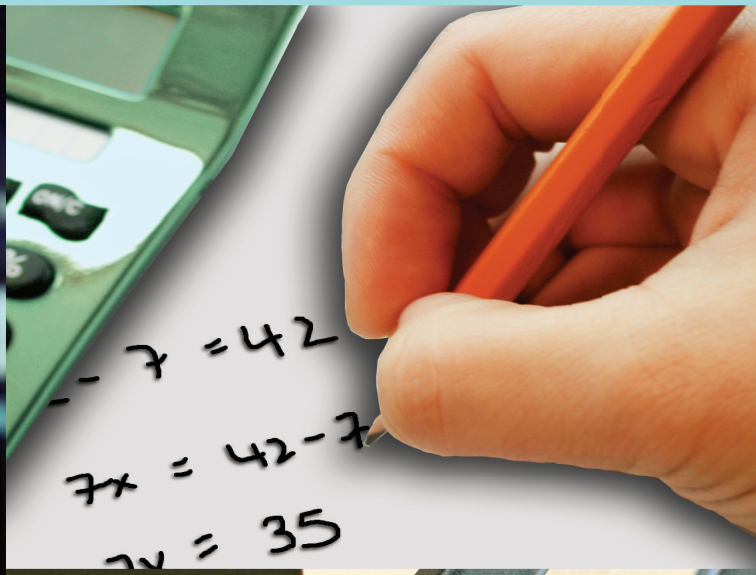
Pan-Canadian Assessment Program

PCAP 2013

Report on the Pan-Canadian Assessment of Science, Reading, and Mathematics



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Report on the Pan-Canadian Assessment of Science, Reading, and Mathematics

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

Through the CMEC Secretariat, the Council serves as the organization in which ministries and departments of education undertake cooperatively the activities, projects, and initiatives of particular interest to all jurisdictions.[1] One of the activities on which they cooperate is the development and implementation of pan-Canadian testing based on contemporary research and best practices in the assessment of student achievement in core subjects.

Note of appreciation

The Council of Ministers of Education (Canada) would like to thank the students, teachers, and administrators whose participation in the Pan-Canadian Assessment Program ensured its success. The quality of your commitment has made this study possible. We are truly grateful for your contribution to a pan-Canadian understanding of educational policy and practices in reading, mathematics, and science at the Grade 8/Secondary II[2] level.

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Ce rapport est également disponible en français.

[1] In this report, "ministry" includes "department," and "jurisdictions" includes participating "provinces" and "territories."
[2] PCAP is administered to students in Secondary II in Quebec and Grade 8 in the rest of Canada.

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1 WHAT IS THE PAN-CANADIAN ASSESSMENT PROGRAM?

The Pan-Canadian Assessment Program (PCAP) is the continuation of CMEC's commitment to inform Canadians about how well their education systems are meeting the needs of students and society. The information gained from this pan-Canadian assessment provides ministers of education with a basis for examining the curriculum and other aspects of their school systems.

School programs and curricula vary from jurisdiction to jurisdiction across the country, so comparing results from these programs is a complex task. However, young Canadians in different jurisdictions learn many similar skills in reading, mathematics, and science. PCAP has been designed to determine whether students across Canada reach similar levels of performance in these core disciplines at about the same age, and to complement existing jurisdictional assessments with comparative Canada-wide data on the achievement levels attained by Grade 8/Secondary II students across the country.

Goals

When the ministers of education began planning the development of PCAP in 2003, they set out the following goals for a conceptually new pan-Canadian assessment instrument designed to:

- inform educational policies to improve approaches to learning;
- focus on reading, mathematics, and science, with the possibility of including other domains as the need arises;
- reduce the testing burden on schools through a more streamlined administrative process;
- provide useful background information using complementary context questionnaires for students, teachers, and school administrators;
- enable jurisdictions to use both national and international results[3] to validate the results of their own assessment programs and to improve them.

Development of the assessment

In August 2003, a PCAP working group of experienced and knowledgeable representatives from several jurisdictions and including an external authority on measurement theory, large-scale assessment, and educational policy, began the development process. A concept paper was commissioned that would elaborate on issues of structure, development planning, operations, and reporting. Drawing on this concept paper, the working group defined PCAP as a testing program that would:

- be administered at regular intervals to students who are 13 years old at the start of the school year;

[3] PCAP 2013 results will be compared to three international studies. Unlike PCAP, these studies are not aligned with jurisdictional programs of study; however, the comparison is useful because the same subjects are assessed, which provides indirect information about the relative progress across grades and ages in performance. PISA is administered in all jurisdictions to the same cohort of students two years later in science, mathematics, and reading. Although fewer jurisdictions participate in TIMSS and PIRLS, TIMSS assesses Grade 8/Secondary II students in science and mathematics, and PIRLS assesses Grade 4 students in reading.

- be based on the commonality of all current jurisdictional curricular outcomes across Canada;
- assess reading, mathematics, and science;
- provide a major assessment of one domain, with a minor concentration on the two other domains;
- focus on reading as the major domain in the first administration in 2007, mathematics in 2010, and science in 2013.

As of 2010, it was determined that PCAP would be administered to Grade 8/Secondary II students, and, whenever possible, intact classes would be selected in order to minimize the disruption to classrooms and schools.

Table 1.1 provides CMEC's actual and proposed dates for administering PCAP to Canadian Grade 8/ Secondary II students.

TABLE 1.1 **Actual and proposed PCAP administrations**

Domain	Actual or proposed date of PCAP assessment					
	Spring 2007	Spring 2010	Spring 2013	Spring 2016	Spring 2019	Spring 2022
Major	Reading	Mathematics	Science	Reading	Mathematics	Science
Minor	Mathematics	Science	Reading	Mathematics	Science	Reading
Minor	Science	Reading	Mathematics	Science	Reading	Mathematics

For each subject area, a thorough review of curricula, current assessment practices, and research literature was then undertaken, and reports were written to indicate the common expectations among all jurisdictions.

The working groups for bilingual framework development, established for each of the three subject areas, were composed of representatives from several jurisdictions with knowledge and experience in curriculum and assessment for the particular subject. Each working group also had an external expert in the assessment of the particular subject to advise and assist with the development of a framework statement establishing the theory, design, and performance descriptors for each domain. The framework statements were reviewed and accepted by all participating jurisdictions as the basis for test-item development.

Bilingual teams for developing the test items were then established; members of these teams were subject-area educators selected from all jurisdictions, with a subject-assessment expert to supervise. Each subject framework provided a blueprint with its table of specifications describing the sub-domains of each subject area, the types and length of texts and questions, the range of difficulty, and the distribution of questions assessing each specific curriculum expectation.

Texts and questions were developed in both official languages and cross-translated. Items were reviewed by curriculum experts and teachers from different regions in Canada in both French and English to ensure equivalency in meaning and difficulty. Jurisdictions reviewed and confirmed the validity of the French to English and English to French translations to ensure fair and equitable testing in both languages.

All new items were reviewed by outside validators and further revised by members of the item-development team. These texts and items were then submitted to the framework-development working group to be examined in light of the blueprint, and field-test booklets were then put together. Booklets contained both selected-response and constructed-response items. Their range of difficulty was deemed accessible to Grade 8/Secondary II students, based on scenarios meaningful to the age group and reflecting Canadian values, culture, and content.

Field testing involved the administration of these temporary forms to a representative sample of students from an appropriate range of jurisdictions in both languages. Approximately 2,000 students in 100 schools across Canada were involved in the field testing. The tests were then scored by teams of educators from the jurisdictions. Following analysis of the data from the field test, each framework-development working group reviewed all items and selected the texts and items considered best, from a content and statistical viewpoint, to form four 90-minute booklets.

Design and development of contextual questionnaires

The accompanying questionnaires for students, teachers, and schools were designed to provide jurisdictions with contextual information that would contribute to the interpretation of the performance results. Such information could also be examined and used by researchers, policy-makers, and practitioners to help determine what factors influence learning outcomes.

A questionnaire-development group comprising educators and research experts from selected jurisdictions developed a framework to ensure that the questions asked of students, teachers, and school principals were consistent with predetermined theoretical constructs or important research questions. The group:

- reviewed models of questionnaire design found in the three large-scale assessment programs — the School Achievement Indicators Program (SAIP);[4] Trends in International Mathematics and Science Study (TIMSS); and the Programme for International Student Assessment (PISA);
- maximized research value by shaping the questionnaires around selected research issues for the major domain for each administration of the test.

For PCAP 2013, the questionnaires were adapted and expanded for science, which was the major domain.

Features of the administration of the PCAP 2013 Science Assessment

In the spring of 2013, the test was administered to a random sample of schools and Grade 8/ Secondary II classes (one per selected school) with a random assignment of booklets.

Sampling and participation

This assessment adopted the following stratified sampling process in the selection of participants:

1. the random selection of schools from each jurisdiction, drawn from a complete list of publicly funded schools[5] provided by the jurisdiction;

[4] SAIP was replaced by PCAP in 2007.
[5] The sample includes both public and private schools.

2. the random selection of Grade 8/Secondary II classes, drawn from a list of all eligible Grade 8/Secondary II classes within each school;
3. the selection of all students enrolled in the selected Grade 8/Secondary II class;
4. when intact Grade 8/Secondary II classes could not be selected, a random selection of Grade 8/Secondary II students.

The sampling process refers to the way in which students were selected to write the assessment. It is necessary to select a large enough number of participants to allow for adequate representation of the population's performance; the word "population" refers to all eligible students within a jurisdiction and/or a linguistic group.

In the case where numbers of students were smaller than the desired size, all schools and/or all Grade 8/Secondary II classes meeting the criteria within the jurisdiction were selected. This approach ensured an adequate number of participants to allow for reporting on their achievement as if all students within the jurisdiction had participated.

The sampling process resulted in a very large sample of approximately 32,000 Grade 8/Secondary II students participating in the assessment. All students answered questions in all three domains. Approximately 24,000 responded in English, and 8,000 in French.

Each school received the assessment handbook that outlined the purposes of the assessment, the organization and administration requirements, and suggestions to encourage the maximum possible participation. Administration documents included a common script to ensure that all students encountered the testing process in a similar manner, as well as guidelines for accommodating special-needs students. PCAP testing is intended to be as inclusive as possible in order to provide a complete picture of the range of performance for students in Grade 8/Secondary II. The students who were excused from participating were nevertheless recorded for statistical purposes; they included those with functional disabilities, intellectual disabilities, socioemotional conditions, or limited language proficiency in the target language of the assessment.

Participation rates

In large-scale assessments, participation rates are calculated in a variety of ways and are used to guide school administrators when determining whether the number of students who completed the assessment falls within the established norm set for all schools. In the case of PCAP, a formula for this purpose is provided to the test administrators, thereby assuring that all schools use the same guidelines and that the set minimum of participating students is uniformly applied. Using this formula, the PCAP student participation rate was over 85 per cent Canada-wide. For additional information concerning the student participation and sampling, refer to Appendix I, Tables I.1 to I.3.

Schools were encouraged to prepare and motivate students for the test, aiming for positive participation and engagement in the process by teachers, students, and parents. The materials provided included information pamphlets for parents and students, as well as the school handbook.

Schools were also asked to have the teacher questionnaire completed by all the science teachers of the participating students in the school, and the school questionnaire by the school principal. All questionnaires were linked to student results but used unique identifiers to preserve confidentiality.

Scoring the student response booklets

The scoring was conducted concurrently in both languages in one location over a three-week period. After all student booklets had been submitted from the jurisdictions, the booklets were then scrambled into bundles of 10 so that any single bundle contained booklets from several jurisdictions. The scoring-administration team, the table leaders, and the scorers themselves came from several jurisdictions. The whole scoring process included:

- a team of scorer leaders for each subject area with responsibility for reviewing all instruments and selecting exemplar and training papers to ensure comparability at every level;
- parallel training of both table leaders and scorers in each subject area;
- twice-daily rater-reliability checks in which all scorers marked the same student work in order to track the consistency of scoring on an immediate basis;
- double scoring in which approximately 300 of each of the four booklets were re-scored, providing an overall inter-rater reliability score; and
- re-scoring of anchor items in which approximately 300 of each item administered in a previous assessment were re-scored in order to track the consistency of scoring between test administrations.

Presentation of performance results

The results of student performance on the PCAP 2013 Science Assessment for Grade 8/Secondary II are presented in this report in two ways: as overall mean scores on the science assessment and as the percentage of students attaining performance levels.

Overall mean scores and relative rankings compared to the Canadian mean scores are useful indicators of the performance of education systems, but they do not provide much information about what students can actually do in science. PCAP developed useful benchmarks or performance levels that relate a range of scores to levels of knowledge and skills measured by the assessment. These performance levels provide an overall picture of students' accumulated proficiency at Grade 8/Secondary II.

In PCAP 2013, scientific literacy is expressed on a four-level scale, whereby tasks at the lower end of the scale (Level 1) are deemed easier and less complex than tasks at the higher end (Level 4), and this progression in task difficulty/complexity applies to both overall science and to each competency and sub-domain in the assessment.

A standard-setting exercise involving a group of educators from each jurisdiction set the "cut scores" for each level using the "bookmark" method (Lewis, Mitzel, Mercado, & Schultz, 2012); that is, determining the relative difficulty of the full set of assessment instruments and delineating the point along a scale that defines the achievement of each level of success, thus determining the "cut score." Once suitable cut scores were set, student performance within the range of cut scores could be refined. These refined descriptors of performance-level results more clearly indicated what students should know and be able to do at each level.

The achievement results in the minor subject domains (mathematics and reading) for all participating jurisdictions are reported as an overall mean score. Together, these domains constitute approximately one-third of the assessment. Because the students responded to a small subset of items for these two minor subject areas, their results by sub-domain or by performance level are not reported.

Reporting results by language

The results obtained from students educated in the French system of their respective jurisdictions are reported as French. The results obtained from students educated in the English system of their respective jurisdictions are reported as English. Results achieved by French immersion students who wrote in French[6] are calculated as part of the English results since these students are considered to be part of the English-language cohort. All students were expected to write for 90 minutes, with breaks deemed appropriate by the test administrator. If necessary, students were given an additional 30 minutes to complete the assessment. They then completed the context questionnaire at the back of their test booklet.

[6] Schools with French immersion students choose whether their students write the test in English or in French. All students in a class write the test in the same language.

The primary domain – science

A literature review of Canadian Grade 8/Secondary II science curricula conducted in preparation for PCAP (CMEC, 2005) clearly identifies scientific literacy as the goal of science education in all Canadian jurisdictions. For the purpose of this assessment, the *PCAP Science Assessment Framework*[7] defines scientific literacy as a student's evolving competencies in understanding the nature of science using science-related attitudes, skills, and knowledge to conduct inquiries, to solve problems, and to reason scientifically in order to understand and make evidence-based decisions about science-related issues.

The scope of this assessment is limited to those concepts and skills encountered and used in the courses of study of most Grade 8/Secondary II students in Canada. Although it is based on the programs taught to Canadian Grade 8/Secondary II students, this assessment is not a comprehensive assessment of all concepts and skills that a particular system expects students at this level to master. The purpose of this assessment is to provide the jurisdictions with data to inform educational policy. It is not designed to identify the strengths or weaknesses of individual students, schools, districts, or regions.

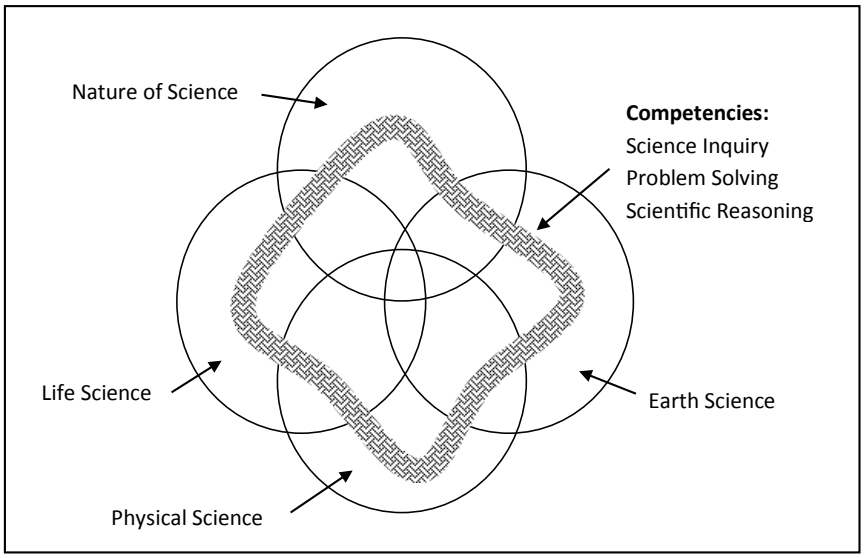
Assessment design

General design of the assessment

For PCAP assessment purposes, the domain of science is divided into three competencies (science inquiry, problem solving, and scientific reasoning); four sub-domains (nature of science, life science, physical science, and Earth science); and attitudes, within a given context. Since PCAP Science is an assessment of scientific literacy, each assessment item is coded to both a competency and a sub-domain. Attitude items are embedded within contexts.

The competencies are interwoven throughout the sub-domains of the science assessment because they encompass the means by which students respond to the demands of a particular challenge. It reflects the current Grade 8/Secondary II science curricula for students in Canadian jurisdictions,[8] as well as the foundation statements in the *Common Framework of Science Learning Outcomes, K to 12: Pan-Canadian Protocol for Collaboration on School Curriculum* (CMEC, 1997). The following diagram articulates the organization of PCAP Science as a major domain for assessment.

