportion of boys than girls achieved below Level 2 in Canada and all provinces. Moreover, a higher proportion of girls than boys were high performers in reading (Levels 5 and 6) in Canada overall and in all provinces with the exception of Newfoundland and Labrador, Prince Edward Island, and New Brunswick, where no statistically significant difference was observed.

On average across Canada, girls outperformed boys by 29 points on the PISA 2018 reading assessment. At the provincial level, the gender gap favouring girls ranged from 26 points in Newfoundland and Labrador, Ontario, and Manitoba, to 40 points in Nova Scotia. Both female and male students in Alberta scored above the respective Canadian averages in reading, while those in New Brunswick, Manitoba, and Saskatchewan scored below the Canadian averages. In all other provinces, both genders scored at the Canadian averages except in Nova Scotia, where boys scored below the Canadian average.

Changes in reading performance over time

PISA 2018 constitutes the seventh assessment of reading since 2000, when the first major assessment of reading took place. In Canada, as well as on average across the OECD countries, reading performance declined between 2000 and 2018. At the provincial level, no significant change in reading achievement was observed in Newfoundland and Labrador, Prince Edward Island, Nova Scotia, and Ontario between 2000 and 2018. However, a decline in reading performance was observed in all the remaining provinces between these two assessment years.



* Significant difference compared with baseline (2000)

In contrast to the decline between 2000 and 2018, reading performance remained unchanged in Canada and on average across the OECD countries between 2009 and 2018 (the last two times reading was the major domain). Provincially, no significant change in reading achievement was observed in any of the provinces between 2009 and 2018.

Another way to study trend results is to look at the change in the proportion of students at the various levels of achievement. At the Canadian level, the proportion of 15-year-old students who are low performers in reading increased between 2009 and 2018; this was also the case in Nova Scotia, New Brunswick, Ontario, and British Columbia. In contrast, the proportion of students achieving Levels 5 and 6 remained unchanged over the 2009 to 2018 period across Canada overall, while, at the provincial level, the proportion of high-performing students increased in Newfoundland and Labrador and Prince Edward Island.

Changes in mathematics and science performance over time

PISA 2018 is the sixth assessment of mathematics since 2003, when mathematics was the major domain for the first time, and the fifth assessment of science since 2006, when science was the major domain for the first time.

Between 2012 — the last time the major focus of PISA was mathematics — and 2018, mathematics performance did not change in Canada overall, although Saskatchewan and British Columbia observed significant declines in the average mathematics performance of their students. The proportions of top-performing (Level 5 or above) and low-performing (below Level 2) 15-year-olds in mathematics remained relatively stable over the period at the Canadian level. Provincially, New Brunswick and British Columbia observed an increase in the proportion of low-performing students, and Saskatchewan observed both an increase in the proportion of low-performing students and a decrease in the proportion of high-performing ones.

With respect to science, at the Canadian level and in Quebec and British Columbia, the average performance of students decreased between 2015 — the last time the major focus of PISA was science — and 2018. In Canada overall, the decrease in science performance was statistically significant, from 528 in 2015 to 518 in 2018. The proportion of students performing below Level 2 in science increased in Canada overall as well as in Prince Edward Island, Quebec, and British Columbia over the period, while no statistically significant differences were observed in Canada overall or in any provinces in the proportion of students performing at Levels 5 and 6.

Looking forward

The results of PISA 2018 reveal that, in Canada, a majority of students have attained the level of reading proficiency required to take advantage of further learning opportunities and to participate fully in modern society. Nevertheless, a persistent gender gap favouring girls continues to exist, and there are still numerous students who perform at lower levels of proficiency and for whom reading is a challenge.

Results from this assessment provide an opportunity to confirm the success of our world-class education systems from a global perspective. Canada remains in the group of top-performing countries and achieves its standing with relatively equitable outcomes. Nevertheless, the performance of Canadian students has remained relatively unchanged in reading and mathematics since the last time those domains were the major focus of PISA (2009 and 2012, respectively) and has declined in science (since 2015). At the same time, several provinces have observed an increase in the proportion of students not reaching the benchmark level established by the OECD (Level 2) in mathematics and science.

Further analysis of the information collected through PISA will help provide a better understanding of the extent to which important background variables not analyzed in the main report are related to the differences in performance highlighted here. Reports on such secondary analysis will be available in forthcoming issues of *Assessment Matters!*, a series of articles available on the CMEC website.

The next PISA assessment is planned for 2021, with mathematics as the major domain and a new and innovative assessment of creative thinking.

Further Canadian results are available in the report *Measuring up: Canadian Results of the OECD PISA 2018 Study — The Performance of Canadian 15-Year-Olds in Reading, Mathematics, and Science*.

This publication is available electronically without charge, at www.cmec.ca