[7] http://www.cmec.ca/docs/pcap/pcap2013/Science-Framework-EN-April2013.pdf
[8] For updated science curricula, please visit official jurisdictional Web sites.



Each assessment unit has a context followed by a series of related items. The contexts chosen for assessment units are intended to captivate the interests of Canadian Grade 8/Secondary II students and, therefore, to increase their motivation to participate in writing the test. Contexts are introduced through an opening situation and could be in the form of a brief narrative and could include tables, charts, graphs, or diagrams. Developers of the assessment items ensured that the contexts were developmentally appropriate and not culturally or geographically dependent.

Any text assumes that students will have a degree of reading literacy. In PCAP Science, context selections are chosen to be at a level that would be accessible to the vast majority of Grade 8/ Secondary II students. This is determined in two ways. Bilingual committees of experienced educators review and validate the items at each stage of item development. Reading indices (Flesch-Kincaid for English texts, and Kandel and Moles for French texts) are used to determine the readability of each assessment unit. The vocabulary is consistent with the level of understanding that can be expected of Canadian students at this level.

Development of assessment booklets

For the PCAP Science assessment, each booklet is composed of eight to ten assessment units, which taken together span each of the competencies and sub-domains. Each unit comprises a scenario and from one to six items. The science units are organized into eight groups, or clusters. The eight clusters are distributed within four booklets so that each booklet contains two clusters of science items, one reading cluster, and one mathematics cluster. The four booklets are randomly and equally distributed to students within a single class. Thus, every student completes two of the eight clusters of science assessment items; however, all eight clusters are completed by students within a class. In addition, pairs of booklets contain sets or units of common items allowing for comparative measurements of student performance from one booklet to another. A sample booklet design is shown below.

TABLE 2.1 **Sample booklet design**

Cluster	Domain	Number of Units	Number of Items per Unit
1	Reading	3	2-3
2	Science	5	2-3
3	Mathematics	3	1-4
4	Science	5	2-5

Booklets are designed so that a student would need approximately 90 minutes to complete all of the items in any one booklet. The units contain selected-response items and constructed-response items. The number of items per cluster varied slightly, depending on the distribution of item types in the cluster. No cluster contains only one type of item.

Because many jurisdictions in Canada assess the performance of both French- and English-language populations, French and English versions of the assessment were developed simultaneously and are considered to be equivalent. In addition, by assuring adequate representative sampling of these groups, this assessment provides statistically valid information at the jurisdictional level and for each of these linguistic groups.

Task characteristics

Item format and item type

PCAP item developers selected item types that were most appropriate to what was asked. These include selected-response and constructed-response items. The test contains approximately 75 per cent selected-response and 25 per cent constructed-response items. Embedded attitude questions constitute approximately 5 per cent of the assessment.

Selected-response items

Selected-response items are those that present a number of responses from which the student must choose. They include multiple-choice, check boxes, true-or-false statements, and yes–no observations. All multiple-choice items consist of a stem statement with four choices, one of which is the correct answer and three of which are logical distractors.

Constructed-response items

Constructed-response items require students to provide a written response. Responses can range from short phrases or two to three sentences to several paragraphs in the case of extended constructed-response items. They may also ask the student to create tables or graphs, sketch diagrams, or design experiments. PCAP Science includes constructed-response items that are open-ended and measure higher-order cognitive skills and content knowledge.

The inclusion of constructed-response items also reflects good assessment practice in that different assessment formats are required, depending on what students are expected to demonstrate. Constructed-response items allow for partial credit, an important aspect when assessing process skills or for items requiring multiple steps.

Contextualized embedded attitude items

The vast majority of Canadian jurisdictions include the development of positive attitudes as an important component of science teaching and learning. This is mirrored in PCAP Science, which gathers data about students' attitudes using both contextualized embedded attitude items and a student questionnaire. Data about students' attitudes both in context (within the test) and out of context (within the questionnaire) provide information about whether attitudes vary between these two approaches and how this affects achievement. Hidi and Berndoff (1998) argue that situational interest can have an important effect on both cognitive and motivational functioning; however, investigations of its role remain "haphazard and scattered." By using both contextualized attitude items and a student questionnaire, PCAP Science could provide data to further this area of research.

PCAP Science contains sufficient attitude items to prepare a reliable scale; however, responses to the attitude items are not included in the overall score of scientific literacy. Nevertheless, they will provide an important component of profiling student scientific literacy.

What the assessment measures

Specific competencies and conceptual knowledge being assessed

Competencies

An understanding of science is important for young people to be able to participate in society and to recognize that science and technology affects their lives both in the present and in the future. Scientific literacy is developed when students are engaged in demonstrating the competencies of science inquiry, problem solving, and scientific reasoning. PCAP Science places a priority on being able to assess these competencies.

Science inquiry: Understanding how inquiries are conducted in science to provide evidence-based explanations of natural phenomena

Science inquiry requires students to address or develop questions about the nature of things, involving broad explorations as well as focused investigations (CMEC, 1997). It is from the perspective of the student in that they focus on the "why" and "how" of science.

The PCAP assessment of students' ability to use scientific practices provides evidence that they can:

- formulate hypotheses;
- make observations;
- design and conduct investigations;
- organize and communicate information;
- analyze and interpret data (e.g., using graphs and tables);
- apply the results of scientific investigations;
- select alternative conclusions in relation to the evidence presented;
- provide reasons for conclusions based on the evidence provided;

- identify assumptions made in reaching the conclusion.

Problem solving: Using scientific knowledge and skills to solve problems in social and environmental contexts

Problem solving requires students to seek answers to practical problems requiring the application of their science knowledge in new ways (CMEC, 1997). Students demonstrate this competency by applying their knowledge of science, their skills, and their understanding of the nature of science to solve science-related problems. Part of the process includes problem finding and problem shaping where problem is defined as the desire to reach a definite goal.

The PCAP assessment of students' ability to solve problems provides evidence that they can:

- define the problem;
- formulate questions;
- communicate the goals related to the problem;
- solve problems by recognizing scientific ideas;
- select appropriate solutions in relation to an identified problem;
- verify and interpret results (communicate, reflect);
- generalize solutions (recognize and apply science in contexts not typically thought of as scientific);
- provide reasons for the solution and how it meets the criteria to solve the problem;
- identify assumptions made in solving the problem;
- show an awareness of sustainable development and stewardship when addressing problems.

Scientific reasoning: Being able to reason scientifically and make connections by applying scientific knowledge and skills to make decisions and address issues involving science, technology, society, and the environment

Scientific reasoning involves a comparison, rationalization, or reasoning from the student in relation to an existing theory or frame of reference. Students demonstrate this competency by applying their knowledge of science, their skills, and their understanding of the nature of science to make informed, evidence-based decisions. They draw conclusions or make comparisons to an existing frame of reference or perspective. Students identify questions or issues and pursue science knowledge that will inform the question or issue.

The PCAP assessment of students' ability to reason scientifically provides evidence that they can:

- recognize patterns;
- develop plausible arguments;
- verify conclusions;
- judge the validity of arguments;
- construct valid arguments and explanations from evidence;

- connect scientific ideas and thereby build one on another to produce a coherent whole;
- use reasoning in order to make an informed decision for a particular issue in relation to the evidence;
- use reasoning in order to understand a science-related issue;
- provide reasons for the decision based on the evidence provided;
- identify assumptions and limitations of the chosen decision for that issue;
- develop and use models;
- show respect and support for evidence-based knowledge;
- display an interest in and an awareness of science-related issues.

For each competency, students are assessed on their understanding and ability to critique the practices and processes related to these competencies.

Sub-domains

The four sub-domains targeted by PCAP Science are aligned with pan-Canadian science curricula of all participating populations and with foundation statements for scientific literacy in Canada (CMEC, 1997). The four sub-domains are nature of science, life science, physical science, and Earth science.

Nature of science

PCAP defines the nature of science as involving an understanding of the nature of scientific knowledge and processes by which that knowledge develops. Science provides a way of thinking and learning about the biological and physical world based on observation, experimentation, and evidence. Science builds upon past discoveries. Theories and knowledge are continually tested, modified, and improved as new knowledge and theories supersede existing ones. Scientific debate on new observations and hypotheses is used to challenge, share, and evaluate data through peer interaction and dissemination of information through written publications and presentations. According to Fensham and Harlen (1999), by developing the abilities of students to relate evidence to conclusions and to distinguish opinion from evidence-based statements, science education promotes a deeper public understanding of science and an appreciation of evidence-based decision making, which is an important component of scientific literacy.

The PCAP assessment of students' understanding of the nature of science provides evidence that they can:

- understand the relationship among collecting evidence, finding relationships, and proposing explanations in the development of scientific knowledge;
- distinguish between processes and terminology that are scientific and those that are not;
- describe the processes of science inquiry and problem solving in evidence-based decision making;
- distinguish between qualitative and quantitative data;
- identify characteristics of measurement (e.g., replicability, variation, accuracy/precision in equipment and procedures);
- distinguish between various types of scientific explanations (e.g., hypothesis, theory, model, law);

- give examples of scientific principles that have resulted in the development of technologies;
- demonstrate scientific literacy with respect to nature of science issues.

The sub-domains of life science, physical science, and Earth science are assessed through the following descriptors:[9]

Life science

- Explain and compare processes that are responsible for the maintenance of an organism's life.
- Describe the characteristics and needs of living things.
- Distinguish between cells and cell components.
- Describe the function and interdependence of systems related to inputs and outputs of energy, nutrients, and waste.
- Demonstrate scientific literacy with respect to life science issues.

Physical science

- Describe the properties and components of matter and explain interactions between those components [e.g., states of matter (i.e., solids, liquids, and gases); properties and changes of matter; particle theory; mass and volume].
- Demonstrate scientific literacy with respect to physical science issues.

Earth science

- Explain how water is a resource for society.
- Explain patterns of change and their effects on water resources on Earth (e.g., water distribution; weather; weathering and erosion; effect of water on regional climates).
- Demonstrate scientific literacy with respect to Earth science issues.

Note: Although understanding the interrelationships between science and technology is an important part of developing scientific literacy, it must be emphasized and made clear that PCAP Science is not designed to assess the technological literacy of students writing this assessment.

Attitudes

Attitudes toward science determine students' interest in pursuing scientific careers (Osborne, Simon, & Collins, 2003). Since creation of new scientific knowledge is essential for economic growth, students' attitudes toward science are a subject of societal concern and debate in many countries (OECD, 2006).

To analyze students' attitudes, PCAP Science assesses:

- interest in and awareness of science-related issues;
- respect and support for evidence-based knowledge;
- awareness of sustainable development and stewardship.

[9] Please note that although these descriptors reflect the commonalities of pan-Canadian curricula, they are not intended to constitute an exhaustive list.

Table of specifications

A table of specifications is a guide for assessment that indicates the emphasis that is placed on the measurement of students' understandings within various learning domains, and it reflects the degree of curricular commonality among Canadian jurisdictions. Table 2.2 summarizes the percentages devoted to each competency and sub-domain in the assessment.

TABLE 2.2 **Percentages allocated to competencies and sub-domains in PCAP 2013 Science**

Competencies	
Science inquiry	34%
Problem solving	12%
Scientific reasoning	54%

Sub-domains	
Nature of science	34%
Life science	25%
Physical science	25%
Earth science	16%

Reporting the PCAP 2013 Science Assessment results

Reporting the overall results in science

Actual results of tests are called "raw scores." Initial analysis of raw scores involves the examination of the range of scores and the calculation of the "mean (average) score" obtained by the total population of participating Grade 8/Secondary II students.

When comparisons of scores obtained from different populations are to be made over time and on different versions of a test, it becomes necessary to develop a common way of reporting achievement scores that will allow for direct comparisons across populations and across tests. The common method used is to numerically convert the raw scores to "standard scale scores." In the case of PCAP 2013, the raw science scores are converted to a scale, which has a range of 0 to 1000, on which the average for the pan-Canadian population is set at 500, with a standard deviation of 100. From this conversion, the scores of two-thirds of all participating students fall within the range of 400 to 600 points, which represents a "statistically normal distribution" of scores. These derived "scale scores" are used to interpret more accurately the performance of students in each assessment and from one administration of the assessment to another. As well, the performance of the sample of students can be shown, within statistical limits, to be representative of the performance of the whole population of Grade 8/Secondary II students in Canada. Once the set of scale scores has been established for the pan-Canadian population, then accurate comparisons can be made between pan-Canadian and jurisdictional achievement results.

Reporting on competencies and sub-domains in science

The mean scale scores for each competency and sub-domain are calculated using the same methodology as that used for the science overall scale score with a mean of 500 and a standard deviation of 100.

Reporting on levels of performance in science

In addition to the reporting of mean scale scores, the results for each jurisdiction are referenced to the levels of achievement using a performance scale. The performance levels represent how jurisdictional performances measure up to the expected level of achievement based on the ability of the student and on the degree of difficulty of the items. This is done by a statistical determination based on the collective performance of the students on the assessment and is accomplished through standard setting in which the "cut scores" for each level are determined.

The four levels of performance as determined by the cut scores are summarized in Table 2.3. Examples of PCAP questions and sample student responses are found in Chapter 4.

TABLE 2.3 **PCAP 2013 science performance levels – summary description**

Level 4 (Scores of 655 and above)
Students at performance level 4 communicate an understanding of complex and abstract concepts in science. They can identify the scientific components of many complex life situations; apply both scientific concepts and knowledge about science to these situations; and can compare, select, and evaluate appropriate scientific evidence for responding to life situations. Students at this level can use well-developed inquiry abilities, link knowledge appropriately, and bring critical insights to these situations. They can construct evidence-based explanations and arguments based on their critical analysis. They can combine information from several sources to solve problems and draw conclusions, and can provide written explanations to communicate scientific knowledge.
Level 3 – Above Expected Level (Scores between 516 and 654)
Students at performance level 3 demonstrate understanding of concepts related to science principles. They demonstrate some science inquiry skills, and combine and interpret information from various types of diagrams, graphs, and tables; select relevant information, analyze, and draw conclusions; and provide explanations conveying scientific knowledge. At this level, students can work effectively with situations and issues that may involve explicit phenomena requiring them to make inferences about the role of science. They can select and integrate explanations from different disciplines of science and link those explanations directly to aspects of life situations. Students at this level can reflect on their actions, and they can communicate decisions using scientific knowledge and evidence.
Level 2 – At Expected Level (Scores between 379 and 515)
Students at performance level 2 recognize and apply their understanding of basic scientific knowledge in various contexts. They interpret information from tables, graphs, and pictorial diagrams; draw conclusions; and communicate their understanding through brief descriptive responses. At this level, students can identify clearly described scientific issues in a range of contexts. They can select facts and knowledge to explain phenomena and apply simple models or inquiry strategies. They can interpret and use scientific concepts from different disciplines and can apply them directly. They can also develop short communications using facts and make decisions based on scientific knowledge.
Level 1 – Below Expected Level (Scores of 378 and less)
Students at performance level 1 may recognize some basic science facts and may be able to interpret simple pictorial diagrams, complete simple tables, and apply basic knowledge to practical situations. At this level, they may be able to provide possible explanations in familiar contexts or draw conclusions based on simple investigations. They may be capable of direct reasoning and making literal interpretations of the results of scientific inquiry.

For the purpose of this assessment, a student is considered to be at a particular performance level when he or she is able to achieve a score that is at or above the cut score for the level. In order to demonstrate the defined characteristics of a particular level, students are required to have at least a two-third chance of achieving correct responses or partial credit for items at that level. Based on curriculum expectations in science across Canada, Grade 8/Secondary II students should be at level 2 or above. Students achieving at level 1 or lower are below that expected of students in their grade.

3 PAN-CANADIAN RESULTS IN SCIENCE

This chapter presents the PCAP 2013 achievement results in science for all participating jurisdictions in Canada. First, the overall results of Grade 8/Secondary II students in participating jurisdictions will be compared to the Canadian mean. The results in the jurisdictions will be presented by language for those provinces that sampled students in the English and French school systems separately in sufficient numbers for a valid statistical comparison. Next, the science performance of boys and girls across jurisdictions will be reported. The overall results for the four sub-domains in science will be described: nature of science, life science, physical science, and Earth science. Finally, the overall results for the three competencies in science will be described: science inquiry, problem solving, and scientific reasoning. Competency and sub-domain results will be reported by jurisdiction, language, and gender.

The PCAP 2013 mean scores are reported on the PCAP scale, which has a range of 0–1000. The Canadian mean is set at 500 with a standard deviation of 100. This means that for Canada overall, two-thirds of the students score between 400 and 600. A weighting is applied for each population when calculating the Canadian mean. This mean can then be used as a reference point that allows the comparison of Canada-wide results.

It may be misleading to compare and rank the students' performance based on the mean scores only. When comparing results, it is important to take into account the error of measurement and sampling error associated with each mean score. This will determine whether differences in the mean scores are statistically significant (additional information is provided below).

Terminology used in the charts and tables

Differences

In this report, the terms "difference" or "different" used in the context of achievement results refer to a difference in a technical sense. They refer to a **statistically significant difference.** A difference is statistically different when there is no overlap of **confidence intervals (CI)** between different measurements. In this report, if there is a significant difference between two mean scores with their confidence intervals, this difference is indicated using bold font and/or an asterisk (*).

Confidence intervals

In this assessment, the reported mean scores provide estimates of the achievement results students would have demonstrated if all students in the population had participated in the assessment. In addition, a degree of error is associated with the scores describing student skills. 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, it is common practice to provide a range of scores for each jurisdiction within which the actual achievement level might fall. This range of scores expressed for each mean 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 mean score should fall 95 per cent of the time.

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 drawn from the same student population.

In the charts in this report, confidence intervals are represented by the following symbol:  . If the confidence intervals overlap, typically the differences are defined as not **statistically significant**. When the confidence intervals overlap slightly, an additional test of significance (t-test) is conducted in order to determine whether the difference is statistically significant. For comparisons between pan-Canadian and jurisdictional results, the Bonferroni adjusted t-test was performed. This correction is used to reduce the rate of false positive (or type 1) errors.

Finally, when comparing results over time, the standard error includes a linking error to account for the fact that different cohorts of students have been tested over time with a test that also varied slightly over time.

Comparisons between results for English and French

Caution is advised when comparing achievement results, even though assessment instruments were prepared collaboratively with due regard for equity for students in both language groups. Every language has unique features that are not readily comparable. While the science items, performance descriptors, scoring guides, and processes were judged equivalent in English and French, pedagogical, cultural, and geographical differences related to differences in language structure and use render direct comparisons between language groups inherently difficult, and any such comparisons should be made with caution.

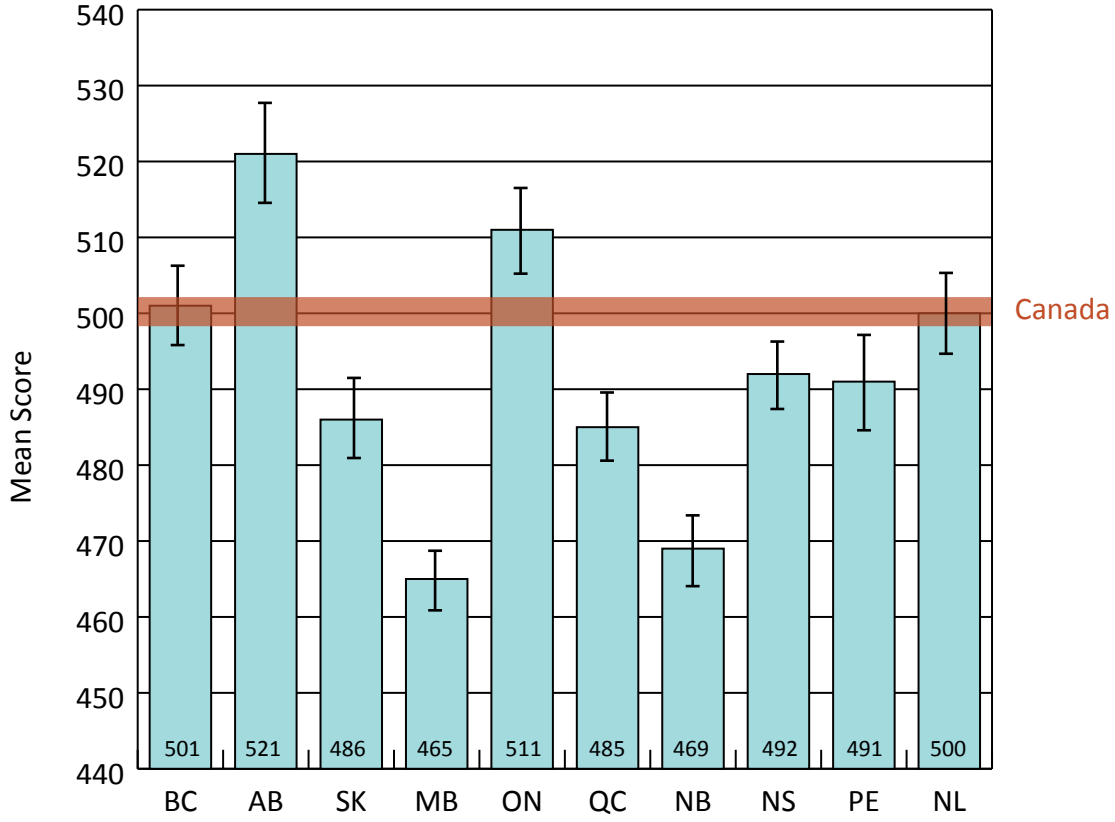
Pan-Canadian results in science for participating jurisdictions

Results in science by jurisdiction

The following chart provides the mean scores in science for jurisdictions participating in the PCAP 2013 Science Assessment for Grade 8/Secondary II. Throughout this report, jurisdictions are listed from west to east.

Jurisdictions can be grouped into three clusters with respect to achievement in science: below the Canadian mean score, at the Canadian mean score, and above the Canadian mean score. Alberta and Ontario are within the cluster with the highest achievement, with average scores above the Canadian mean. Students in British Columbia and Newfoundland and Labrador achieve statistically similar results that are the same as the Canadian mean. Grade 8/Secondary II students in Saskatchewan, Manitoba, Quebec, New Brunswick, Nova Scotia, and Prince Edward Island achieve results with scores below the Canadian mean score.

CHART 3.1 **Results in science by jurisdiction**



Results in science by language

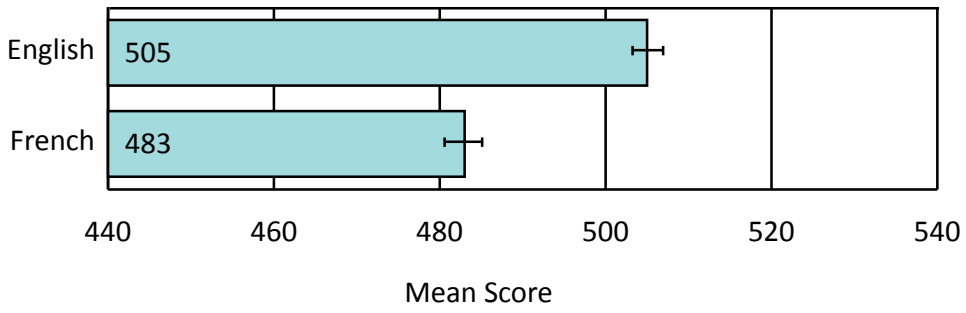
The inclusion of Section 23, "Minority Language Educational Rights," in the Canadian Charter of Rights and Freedoms of the Constitution Act, 1982, gave language education rights to those living in minority language settings in Canada. This guarantees French minority language education rights to French-speaking communities in English-speaking areas (primarily outside of Quebec), and guarantees English minority language education rights to English-speaking communities in French-speaking areas. Today, the Fédération nationale des conseils scolaires francophones (FNCSF) includes 29 school districts throughout Canada, except in Quebec. Nine school districts serve the English-speaking population in several regions of Quebec. Moreover, all ministries and departments of education in Canada have, within their structure, an administrative unit in charge of educational services for official-language minorities.

Samples in PCAP are selected that are representative of both majority and minority official language groups in eight jurisdictions that have sufficient numbers for valid statistical comparisons. Owing to the small sample size, results for students enrolled in French-language schools in Prince Edward Island and Newfoundland and Labrador are not indicated in these results; however, they are included in the calculations for the overall mean score in those jurisdictions. Although the Saskatchewan francophone sample is also very small with 97 students, it represents 85 per cent of the Saskatchewan Grade 8 francophone population.

PCAP results are weighted based on population size. While larger jurisdictions have a higher weight, the lower scores tend to occur in the smaller jurisdictions. This has a particular impact on Ontario English and Quebec French because those populations contribute such a large amount to the Canadian English and French mean scores that their results are more likely than any other populations to be close to those averages.

Chart 3.2 presents the science performance for students enrolled in the English- and French-language school systems. Overall, students enrolled in English-language schools are performing at a level that is statistically higher than those enrolled in French-language schools.

Chart 3.2 **Results in science by language of the school system**



The performance results of students enrolled in English- and French-language school systems are also examined by jurisdiction. Tables 3.1 and 3.2 presents the comparison of the jurisdiction results to the Canadian mean for the two language systems. There are four jurisdictions in which the trend is consistent for both school systems. In Saskatchewan, Manitoba, New Brunswick, and Nova Scotia, students in both English- and French-language school systems achieve below the Canadian mean.

TABLE 3.1 **Achievement in science in English-language school systems by jurisdiction**

Above the Canadian English Mean	At the Canadian English Mean 505 ± 2.3	Below the Canadian English Mean
Alberta, Ontario	British Columbia, Newfoundland and Labrador	Saskatchewan, Manitoba, Quebec, New Brunswick, Nova Scotia, Prince Edward Island

TABLE 3.2 **Achievement in science in French-language school systems by jurisdiction**

Above the Canadian French Mean	At the Canadian French Mean 483 ± 2.6	Below the Canadian French Mean
British Columbia	Alberta, Quebec	Saskatchewan, Manitoba, Ontario, New Brunswick, Nova Scotia

The performance results of students enrolled in English- and French-language school systems is examined within jurisdictions and the results are shown in Table 3.3. In British Columbia, Quebec, and New Brunswick, there is no significant difference in student performance between the English- and French-language school systems. Other jurisdictions show a significant difference between the two systems with a clear pattern in the difference in science results: students in the English-language school system outperform those enrolled in the French-language school system. The differences for these jurisdictions range from 12 points in Saskatchewan and Manitoba to 49 points in Ontario.

TABLE 3.3 **Achievement in science by jurisdiction and by language of the school system**

	Anglophone school system		Francophone school system		Difference
	Mean	CI	Mean	CI	
BC	501	4.3	495	7.8	6
AB	521	4.2	488	4.9	33*
SK	486	4.5	474	1.6	12*
MB	465	3.5	453	3.6	12*
ON	513	5.1	464	4.0	49*
QC	484	5.0	485	3.7	1
NB	467	3.7	475	5.1	8
NS	493	4.2	466	3.8	27*
PE	492	5.2	--	--	--
NL	500	4.8	--	--	--
CAN	**505**	**2.5**	**483**	**3.0**	**22***

*statistically significant difference[10]

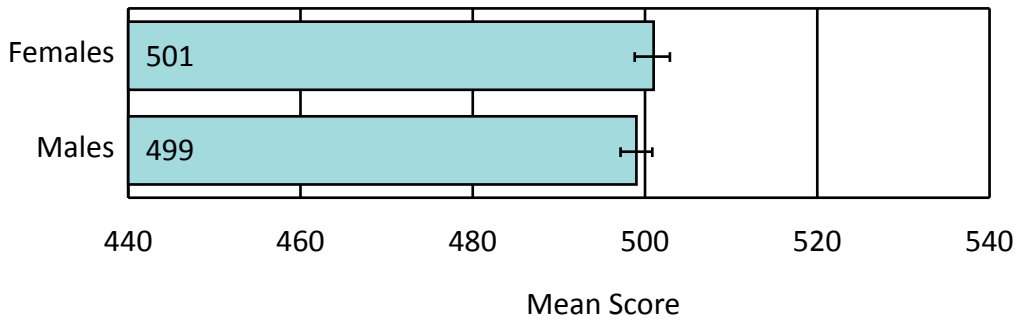
[10] Results are significantly different when there is no overlap when comparing the mean plus or minus the confidence interval (Mean ± CI) between two populations.

Results in science by gender

Policy makers have an interest in reducing gender disparities in education. Student motivation and interest in school can have a significant impact on their later career choices and salary prospects. Most international studies on science, technology, engineering, and mathematics (STEM) education have found that interest in science tends to decrease with age (OECD, 2013). Common explanations focus on how classes are taught, often citing the shift from hands-on learning at the elementary level to more rote memorization in high school, which is less engaging and meaningful to students. A number of studies have shown that girls believe they have to work harder at science than boys, and prefer to avoid it in favour of reading and language arts (Lupart et al., 2004; Andre et al., 1999; Ford et al., 2006). Girls exhibit steeper and more sustained decreases in interest in science than boys from elementary to middle and high school (Greenfield, 1997; Lupart et al., 2004). As a result, they do not find scientific careers attractive, and science remains a male-dominated field (Eccles, 2007; Ceci, Williams, & Barnett, 2009; Lupart et al., 2004; Stake, 2006). According to data from the Natural Sciences and Engineering Research Council of Canada (NSERC, 2010), although women make up approximately 37 per cent of undergraduate students in natural science and engineering (NSE) in Canada, the percentage of students going on to university who are selecting NSE fields for both sexes is declining. It is important that policy makers continue to have an interest in reducing gender disparities in education in order to ensure Canada's ability to fully participate in the global knowledge economy.

Performance in science in Grade 8/Secondary II is remarkably similar between boys and girls both overall in Canada as shown in Chart 3.3 and within jurisdictions (see Appendix II, Table II.3). This is similar to the results from international studies such as PISA (Brochu, Deussing, Houme, & Chuy, 2013) and TIMSS (Martin, Mullis, Foy, & Stanco, 2012). Jurisdictions that have concerns regarding a gap in results between girls and boys in reading and mathematics can look to science as an area of gender equality.

CHART 3.3 **Results in science by gender**



Pan-Canadian results in science by sub-domain

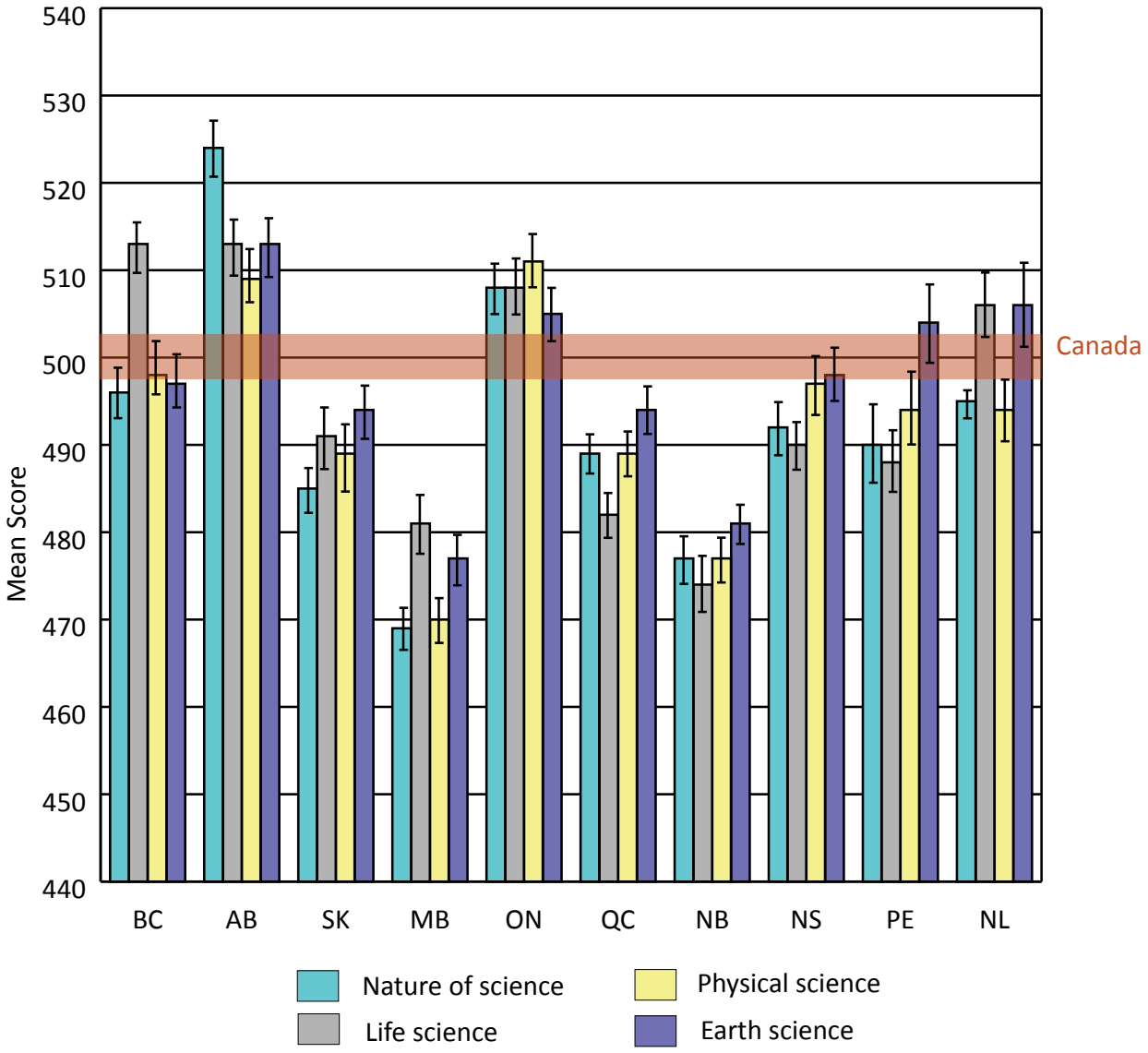
The four sub-domains targeted by PCAP Science are aligned to the common elements of pan-Canadian science curricula.[11] The sub-domains and the percentage of the science assessment attributed to each one are nature of science (34 per cent), life science (25 per cent), physical science (25 per cent), and Earth science (16 per cent). These are described in more detail in Chapter 2.

Results by sub-domain, by jurisdiction

The overall results for the sub-domains in PCAP Science are reported as scale scores. The Canadian mean is set at 500 with a standard deviation of 100. As shown in Chart 3.4, there are few significant differences in achievement among the four sub-domains in science within jurisdictions. The only province in which students achieve significantly above the Canadian mean in all four sub-domains is Alberta. When achievement among the four sub-domains is examined within each province, a pattern of higher achievement can be seen in life science for British Columbia students, nature of science for Alberta students, Earth science for Prince Edward Island students, and both life science and Earth science for Manitoba and Newfoundland and Labrador students. More detailed information about differences among sub-domains can be found in the jurisdictional reports in Chapter 7 and in Appendix II, Tables II.7, II.10, II.13, and II.16.

[11] For updated science curricula, please visit official jurisdictional Web sites.

CHART 3.4 **Results by sub-domain in science by jurisdiction**



Results by sub-domain, by language

In Canada overall, the English-language school system has significantly higher achievement than the French-language school system for each of the four sub-domains as shown in Table 3.4 (see Appendix II, Tables II.8, II.11, II.14, and II.17). The largest gap between the two school systems is found in life science and the smallest gap, in Earth science.

TABLE 3.4 **Results by sub-domain in science by language of the school system**

	Nature of science		Life science		Physical science		Earth science	
	Mean	CI	Mean	CI	Mean	CI	Mean	CI
English	504	2.2	506	2.6	504	2.3	502	2.5
French	487	2.6	481	3.0	488	3.3	492	2.4
Difference	**17***		**25***		**16***		**10***	

Results by sub-domain, by gender

There are very few achievement differences between boys and girls across sub-domains in science either in Canada overall or at the jurisdictional level (see Table 3.5 and Appendix II, Tables II.9, II.12, II.15, and II.18). These results differ from the TIMSS survey in which boys had significantly higher achievement in Earth science in Alberta and Quebec (Martin et al., 2012); however, TIMSS does assess a larger number of Earth science topics, which are not all common to pan-Canadian curricula.

TABLE 3.5 **Results by sub-domain in science by gender**

	Nature of science		Life science		Physical science		Earth science	
	Mean	CI	Mean	CI	Mean	CI	Mean	CI
Females	501	2.7	501	2.5	499	2.5	501	3.3
Males	499	2.8	499	2.1	501	2.4	500	2.9
Difference	2		2		2		1	

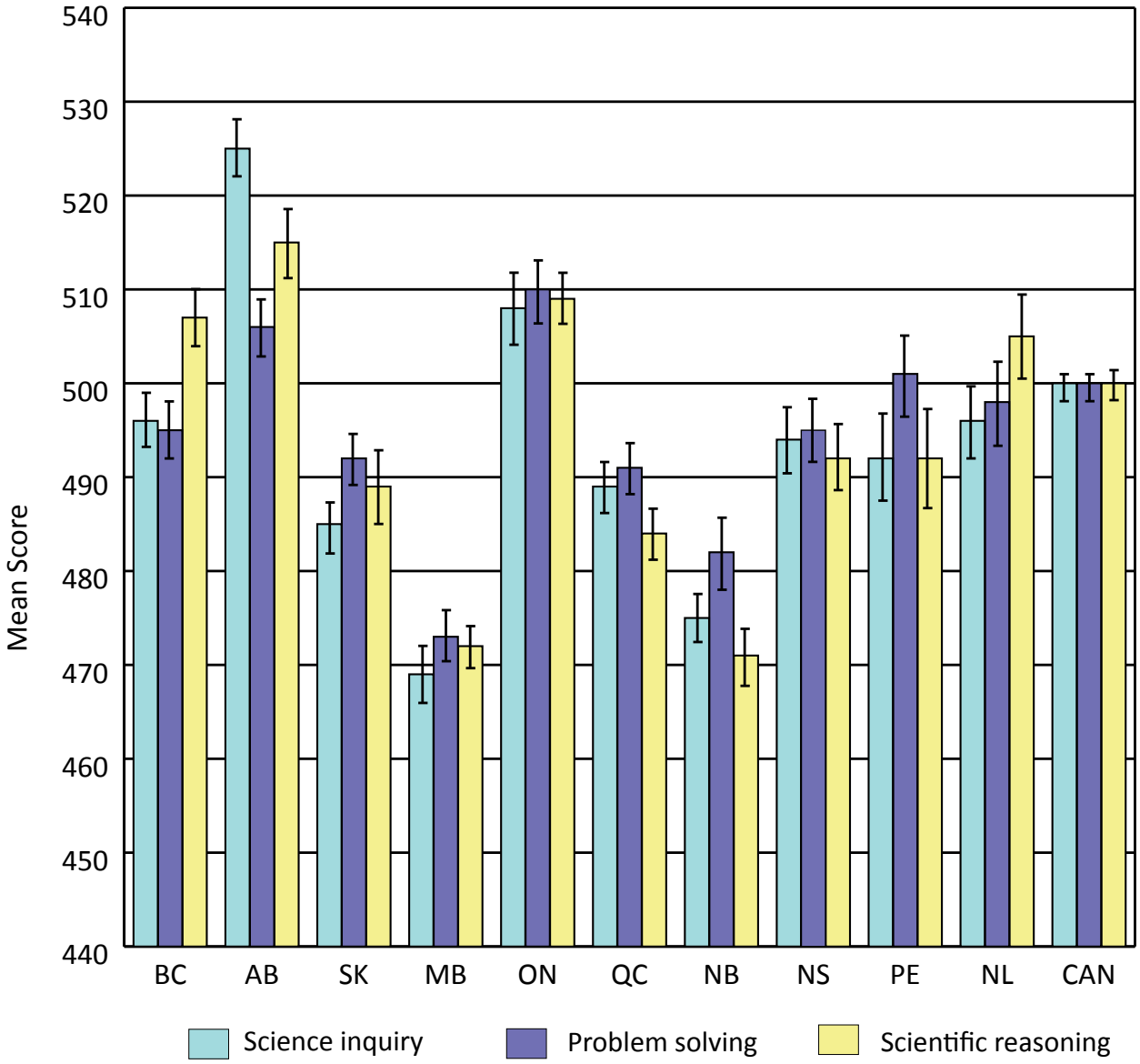
Pan-Canadian results in science by competency

Scientific literacy is a continually evolving process and is part of being a lifelong learner. The PCAP definition of scientific literacy recognizes that students continue to evolve and develop competencies as they move from grade to grade and mature into adulthood. The term "competency" is used to articulate the importance of students being able to identify questions or issues that can be addressed with science knowledge or approaches; to seek answers to practical problems requiring the application of their science knowledge in new ways; and to reason scientifically when making decisions based on an understanding of the relationships among science, technology, society, and the environment when engaging with science-related issues. A detailed description of the three competencies is found in Chapter 2.

Results by competency, by jurisdiction

The overall results for the three competencies in PCAP Science are also reported as scale scores with the Canadian mean set at 500 and a standard deviation of 100. As shown in Chart 3.5, there are few significant differences in achievement among the three competencies in science within jurisdictions. In British Columbia, students have higher achievement in scientific reasoning than the other two competencies, and Alberta students achieve higher scores in both science inquiry and scientific reasoning. More detailed information about differences among competencies can be found in the jurisdictional reports in Chapter 7 and in Appendix II, Tables II.19, II.22, and II.25.

Chart 3.5 **Results by competency in science by jurisdiction**



Results by competency, by language

In Canada overall, the English-language school system has significantly higher achievement than the French-language school system for each of the three competencies. As shown in Table 3.6, the largest difference between the two school systems is found in scientific reasoning. Although English-language schools achieve significantly higher scores in problem solving in science in this assessment, the opposite trend was shown in problem solving in mathematics in PCAP 2010 (CMEC, 2011) with higher achievement in French-language schools.

TABLE 3.6 **Results by competency in science by language**

	Science inquiry		Problem solving		Scientific reasoning	
	Mean	**CI**	**Mean**	**CI**	**Mean**	**CI**
English	504	2.0	503	2.1	505	1.9
French	487	2.8	490	3.2	482	2.7
Difference	**17***		**13***		**23***	

Results by competency, by gender

There are achievement differences between boys and girls across the three competencies in science. Girls achieve significantly higher results in science inquiry overall in Canada as shown in Table 3.7.

TABLE 3.7 **Results by competency in science by gender**

	Science inquiry		Problem solving		Scientific reasoning	
	Mean	**CI**	**Mean**	**CI**	**Mean**	**CI**
Females	503	2.6	499	3.0	499	2.5
Males	497	3.3	501	2.4	501	2.7
Difference	**6***		2		2	

Summary

In this chapter, achievement in science is examined overall, and by language and gender. The results are analyzed first by overall science and then by the four science sub-domains (nature of science, life science, physical science, and Earth science) and the three competencies (science inquiry, problem solving, and scientific reasoning).

There are differences in achievement among jurisdictions. The comparative approach taken in this chapter does not lend itself to developing explanations for these differences. Secondary analysis undertaken as part of the forthcoming report, *PCAP 2013 Contextual Report on Student Achievement in Science*, will explore how resources and school and classroom conditions, as well as student characteristics and family circumstances, may impact achievement in Grade 8/Secondary II students.

4 ACHIEVEMENT BY PERFORMANCE LEVEL IN SCIENCE

Pan-Canadian results by levels of performance in science

PCAP summarizes achievement in order to provide an overall picture of students' accumulated understanding of science by the end of their eighth year of formal schooling. Results are determined in terms of the percentage of students at each of four levels of performance, a general description of which is given in Chapter 2. This chapter first describes the knowledge and abilities that characterize the achievement of students at each of the performance levels broken down by competency and sub-domain. Next, sample test questions are presented to place assessment items within the context of descriptions of the performance levels. Finally, the results for these performance levels are reported, first by jurisdiction and then by language and gender.

Descriptions of the knowledge and skills that characterize each of the four levels of performance in science are given in the next four tables. It is assumed that students classified at a given performance level can perform most of the tasks at that level as well as those at the lower levels. The performance levels were established using the Bookmark standard setting method (Lewis et al., 2012).

TABLE 4.1 **Knowledge and skills characteristic of achievement at level 4**

Level 4 – Scores of 655 and above			
Competencies Students at this level demonstrate advanced science inquiry skills. They understand the need for variables holistically and can design novel experiments to verify or validate information, and also evaluate and modify procedures to improve experiments. They understand the need for precise measurements in science and apply knowledge in complex and novel situations. When solving problems, students at this level can identify assumptions and use their knowledge and experience of science to propose solutions and communicate their reasoning. They can formulate an argument to defend their point of view on environmental or societal issues.			
Sub-domains			
Nature of science	**Life science**	**Physical science**	**Earth science**
Students understand the characteristics of measurements and the various types of scientific explanations. They interpret scientific experiments with regard to variables and design of scientifically valid tests, and they can draw valid conclusions. They can interpret data using multiple sources of information, which can include graphs, tables, and text. Students can design good experiments and select equipment for precise measurements.	Students can interpret information to explain science or natural phenomena and communicate their reasoning. They can identify the characteristics of living things; they understand the role of organisms in the environment and that chemicals are transformed by organisms into usable substances that support life.	Students demonstrate an understanding of states of matter and physical changes. They understand the impact of changes of state on the environment and can use this knowledge to design experiments.	Students understand climate in a global context in relation to science, technology, and society, and they can describe environmental impacts related to water resources and climate issues. They can also organize information and identify data patterns in order to support an argument on environmental issues.

TABLE 4.2 **Knowledge and skills characteristic of achievement at level 3**

Level 3 – Scores between 516 and 654			
Competencies In an experimental context, students demonstrate evidence-based decision making and can draw from multiple sources of information when making decisions. They can evaluate hypotheses, identify trends, and draw conclusions from observations and data. They demonstrate a holistic understanding of a scientifically valid test and the need for variables in science. Students at this level can identify a solution to a problem in a given context and relevant assumptions required to make predictions. They can generate a solution to a problem using two or more types of information and then communicate their reasoning. Also, they can formulate an argument to defend their point of view on environmental or societal issues.			
Sub-domains			
Nature of science	**Life science**	**Physical science**	**Earth science**
Students demonstrate solid science inquiry skills and show understanding for the requirements of accuracy and replicability in science. They understand characteristics of measurements and various types of scientific explanations. They can evaluate investigations and demonstrate an understanding of the role of variables.	Students can interpret information to explain science or natural phenomena and communicate their reasoning. They can compare and contrast types of cells and their components, and they understand the interaction between the basic needs of an organism and its habitat. In familiar contexts related to health, they can select information that supports an argument.	Student can interpret evidence, identify trends, and draw conclusions based on solution experiments. They can analyze experimental evidence and communicate their understanding using multiple modes of representations including graphs and tables. They have some understanding of how to choose equipment for experiments that would ensure precise measurements of solids and liquids. They understand the physical changes that occur during phase changes.	Students can evaluate environmental impacts of climate in relation to water resources. They can organize information and identify data patterns in order to support an argument on environmental issues.

TABLE 4.3 **Knowledge and skills characteristic of achievement at level 2**

Level 2 – Scores between 379 and 515			
Competencies At this performance level, students can identify good inquiry practices and have basic science skills. In a simple experiment in a familiar context, they can formulate a hypothesis, identify a suitable way to test a hypothesis, make a prediction, and draw direct conclusions from given evidence. They can evaluate the validity of a source of information and use it as evidence to support given statements or draw simple conclusions. At this level, students can select and apply a simple problem-solving strategy and make decisions based on their scientific knowledge. They can make connections using scientific knowledge in an everyday environment using more than one source of data.			
Sub-domains			
Nature of science	**Life science**	**Physical science**	**Earth science**
Students can draw simple conclusions based on observations or contextualized information including pictorial diagrams and data tables. They understand what is required for a scientifically valid test and can identify measurable variables. They can differentiate between scientific and non-scientific information and select appropriate methods to communicate evidence from experiments.	Students recognize characteristics and components of plant and animal cells, and they understand the interaction between the components of air and living organisms. In experiments, they can identify a good hypothesis and select the experimental design that would test a given hypothesis. Students at this level have some knowledge of the role of bacteria in contexts related to health.	Students apply knowledge of properties of matter in given contexts. They can identify states of matter and relate changes in state to the particle theory of matter. Students have knowledge of renewable and non-renewable energy sources and their application.	Students recognize patterns and changes related to weather and water, such as how weather and weather patterns affect the physical environment both locally and globally. They can interpret graphs and draw conclusions related to weather. They understand erosion and can apply a scientific approach to interpret erosion experiments.

TABLE 4.4 **Knowledge and skills characteristic of achievement at level 1**

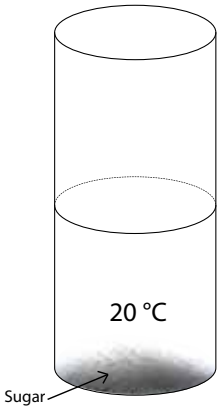
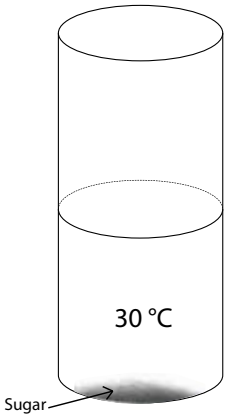
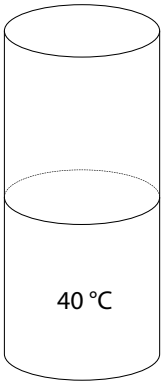
Level 1– Scores of 378 and less			
Competencies In science inquiry, students can recognize some valid scientific procedures such as replicability, the importance of taking measurements, and careful observations. Given one source of information, they can use direct reasoning to interpret simple diagrams, graphs, and tables. Students at this level can provide simple explanations or literal interpretations in familiar contexts, such as the impact of water on land forms. They can also identify questions that could be answered using scientific experiments.			
Sub-domains			
Nature of science	**Life science**	**Physical science**	**Earth science**
Students at this level can identify direct relationships when given data in simple formats and make observations from diagrams. They recognize that there are scientific and non-scientific sources of information. Students can make literal interpretations of the results, and they can draw conclusions based on simple investigations.	Students can identify that relationships between organisms can be both good and bad when given explicit contexts. They can differentiate between living and nonliving things and recognize some of the basic requirements for life.	Students recognize some basic information about matter and understand that energy can be transferred between objects in an everyday context. In a familiar context, they recognize that temperature has an effect on the movement of particles and on the states of matter. They can use direct reasoning to offer simple explanations related to familiar contexts such as sports equipment.	Students understand the role of water in their everyday lives and recognize that changes in global temperature can have an impact on water supplies.

An example of a PCAP Science unit is included to show the types of knowledge or skills that are accessible to students at different levels of performance. A physical science unit containing four items that focus on the competency of science inquiry is given below. A more comprehensive set of sample items will be available in a forthcoming publication of *Assessment Matters!*, a series of articles available on the CMEC Web site.[12]

[12] http://www.cmec.ca/131/Programs-and-Initiatives/Assessment/Overview/index.html

Solutions

A student added an equal amount of sugar to three containers. Each container had 400 mL of water at different temperatures. His observations are shown in the diagram below.

Solution 1	Solution 2	Solution 3
		

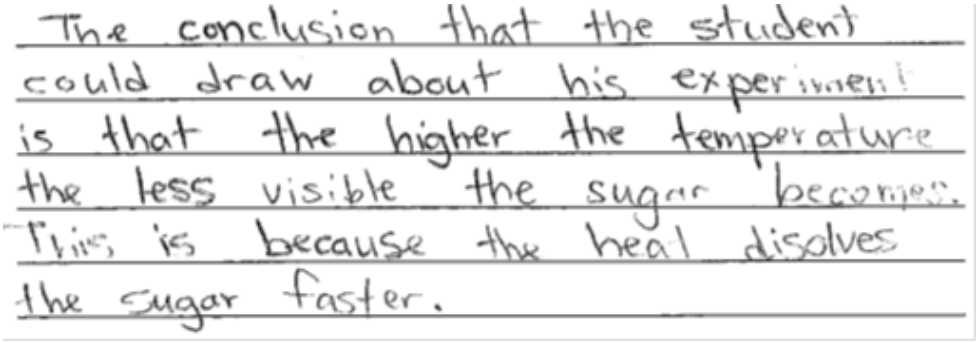
Question 1:

What conclusion could the student draw about his experiment?

Classification: Competency – Science inquiry; Sub-domain – Physical science;

Performance Level: 2

Example full credit:


The conclusion that the student could draw about his experiment is that the higher the temperature the less visible the sugar becomes. This is because the heat dissolves the sugar faster.

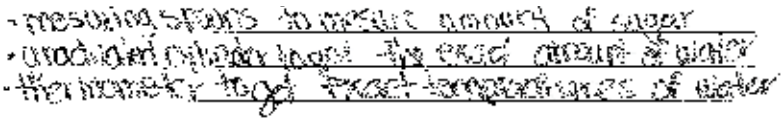
Comment:

This example centres on the competency of science inquiry and asks students to draw a conclusion based on observed experimental evidence. This question requires students to identify the variables that are changing and then to communicate a generalization about the relationship between these variables. For full credit, students must state a conclusion that involves the temperature of the water and the amount of sugar visible. The need to identify changed and measured variables from a diagram, together with the recognition of the relationship between these variables locates this question at performance level 2. On the PCAP Science assessment, there is no penalty for spelling and grammar mistakes if they did not prevent the scorer from understanding what the student was trying to communicate.

Question 2:
List three pieces of equipment that the student should use to get precise results.

Classification: Competency – Science inquiry; Sub-domain – Physical science;
Performance Level: 4

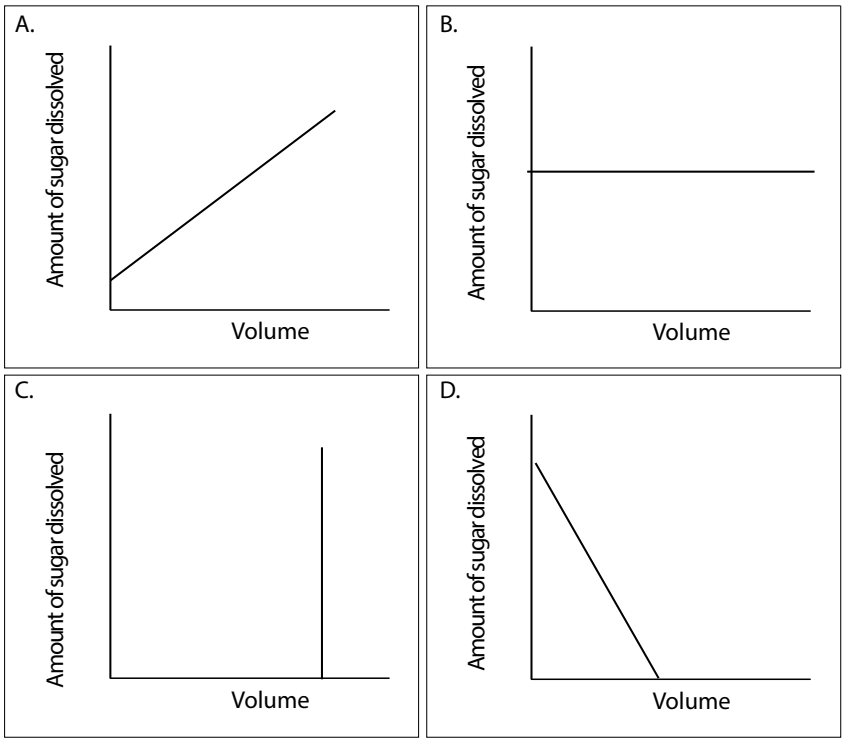
Example full credit:



Comment:
This question, which focuses on the competency of science inquiry, shows an example of a performance level 4 response. As a first step in gaining credit for this question, the student must have sufficient understanding of methods of investigation to recognize which measurements are needed while setting up this experiment. For full credit, the student needs to select equipment that would obtain accurate measurements for the volume and temperature of water and an appropriate amount of sugar. This requires the student to understand how precision is related to the tools used to take measurements in an investigation.

Question 3:
The student draws a hypothesis. If the temperature is the same, then, as the volume of water increases, the amount of sugar that can be dissolved increases.

Which graph below shows the student's hypothesis?



Correct response: A
Classification: Competency – Science inquiry; Sub-domain – Physical science;
Performance Level: 2

Comment:
This question requires the student to recognize that the hypothesis is related to a different experiment from the one shown in the context of this unit. In this experiment, the volume of water becomes a manipulated variable, which changes in the experiment. The student must relate two modes of representation, text and pictorial, which locates the question at performance level 2.

Question 4:
A well-designed investigation in science should produce the same results when it is repeated.

Choose Yes or No for each item below to indicate whether or not you agree with the statement.

Statement		Yes	No
1.	The results will be the same if the investigation is repeated in the same way.	☐ 1	☐ 2
2.	The results will be the same if the experiment is repeated using a different procedure.	☐ 1	☐ 2

Correct responses: Yes, No
Classification: Competency – Science inquiry; Sub-domain – Nature of science;
Performance Level: 1

Comment:
This question requires students to recognize that a scientifically valid test must produce reproducible results. This cannot be done reliably if changes are made to the way the experiment is conducted. This question is located at level 1 because it is related to a basic science value that students would develop during their classroom science investigations.

Students' level of science performance by jurisdiction

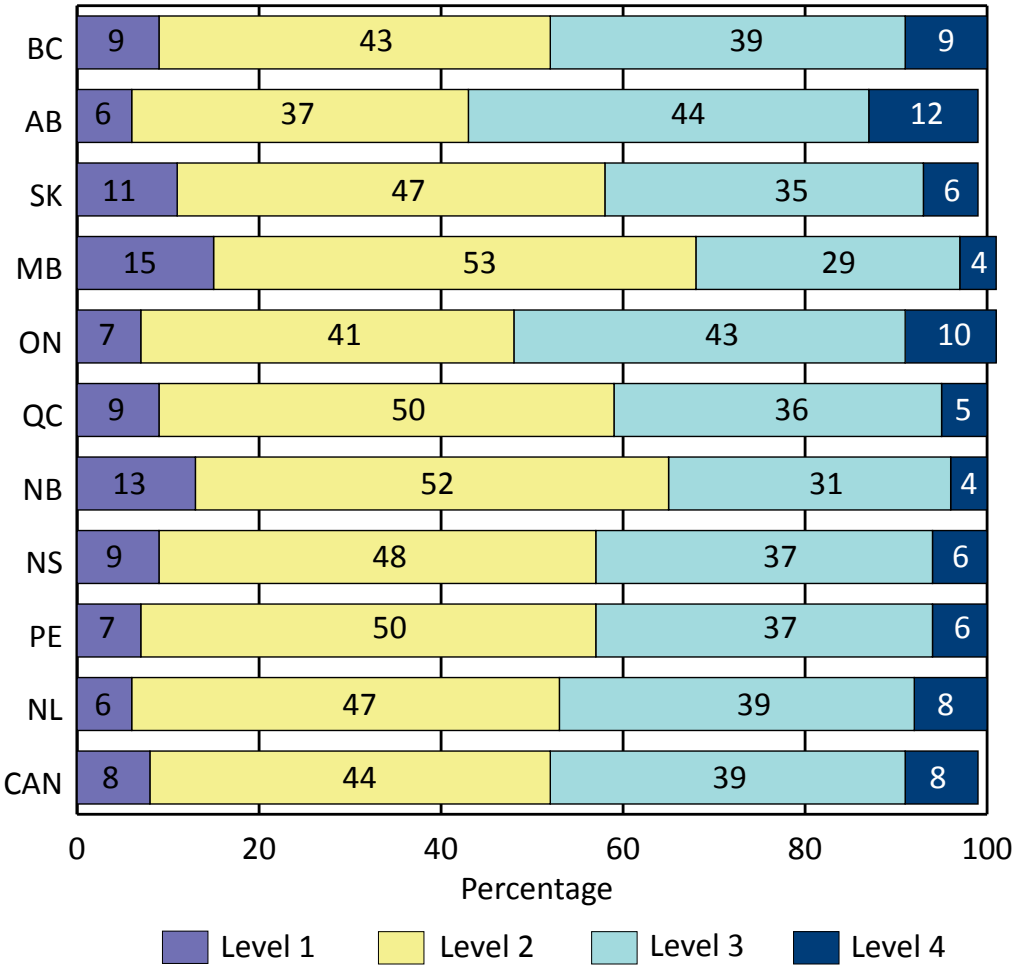
The data for performance levels are presented in Chart 4.1 as the percentage of students who obtain a score within the range of scores attributed to each of the four specific levels. Level 2 is designated as the acceptable level of performance for Grade 8/Secondary II students.

In Canada, 91 per cent of Grade 8/Secondary II students attain at or above the expected level of achievement (level 2 and above) in science. This is similar to the PISA 2006 science results, when science was the major domain, in which 90 per cent of Canadian 15-year-old students achieve or exceed level 2[13] (Bussière et al., 2007). At the higher performance levels in PCAP, 47 per cent of students attain levels 3 and 4. This is similar to the percentage of Ontario and Quebec Grade 8/ Secondary II students who attained the two highest levels of performance in TIMSS, although a larger percentage of Alberta students achieved at the higher levels (Martin et al., 2011).

[13] Although PISA uses a six-level scale, level 2 is considered "baseline proficiency" or the level at which "students begin to demonstrate the scientific competencies that will enable participation in life situations related to science and technology" (OECD, 2007).

Across jurisdictions, the percentage of Canadian students at or above the expected level of performance ranges from 86 per cent in Manitoba to 94 per cent in Ontario and Newfoundland and Labrador. In Alberta and Ontario more than 50 per cent of students achieve above the expected level of performance in science, and more than 40 per cent of students achieve above the expected level in British Columbia, Saskatchewan, Quebec, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador. Indeed, 10 per cent or more of students in Alberta and Ontario achieve performance level 4, the most advanced level. In other jurisdictions, the proportion of students achieving level 4 varies between 4 per cent and 9 per cent.

CHART 4.1 **Distribution of students by level of performance in science**[14]



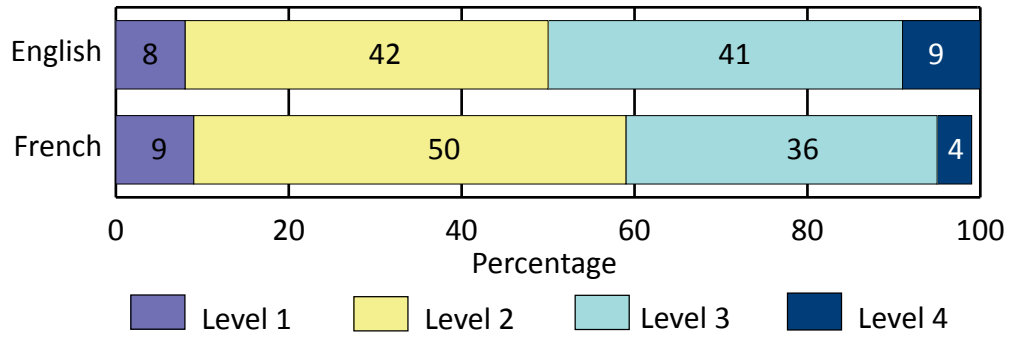
Students' level of science performance by language

Chart 4.2 presents the percentage of students at each performance level reported by language of the school system in which students are enrolled. The percentages of students enrolled in English-language schools in all jurisdictions are very close to the percentages for Canada English overall. The proportion of students who achieve level 2 and above is about the same in the French- and English-language systems in Canada. However, there is a higher percentage of students achieving at performance levels 3

[14] Totals may not sum to exactly 100 per cent because of rounding.

and 4 in English-language schools than in French-language schools. More detailed jurisdictional data can be found in Chapter 7 and in Appendix II, Table II.5.

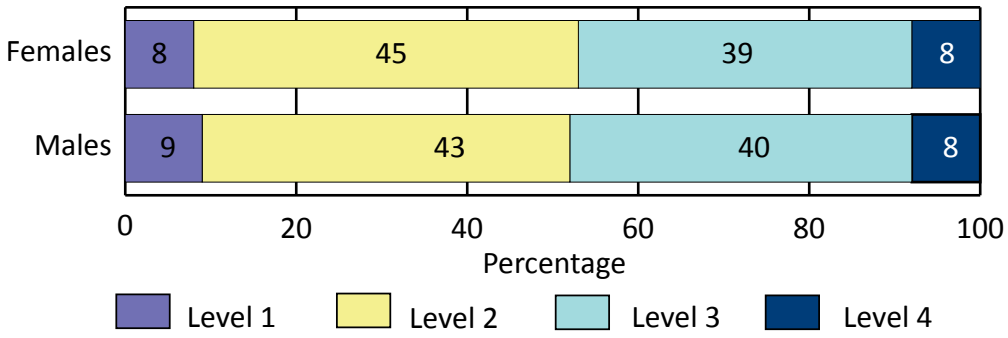
CHART 4.2 **Distribution of students by level of performance by language of the school system**



Students' level of science performance by gender

Girls and boys achieve similar levels of performance in science in Grade 8/Secondary II, as shown in Chart 4.3. More detailed information at the jurisdiction level can be found in Appendix II, Table II.6.

CHART 4.3 **Distribution of students by level of performance by gender**



5 PAN-CANADIAN RESULTS IN READING

Describing the domain

The reading framework statement for PCAP 2013 has not been altered from that used to define reading performance in the 2007 assessment, in which reading was the major domain. This enables comparisons over time between the three cohorts.

According to curricula across Canada, reading is a dynamic, interactive process whereby the reader constructs meaning from texts. The process of reading effectively involves the interaction of reader, text, purpose, and context before, during, and after reading.

The reader

In order to make meaning of a text, readers must make a connection between what is in the text and what they know or bring to the text. Readers' personal experiences, real or vicarious, allow a greater or lesser access to the content and forms of what they read. Knowledge of language, facility with language strategies, and knowledge of the way language works in print affect the student's construction of meaning in the text.

The text

Writers produce texts for a variety of purposes and use a variety of forms. Currently, many of the traditional genres have been combined or used in novel ways. Students must read a variety of texts such as those generally considered fiction and those considered non-fiction. Within that range, texts have different degrees of complexity in structure, vocabulary, syntax, organization, ideas, rhetorical devices, and subject matter. To read these forms or types successfully, students need to recognize how these forms or types of text function in different situations.

The reader's purpose

The purpose of the reading activity affects the reader's construction of meaning. Students read texts for a variety of purposes, ranging from the pleasure they take in the text's content and style to the practical information or point of view they acquire from engaging with it. Whereas particular forms or types of text are often considered aesthetic or pragmatic in intention, the reader's purpose may differ from that intent. For example, social studies students may be required to read a novel to develop knowledge of a particular culture, era, or event.

The context

Context is important in any reading act because it affects the stance the reader takes toward the printed word. Context refers specifically to the physical, emotional, social, and institutional environment at the time of reading. Any meaning constructed by a reader is a reflection of the social

and cultural environment in which the reader lives and reads. Peers, family, and community values affect the stance readers take as they engage with text.

Organization of the domain

In light of the interactive process linking the reader, text, purpose, and context, this assessment of the domain of reading considers the reader's engagement with the text and his or her response to it. Language arts curricula across Canada identify comprehension, interpretation, and response and reflection as major organizing aspects of reading literacy. In this assessment, three sub-domains of the integrated process of reading are assessed: comprehension, interpretation, and response to text (which includes response and reflection).

Comprehension: Students understand the explicit and implicit information provided by the text. In particular they understand the vocabulary, parts, elements, and events of the text.

Interpretation: Students make meaning by analyzing and synthesizing the parts/elements/events to develop a broader perspective and/or meaning for the text. They may identify theme/thesis and support that with references to details, events, symbols, patterns, and/or text features.

Response to text: In responding, the readers engage with the text in many ways: by making personal connections between aspects of the text and their own real/vicarious/prior experiences, knowledge, values, and/or points of view; by responding emotionally to central ideas or aspects of the text; and/or by taking an evaluative stance about the quality or value of the text, possibly in relation to other texts and/or social or cultural factors.

An important feature of PCAP is to determine if the performance of students changes over time. This type of comparison presents significant challenges. The major focus of PCAP rotates among the three administrations in a cycle. Because of this rotation of major/minor test focus, the tests themselves in reading are not identical in successive assessments. Reading was the major domain in 2007 and comprised a large number of items, which enabled broad coverage of the sub-domains delineated in the PCAP Reading Assessment Framework.[15] In 2013, as was the case in 2010, reading is a minor domain with a limited number of items (approximately 20 per cent). Although items were selected from each sub-domain and with a range of difficulties, the use of a smaller set of items means that the framework coverage is less representative. To facilitate the comparison between administrations, the 2013 reading test was constructed from a subset of the 2007 items. These items, known as "anchor items," are used to link the 2007, 2010, and 2013 reading assessments and are used to report changes over time in reading achievement.

[15] http://www.cmec.ca/docs/pcap/pcap2007/Reading-Framework-EN-Apri2013.pdf

Results in reading

The PCAP 2013 mean scores in reading are reported on the PCAP scale, which has a range of 0–1000. In PCAP 2007, when reading was the major domain, the Canadian mean was set at 500 with a standard deviation of 100. The scale was reset to 500 in 2010, in order to accommodate a change in the target population that was sampled. PCAP assessed 13-year-olds in 2007 but in order to minimize the disruption to classrooms and schools, intact Grade 8/Secondary II classes were sampled in PCAP 2010. In order to ensure a valid comparison, only Grade 8/Secondary II students were selected from the 2007 sample,[16] and the baseline for reading was changed to PCAP 2010.[17] To facilitate direct comparisons over time, the Canadian mean is not rescaled to 500 in 2013 and so in PCAP 2013, the Canadian mean for reading is 508 with a 95 per cent confidence interval of 2.0 suggesting an overall improvement between 2010 and 2013.

The results for reading will be presented by jurisdiction and compared to the results for Canada overall. Then the results will be reported by language of the school system and by gender. Finally multiple comparisons will be made for reading achievement for the three administrations of PCAP: 2007, 2010, and 2013 at the Canadian level and by jurisdiction, by language of the school system, and by gender.

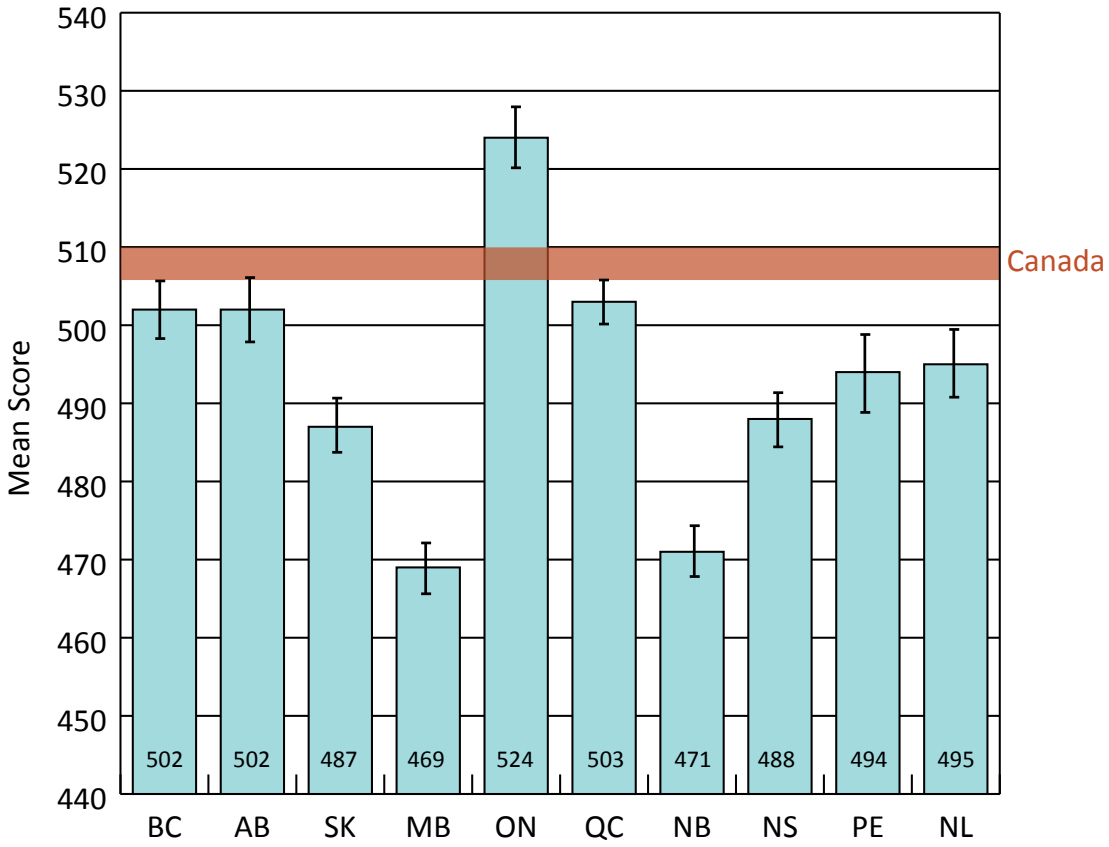
Results in reading by jurisdiction

Chart 5.1 provides the mean scores in reading for jurisdictions participating in PCAP 2013. Jurisdictions can be grouped into three clusters with respect to achievement in reading: below the Canadian mean score, at the Canadian mean score, and above the Canadian mean score. Ontario students have the highest achievement with average scores significantly above the Canadian mean. There are no jurisdictions that achieve at the Canadian mean in PCAP 2013. Students in British Columbia, Alberta, Saskatchewan, Manitoba, Quebec, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador achieve results below the Canadian mean. These results are different from those reported for Grade 4 students in PIRLS 2011 (Labrecque, Chuy, Brochu, & Houme, 2012) and for 15-year-olds in PISA 2012 (Brochu et al., 2013) in which British Columbia was above the Canadian mean, and Ontario and Alberta were at the Canadian mean in both studies. More detailed information on the PCAP results in reading can be found in Appendix II, Tables II.28 and II.41.

[16] More detailed information on the process used to ensure a valid comparison can be found in the *PCAP 2013 Technical Report*, which can be found on the CMEC Web site.

[17] Changes over time are typically reported by comparison to the year in which the subject was the major domain involving a large number of items with broad coverage of the sub-domains in this subject. Reading was a minor domain in the baseline year, and it is therefore necessary to exercise caution when interpreting results for reading trends.

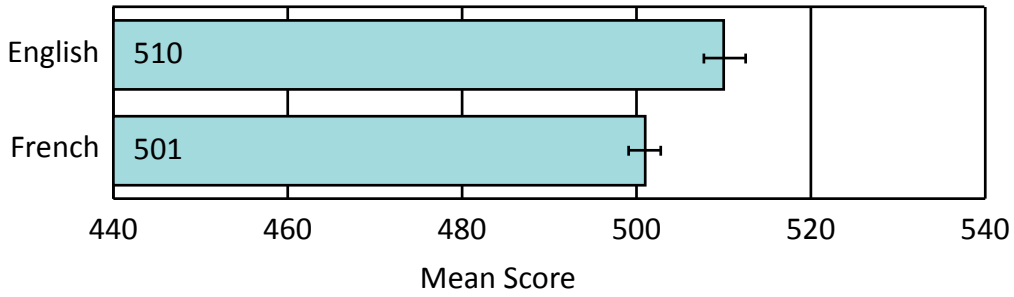
CHART 5.1 **Results in reading by jurisdiction**



Results in reading by language

Chart 5.2 presents the reading performance for students enrolled in the English- and French-language school systems. Overall, students enrolled in English-language schools are performing at a level that is statistically higher than those enrolled in French-language schools. This is consistent with the results reported for Canadian Grade 4 students in PIRLS 2011 (Labrecque et al., 2012) but differs from that reported for Canadian 15-year-olds in the 2012 PISA study for reading in which there was no significant difference between the two language systems (Brochu et al., 2013).

CHART 5.2 **Results in reading by language of the school system**



The performance results of students enrolled in English- and French-language school systems are also examined by jurisdiction. Tables 5.1 and 5.2 present the comparison of jurisdiction results to the Canadian mean for each of the two language systems. In the English-language school system, students in Ontario have achievement that is significantly above the Canadian English mean in reading; all other jurisdictions are below the Canadian English mean. In French-language schools in British Columbia and Quebec, students achieve at the Canadian French mean, whereas, the results are significantly below the Canadian French mean for all other jurisdictions with a sufficiently large sample size for separate reporting for students in the majority and minority language systems.

TABLE 5.1 **Reading achievement in English-language school systems by jurisdiction**

Above the Canadian English Mean	At the Canadian English Mean 510 ± 2.1	Below the Canadian English Mean
Ontario		British Columbia, Alberta, Saskatchewan, Manitoba, Quebec, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador

TABLE 5.2 **Reading achievement in French-language school systems by jurisdiction**

Above the Canadian French Mean	At the Canadian French Mean 501 ± 2.2	Below the Canadian French Mean
	British Columbia, Quebec	Alberta, Saskatchewan, Manitoba, Ontario, New Brunswick, Nova Scotia

The performance results of students enrolled in English- and French-language school systems is examined within jurisdictions, and the results are shown in Table 5.3. In British Columbia, Saskatchewan, Manitoba, and Quebec, there is no significant difference in student performance between the English- and French-language school systems. Other jurisdictions show a significant difference between the two systems. The French-language school system significantly outperforms the English-language school system in New Brunswick, whereas, the English-language system has higher achievement than the French-language system in Alberta, Ontario, and Nova Scotia. These differences are consistent with those reported for 15-year-olds in PISA 2012 for Manitoba, Ontario, and Nova Scotia; however, in that study, there was no significant difference in reading at the Canadian level, and an opposite pattern was identified in New Brunswick where English-language schools outperformed French-language schools (Brochu et al., 2013). Although fewer jurisdictions sampled Grade 4 students in both language systems in PIRLS 2011 compared to this study, the PIRLS results are consistent with the PCAP 2013 results in Canada overall and in Ontario and Nova Scotia (Labrecque et al., 2012).

TABLE 5.3 **Results in reading by jurisdiction and by language**

	Anglophone school system		Francophone school system		Difference
	Mean	CI	Mean	CI	
BC	502	3.3	499	8.3	3
AB	503	4.0	473	4.0	30*
SK	487	2.5	478	2.4	9
MB	469	2.8	471	3.1	2
ON	526	3.5	481	3.2	45*
QC	497	3.9	504	3.3	7
NB	466	3.7	485	4.6	19*
NS	489	4.0	468	3.9	21*
PE	496	5.5	--	--	--
NL	495	4.5	--	--	--
CAN	**510**	**2.1**	**501**	**2.2**	**9***

*denotes significant difference

Results in reading by gender

Girls perform significantly better than boys in reading as shown in the PCAP 2013 reading assessment. As presented in Chart 5.3 and Table 5.4, overall in Canada and in all jurisdictions, girls outperformed boys with the gender gap favouring girls, ranging from 17 points in Newfoundland and Labrador to over 30 points in British Columbia and Alberta. This is consistent with results from multiple studies. Girls have been shown to perform better than boys in Grade 4 (PIRLS 2011, Labrecque et al., 2012) and in Grade 8/Secondary II (PCAP 2007 when reading was the major domain) and at age 15 (PISA 2012, Brochu et al., 2013). Indeed the pattern for reading achievement may be reflected in the tendency to read later in life. In the Program for the International Assessment of Adult Competencies (PIAACC, 2012) study, a significantly higher proportion of women reported reading books frequently (daily or at least once a week).

Given the importance of reading with regard to educational and individual development, both within school and later in life (OECD, 2001), it is not surprising that concerns regarding the ongoing gender gap in reading, what might explain it, and how best to respond to it, appear to be widespread. PISA 2012 reported that although girls outperform boys in both print and digital reading, the gender gap is smaller internationally and across Canada for digital reading, and according to Brochu et al. (2013) "these results suggest that it might be possible to harness boys' performance in digital reading to improve their reading proficiency in both print and digital formats."

CHART 5.3 **Results in reading by gender**

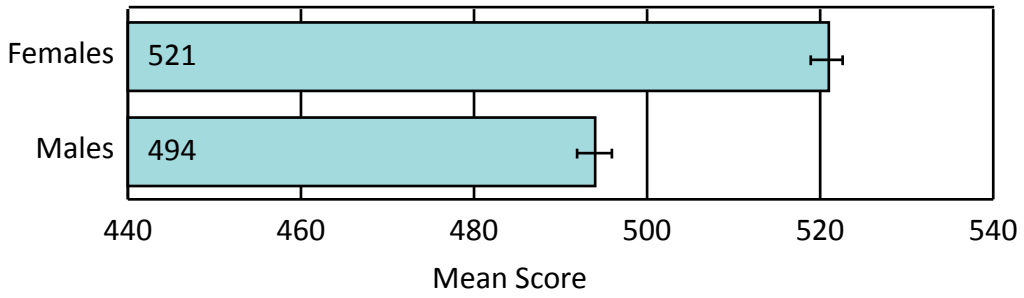


TABLE 5.4 **Results in reading by jurisdiction and by gender**

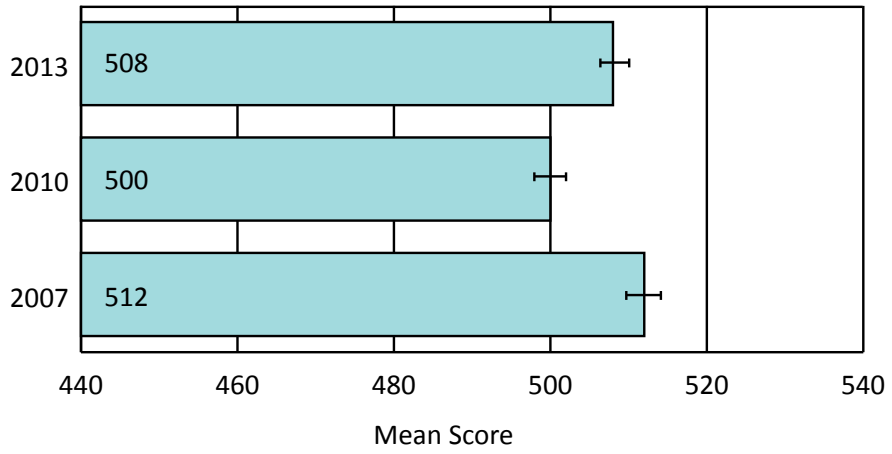
	Females		Males		Difference
	Mean	CI	Mean	CI	
BC	518	4.2	486	4.7	32*
AB	518	5.1	485	5.1	33*
SK	498	3.9	476	5.3	22*
MB	480	4.3	459	4.2	21*
ON	538	4.8	510	5.5	28*
QC	514	4.6	493	4.3	21*
NB	485	4.0	459	5.2	26*
NS	499	5.2	477	5.0	22*
PE	509	5.9	479	7.2	30*
NL	503	4.8	486	7.8	17*
CAN	**521**	**2.2**	**494**	**2.3**	**27***

*denotes significant difference

Changes over time in reading: 2007, 2010, and 2013

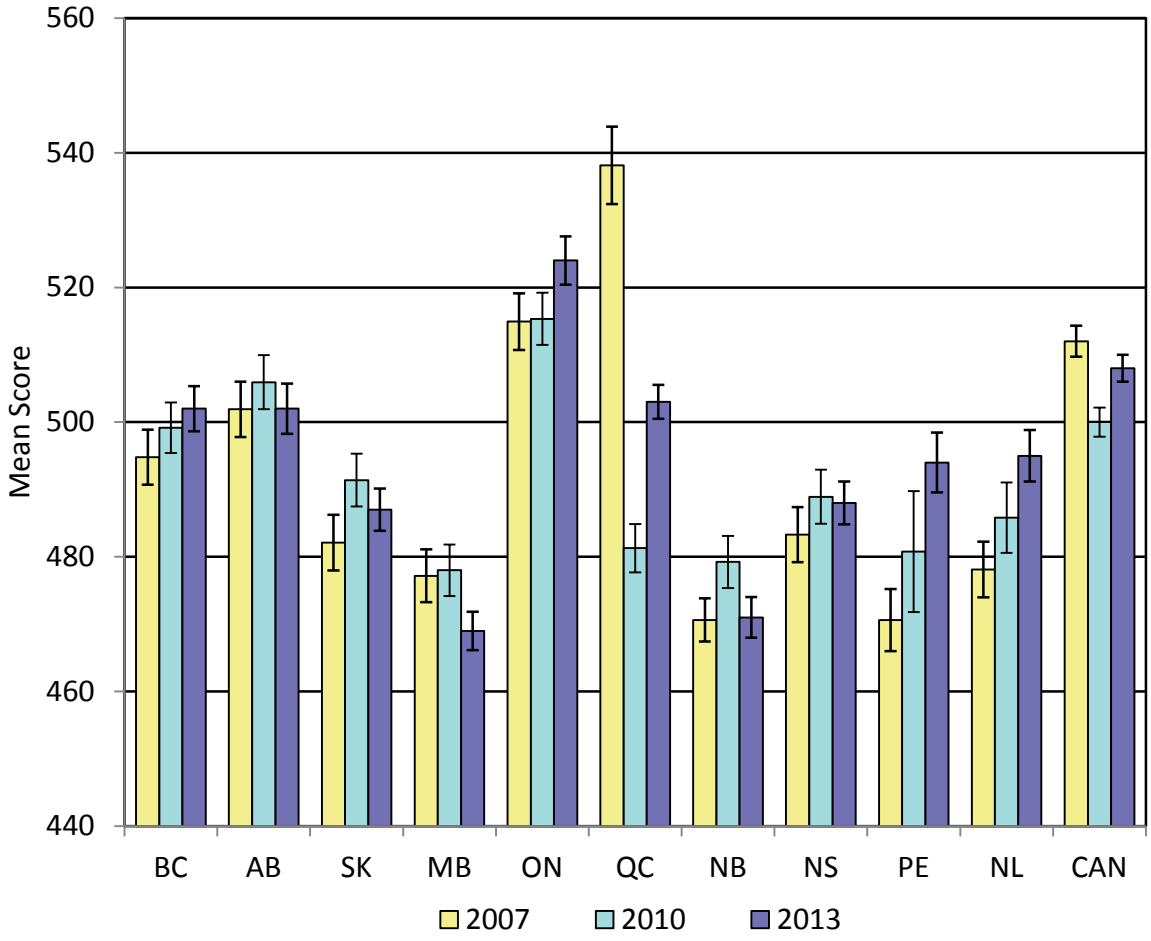
As presented in Chart 5.4, reading achievement improved overall in Canada from 2010 to 2013. Although there is no significant difference in achievement between 2007 and 2013, reading achievement did decline between 2007 and 2010. Although the PCAP 2013 reading test included items from each of the three sub-domains in reading and a range of difficulties, the content coverage in PCAP 2013 is limited because reading was a minor domain in this assessment. Caution must be used when analyzing the data for minor domains and with only three data points.

CHART 5.4 **Canadian changes over time in reading**



Within jurisdictions, there is much variation as shown in Chart 5.5. In British Columbia, Alberta, and Nova Scotia there is no significant difference among the three administrations of PCAP. Between 2010 and 2013, a significant increase in reading scores is shown in Canada overall and in Ontario, Quebec, and Newfoundland and Labrador, whereas a significant decrease is shown in Manitoba and New Brunswick. Between 2007 and 2013, a significant increase in reading scores is shown in Prince Edward Island and Newfoundland and Labrador, but a decrease is shown in Quebec. More detailed information can be found in Appendix II, Table II.31.

CHART 5.5 **Changes over time in reading by jurisdiction**



As presented in Chart 5.6, in Canadian English-language schools, results in reading show a positive change between PCAP 2007 and PCAP 2013. In French-language schools, there has been a significant improvement in reading achievement between 2010 and 2013, although there was a dramatic decrease in reading achievement between the previous two administrations of PCAP.

CHART 5.6 **Canadian changes over time in reading by language**

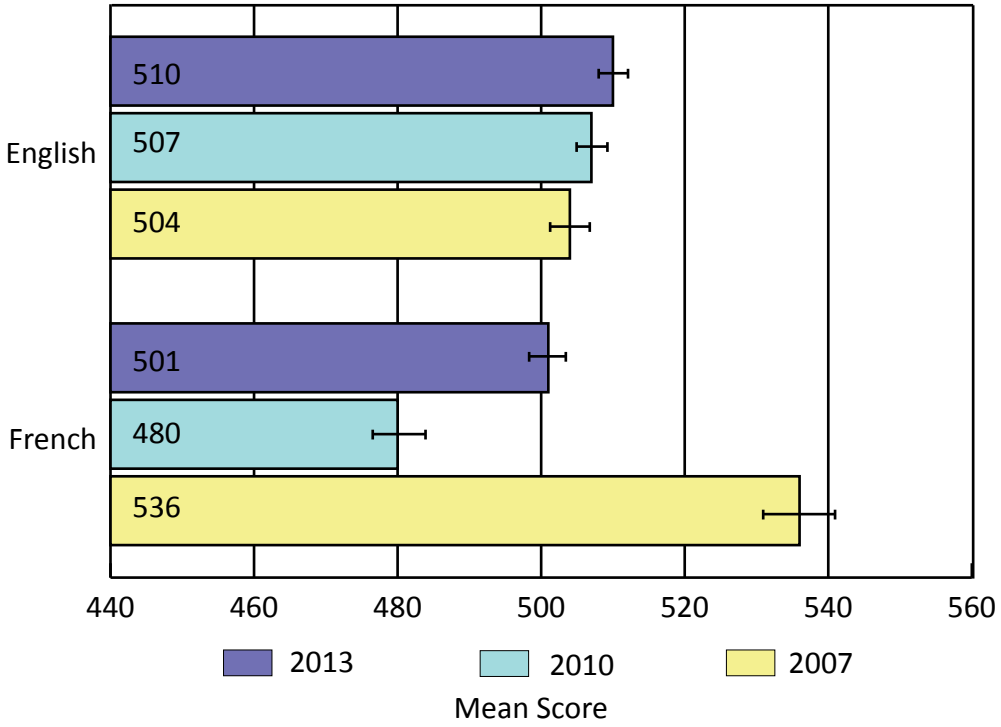


Table 5.5 presents the comparison in reading achievement by language of the school system for the three administrations of the PCAP reading assessment. Between 2007 and 2013, positive change in reading achievement is found in French-language schools in British Columbia, Manitoba, and New Brunswick, whereas the opposite pattern was found in Alberta, Quebec and in Canada overall. In English-language schools, a significant positive change is found in Canada overall, Ontario, Prince Edward Island, and Newfoundland and Labrador, and a negative change is found in Manitoba. When comparing the 2010 and 2013 PCAP reading assessments, significant positive changes are found in Ontario English schools and in French schools in Canada overall and in British Columbia, Saskatchewan, Quebec, and New Brunswick. Significant negative changes between the reading assessment in 2010 and 2013 are found in English-language schools in Manitoba and New Brunswick and in French-language schools in Alberta.

TABLE 5.5 **Changes over time in reading by jurisdiction and by language**

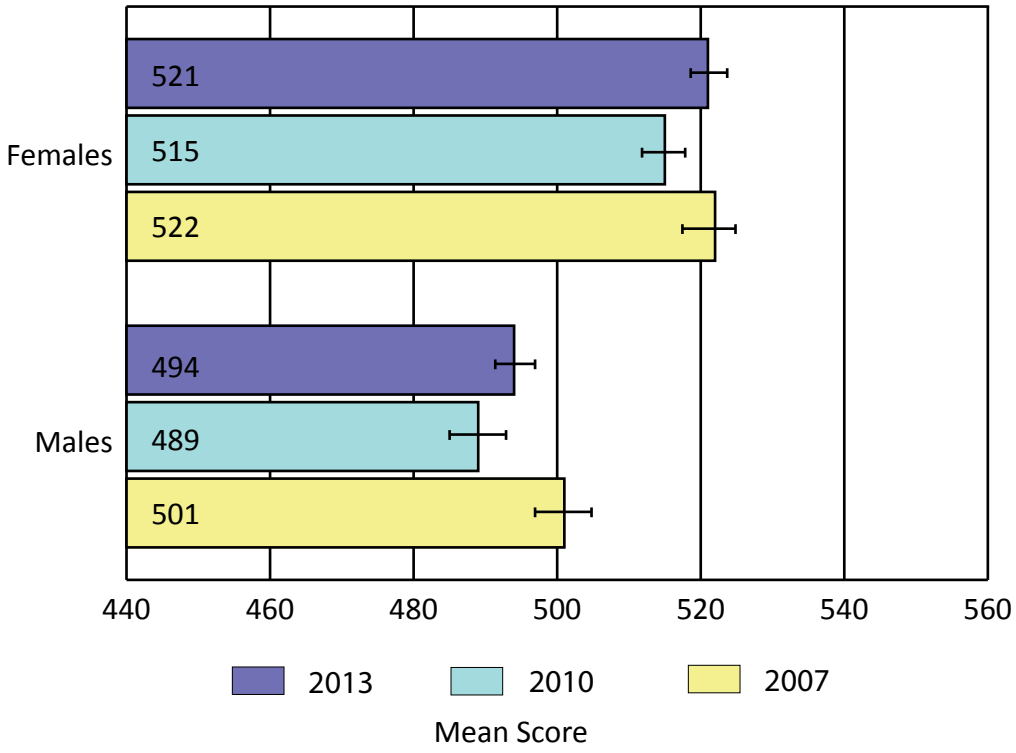
	2013		2010		2007**		Difference (2013–2010)	Difference (2013–2007)
	Mean	CI	Mean	CI	Mean	CI		
BCe	502	3.3	499	3.8	495	4.6	3	7
BCf	499	8.3	473	5.1	476	13.9	26*	23*
ABe	503	4.0	506	4.0	502	4.0	-3	1
ABf	473	4.0	490	5.2	490	7.5	-17*	-17*
SKe	487	2.5	492	3.9	482	4.0	-5	5
SKf	478	2.4	468	8.0	474	28.2	10*	4
MBe	469	2.8	478	4.0	482	4.6	-9*	-13*
MBf	471	3.1	468	4.0	437	7.7	3	34*
ONe	526	3.5	517	5.0	516	4.6	9*	10*
ONf	481	3.2	481	3.7	482	5.3	0	-1
QCe	497	3.9	492	5.9	492	5.4	5	5
QCf	504	3.3	480	3.6	544	6.3	24*	-40*
NBe	466	3.7	486	5.3	471	3.9	-20*	-5
NBf	485	4.6	464	4.5	470	3.9	21*	15*
NSe	489	4.0	489	3.5	484	3.9	0	5
NSf	468	3.9	475	2.9	479	10.3	-7	-11
PEe	496	5.5	482	10.3	470	4.0	14	26*
NLe	495	4.5	486	5.0	478	5.1	9	17*
CANe	**510**	**2.1**	**507**	**2.1**	**504**	**2.7**	**3**	**6***
CANf	**501**	**2.2**	**480**	**3.6**	**536**	**4.9**	**21***	**-35***

*denotes significant difference.

**In Manitoba, French immersion students participated in French and are included in the Manitoba-French results.

The gender gap reported in PCAP 2007 and PCAP 2010 persists in this administration of the reading assessment. As shown in Chart 5.7, reading scores for boys are significantly lower than for girls for each of the three administrations of PCAP. Compared to the first administration of PCAP in 2007, there has been no significant change in PCAP 2013 in achievement for girls overall in Canada; however, there is a significant positive change between 2010 and 2013. Although there was a significant decline for boys in reading achievement between 2007 and 2013, results are consistent for boys at the Canadian level between this administration of the reading assessment and PCAP 2010. For more detailed information, refer to Appendix II, Table II.33.

CHART 5.7 **Changes over time in reading by gender**



Changes over time for reading achievement for girls and boys are presented at the jurisdiction level in Table 5.6. Between 2007 and 2013, positive changes are shown by girls in British Columbia, Ontario, and Prince Edward Island, whereas a negative change is found for girls in Quebec. For boys in the same time period, a positive change is found in reading achievement in Prince Edward Island and Newfoundland and Labrador, while a negative change is found Quebec and in Canada overall. Between the two recent administrations of PCAP in 2010 and 2013, a positive change is found for both girls and boys in Quebec, for girls in British Columbia and Canada overall, and for boys in Newfoundland and Labrador. A negative change during this time is found for girls in Manitoba and New Brunswick and for boys in Alberta. All other changes in the reading assessment are not statistically significant.

TABLE 5.6 **Changes over time in reading by jurisdiction and by gender**

		2013		2010		2007		Difference (2013–2010)	Difference (2013–2007)
		Mean	CI	Mean	CI	Mean	CI		
BC	Females	518	4.2	511	5.7	505	6.0	7*	13*
	Males	486	4.7	491	5.4	485	6.4	-5	1
AB	Females	518	5.1	516	5.4	511	5.8	2	7
	Males	485	5.1	497	4.5	492	6.2	-12*	-7
SK	Females	498	3.9	504	5.9	490	5.8	-6	8
	Males	476	5.3	482	5.1	476	5.0	-6	0
MB	Females	480	4.3	494	5.5	485	6.2	-14*	-5
	Males	459	4.2	466	5.9	471	5.2	-7	-12
ON	Females	538	4.8	530	6.1	523	7.0	8	15*
	Males	510	5.5	503	5.6	506	6.8	7	4
QC	Females	514	4.6	498	4.5	550	7.2	16*	-36*
	Males	493	4.3	471	5.4	524	7.8	22*	-31*
NB	Females	485	4.0	501	4.9	484	4.0	-16*	1
	Males	459	5.2	462	5.9	457	4.4	-3	2
NS	Females	499	5.2	501	5.0	491	6.2	-2	8
	Males	477	5.0	480	5.8	475	6.2	-3	2
PE	Females	509	5.9	491	13.5	481	5.1	18	28*
	Males	479	7.2	474	13.6	461	5.8	5	18*
NL	Females	503	4.8	506	7.4	496	7.8	-3	7
	Males	486	7.8	468	7.3	458	6.3	18*	28*
CAN	**Females**	**521**	**2.2**	**515**	**2.6**	**522**	**3.1**	**6***	**-1**
	Males	**494**	**2.3**	**489**	**3.3**	**501**	**3.4**	**5**	**-7***

*denotes significant difference

Summary

This chapter summarizes the performance of Canadian students on the PCAP 2013 assessment of reading. Reading is a minor domain in PCAP 2013 so the assessment comprises a smaller number of items than the science assessment. Consequently, this chapter provides only an update on overall performance in reading and not its sub-domains as was done in PCAP 2007, when reading was the major domain.

Ontario students have the highest achievement with average scores significantly above the Canadian mean. All other jurisdictions achieve below the Canadian mean.

The English-language school systems continue to significantly outperform the French-language schools system in Canada as was the case in the PCAP 2010 assessment; however, the opposite pattern occurred in the baseline year of 2007 when the French-language school systems had higher achievement. This result is consistent with that reported for Grade 4 students in PIRLS 2011 (Labrecque et al. 2012), but it is not consistent with the PISA 2012 report, in which there was no significant difference between the two school systems (Brochu et al., 2013). For English schools, the highest achievement in reading is found in Ontario, and for French schools, the highest results are found in British Columbia and Quebec. Significant differences between the school systems are found in six jurisdictions. Higher reading achievement is found in English schools in Alberta, Saskatchewan, Ontario, and Nova Scotia and in French schools in Quebec and New Brunswick. Within the eight jurisdictions with large enough samples to report results separately, the greatest changes over time within the majority and minority language systems are found in French-language schools in British Columbia and New Brunswick, with positive changes of at least 15 points both between 2007 and 2013 and between 2010 and 2013.

The assessment of reading in each of the three cycles of PCAP provides a way to look at changes over time. Significant positive changes are found between 2010 and 2013 in Canada overall and in Ontario, Quebec, and Newfoundland and Labrador, whereas significant negative changes are found in Manitoba and New Brunswick. Between 2007 and 2013, significant positive changes are found in Prince Edward Island and in Newfoundland and Labrador, whereas negative changes are found in Quebec.

The gender difference in reading continues to persist in PCAP 2013. Girls outperform boys in reading in this national study and in the international studies in which Canada participates. The result is consistent with that reported for Grade 4 students in PIRLS 2011 (Labrecque et al., 2012) and PISA 2012 (Brochu et al., 2013). This gap in achievement may be influencing the tendency to read in later life. Results from PIAAC, an international household survey of adults 16–25, suggests that men read less frequently than women, and even among adults who read most frequently (i.e., daily or at least once a week), there is a significant gender gap that favours women (PIAAC, 2012, unpublished data). PISA 2012 reports that the gender gap is smaller for digital reading than for print reading (Brochu et al., 2013), which may provide insight into teaching and learning strategies that could lead to improvements in reading achievement for boys.

6 PAN-CANADIAN RESULTS IN MATHEMATICS

Describing the domain

The mathematics framework statement for PCAP 2013 has not been altered from that used to define mathematics performance in the 2010 assessment, in which mathematics was the major domain. This enables comparisons over time between the two cohorts.

For the purpose of this assessment, mathematics is broadly defined as a conceptual tool that students can use to increase their capacity to calculate, describe, and solve problems. The domain is divided into four strands or sub-domains and five processes. The PCAP assessment focuses on curricular outcomes that are common to all participating Canadian jurisdictions at the Grade 8/Secondary II level.

Regardless of the terms used to define mathematics, curricula across Canada are structured to enable a student "to use mathematics in his or her personal life, in the workplace, and in further study. All students deserve an opportunity to understand the power and beauty of mathematics. Students need to learn a new set of mathematics basics that enable them to compute fluently and to solve problems creatively and resourcefully" (NCTM, 2000).

Organization of the domain

The mathematics component in PCAP 2013 is aligned with the jurisdictions' own curricula. The overriding principle of the assessment is that the application of mathematics is an integrated act in which the skills and concepts of various content areas are inherently linked.

The PCAP mathematics sub-domains are listed below:

- numbers and operations (properties, equivalent representations, and magnitude);
- geometry and measurement (properties of 2-D figures and 3-D shapes, relative position, transformations, and measurement);
- patterns and relationships (patterns and algebraic expressions, linear relations, and equations); and
- data management and probability (data collection and analysis, experimental and theoretical probability).

Mathematics curricula within the various jurisdictions in Canada are structured on a number of mathematical processes deemed essential to the effective study of the subject. The processes reflect the means by which students acquire and apply mathematical knowledge and skills and are not intended to be separated from the knowledge and skills acquired through the curriculum content. These five processes are listed below:

- problem solving
- communication

- representation
- reasoning and proof
- connections

The sub-domains are traditional groupings of skills and knowledge, while the processes are used in the application of all sub-domains.

For the PCAP 2013 mathematics component, an attempt was made to ensure that the contexts of the various scenarios were drawn from situations that were relevant, appropriate, and sensible for Canadian Grade 8/Secondary II students.

An important feature of PCAP is to determine if the performance of cohorts of students changes over time. This type of comparison presents significant challenges. The major focus of PCAP rotates among the three administrations in a cycle. Because of this rotation of major/minor test focus, the tests themselves in mathematics are not identical in successive assessments. Mathematics was the major domain in 2010 and comprised a large number of items, which enabled broad coverage of the sub-domains and processes delineated in the PCAP Mathematics Assessment Framework.[18] In 2013, mathematics is a minor domain with a limited number of items (approximately 20 per cent) in this domain. Although items were selected from each sub-domain and with a range of difficulties, the use of a smaller set of items means that the framework coverage is less representative. To facilitate the comparison between administrations, the 2013 mathematics test was constructed from a subset of the 2010 items. These items, known as "anchor items," are used to link the 2010 and the 2013 mathematics assessments and to report changes over time in mathematics achievement.

Results in mathematics

The PCAP 2013 mean scores in mathematics are reported on the PCAP scale, which has a range of 0−1000. In the baseline year for mathematics (PCAP 2010), the Canadian mean was set at 500 with a standard deviation of 100. To facilitate direct comparisons over time, the Canadian mean is not rescaled to 500 following the baseline year. In PCAP 2013, the Canadian mean for mathematics is 507 with a 95 per cent confidence interval of 2.0.

The results for mathematics will be presented by jurisdiction and compared to the results for Canada overall. Then the results will also be reported by language of the schools system and by gender. Finally a comparison will be made between mathematics achievement in the baseline year of 2010 and in PCAP 2013 by language of the school system and by gender. Mathematics is a minor domain in 2013 and so these results will be compared to PCAP 2010 when mathematics was major domain involving a large number of items with broad coverage of the processes and sub-domains in this subject.

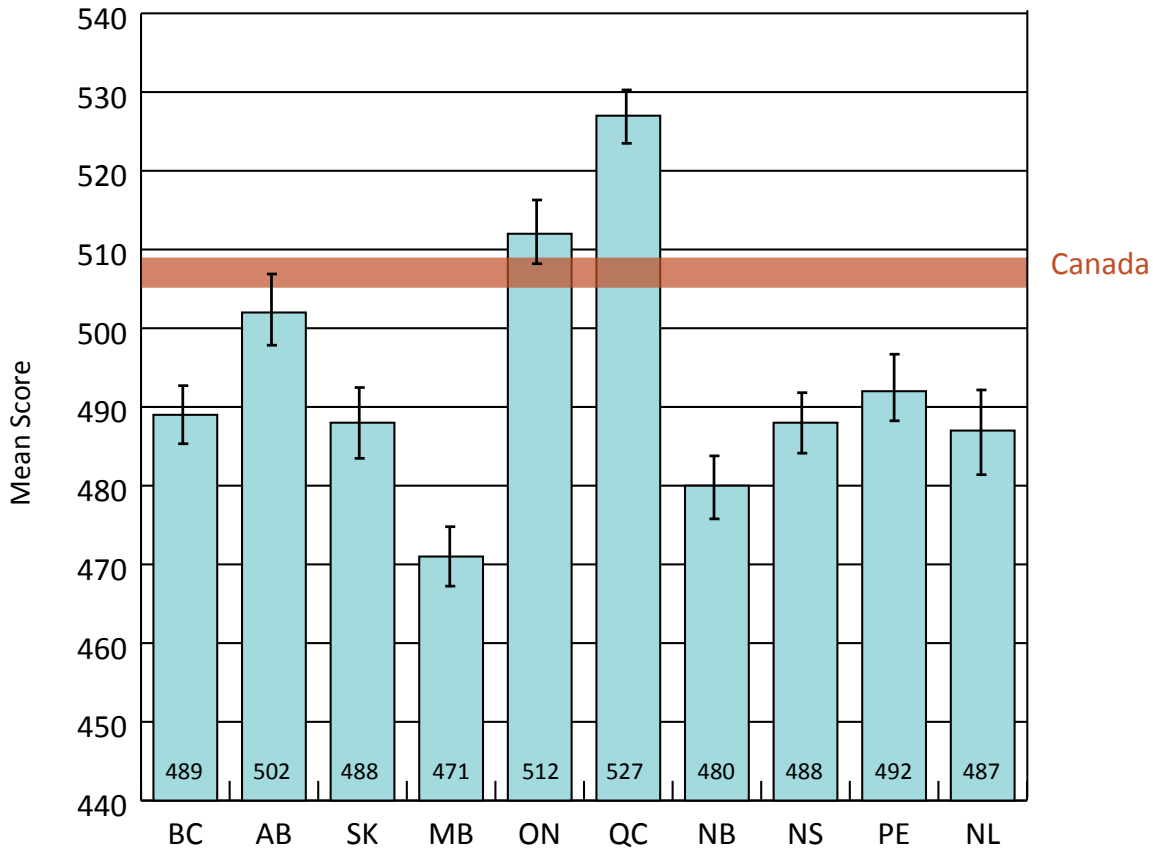
Results in mathematics by jurisdiction

Chart 6.1 provides the mean scores in mathematics for jurisdictions participating in PCAP 2013. Jurisdictions can be grouped into three clusters with respect to achievement in mathematics: below the Canadian mean score, at the Canadian mean score, and above the Canadian mean score. Quebec students have the highest achievement with average scores above the Canadian mean. Students in

[18] http://www.cmec.ca/docs/pcap/pcap2013/Math-Framework-April-2013-EN.pdf

Alberta and Ontario have achievement scores the same as the Canadian mean, although students in Ontario achieve higher scores than those in Alberta. Grade 8/Secondary II students in British Columbia, Saskatchewan, Manitoba, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador achieve results with scores below the Canadian mean. More detailed information on the PCAP results in mathematics can be found in Appendix II, Tables II.34 and II.42.

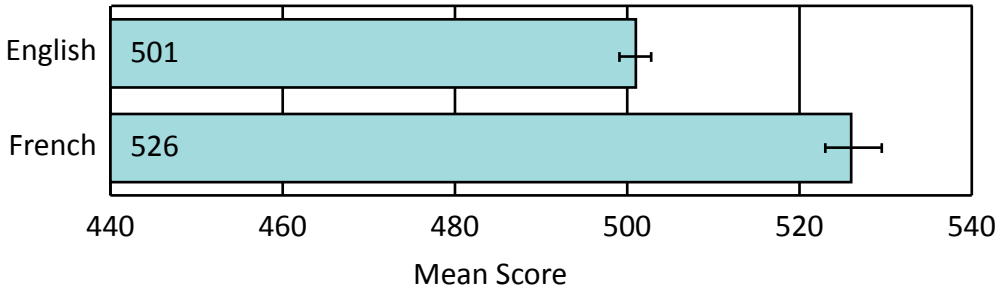
CHART 6.1 **Results in mathematics by jurisdiction**



Results in mathematics by language

Chart 6.2 presents the mathematics performance for students enrolled in the English- and French-language school systems. Overall, students enrolled in French-language schools are performing at a level that is statistically higher than those enrolled in English-language schools. This is consistent with the results reported in the 2012 PISA study (Brochu et al., 2013).

CHART 6.2 **Results in mathematics by language**



The performance results of students enrolled in English- and French-language school systems is also examined by jurisdiction. Tables 6.1 and 6.2 present the comparison of the jurisdiction results to the Canadian mean for each of the two language systems. In the English-language school system, students in Ontario and Quebec have achievement that is significantly above the Canadian English mean in mathematics, whereas students in Alberta achieve statistically similar results to Canadian English-language schools. The results are significantly lower than the Canadian English mean for all other jurisdictions. In French-language schools in Quebec, students achieve at the Canadian French mean. The results are significantly lower than the Canadian French mean for all other jurisdictions with a sufficiently large sample size for separate reporting for students in the majority and minority language systems.

TABLE 6.1 **Mathematics achievement in English-language school systems by jurisdiction**

Above the Canadian English Mean	At the Canadian English Mean 501 ± 1.9	Below the Canadian English Mean
Ontario, Quebec	Alberta	British Columbia, Saskatchewan, Manitoba, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador

TABLE 6.2 **Mathematics achievement in French-language school systems by jurisdiction**

Above the Canadian French Mean	At the Canadian French Mean 526 ± 3.0	Below the Canadian French Mean
	Quebec	British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, New Brunswick, Nova Scotia

The performance results of students enrolled in English- and French-language school systems is examined within jurisdictions, and the results are shown in Table 6.3. All jurisdictions, except Alberta and Manitoba, show a significant difference between the two systems. The French-language school system has higher achievement in British Columbia, Saskatchewan, Quebec, New Brunswick and Nova Scotia. The opposite situation occurs in Ontario where the English-language system significantly outperforms the French-language system. Although the pattern for Ontario and Quebec is consistent with the PISA 2012 results, no significant difference between the two systems was found for the other provinces in that study (Brochu et al., 2013).

TABLE 6.3 **Results in mathematics by jurisdiction and by language**

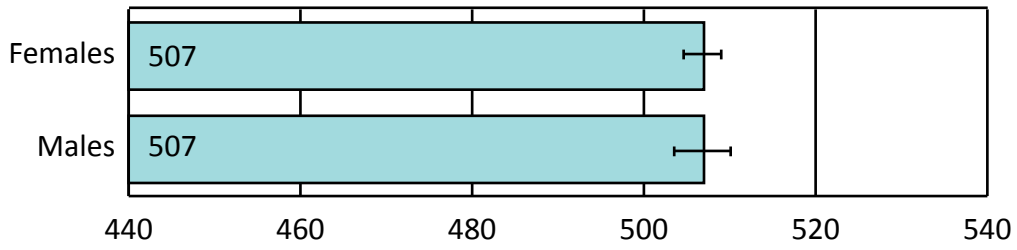
	Anglophone school system		Francophone school system		Difference
	Mean	CI	Mean	CI	
BC	489	3.3	513	6.2	24*
AB	502	4.0	502	3.6	0
SK	487	3.4	518	2.1	31*
MB	470	2.6	476	2.9	6
ON	512	2.9	500	3.9	12*
QC	509	4.0	529	3.5	20*
NB	470	3.8	507	5.7	37*
NS	488	4.0	499	3.6	11*
PE	492	4.3	--	--	--
NL	487	4.7	--	--	--
CAN	**501**	**1.9**	**526**	**3.0**	**25***

*denotes significant difference

Results in mathematics by gender

Performance in mathematics in Grade 8/Secondary II is remarkably similar between boys and girls both overall in Canada as shown in Chart 6.3 and within jurisdictions (see Appendix II, Table II.36). The only significant difference is found in Prince Edward Island, where girls outperformed boys in mathematics in PCAP 2013. This does not correspond with the Canadian and international results reported in PISA 2012 (Brochu et al., 2013) in which boys significantly outperformed girls in mathematics at 15 years of age. In TIMSS 2011, which assessed the same target sample as PCAP, gender differences were specific to content domains in mathematics for Grade 8/Secondary II students. Boys had higher achievement in one content area (numbers), but girls had higher achievement in three content areas (algebra, geometry, data and chance). Indeed for the three benchmarking provinces participating in TIMSS 2011 — Alberta, Ontario, and Quebec — no significant differences were found in the content area of data and chance between boys and girls (Mullis et al., 2012). Although there are differences between the mathematics frameworks of these assessments, this comparison serves to highlight that gender differences are not straightforward and that deeper exploration is required in order to identify strategies to promote learning equity.

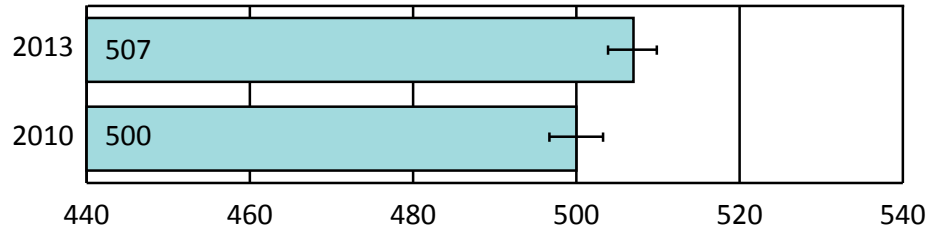
CHART 6.3 **Results in mathematics by gender**



Changes over time in mathematics achievement: 2010 and 2013

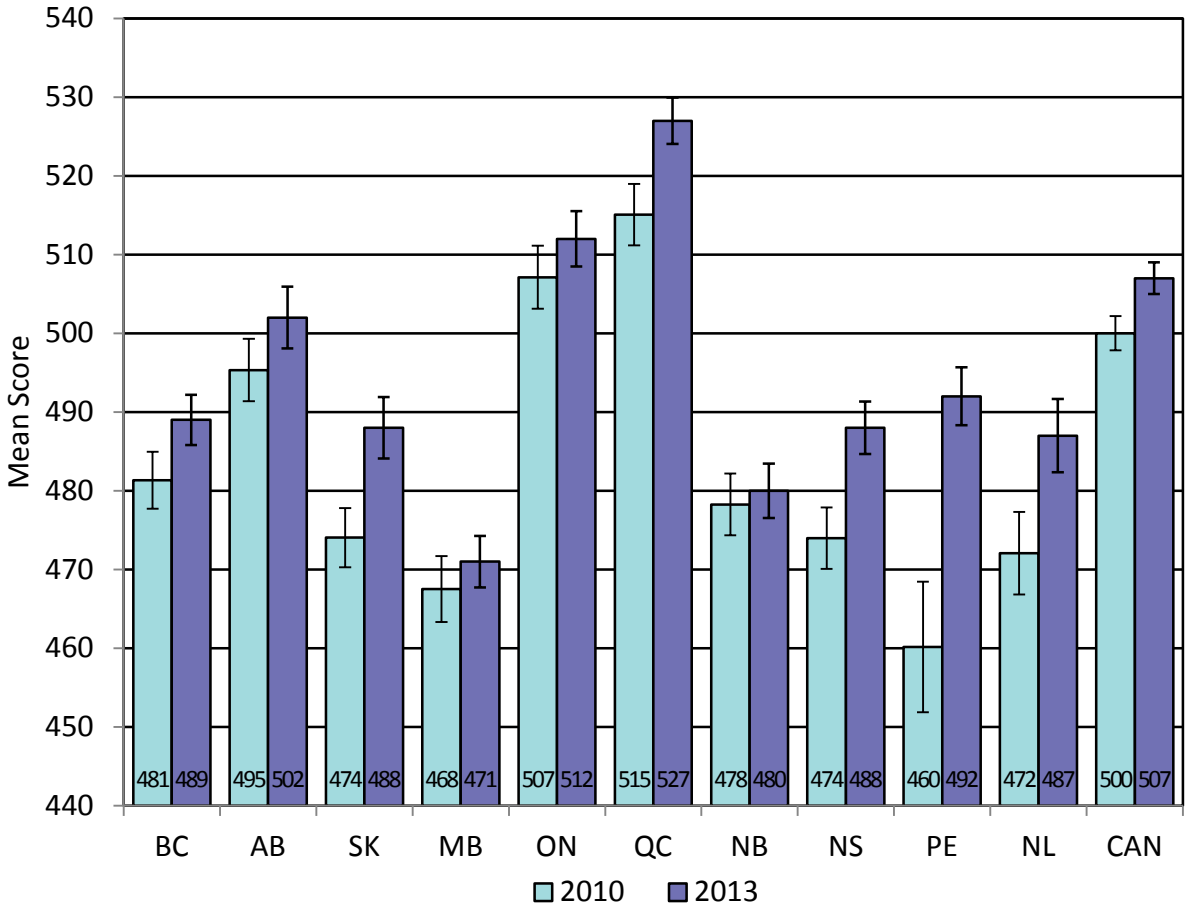
As presented in Chart 6.4, based on the PCAP assessment, mathematics achievement has improved overall in Canada from 2010 to 2013 although there is much variation among jurisdictions as shown in Chart 6.5. This is not consistent with the most recent PISA results, which suggest a decrease in mathematics achievement between 2003 and 2012 at age 15 (Brochu et al, 2013).

CHART 6.4 **Canadian results over time in mathematics**



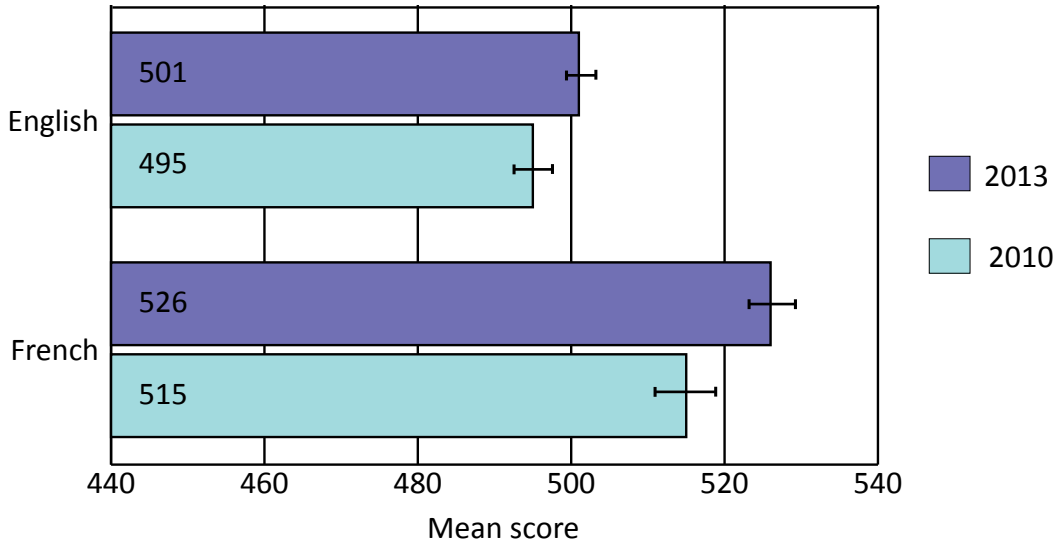
As presented in the Chart 6.5, jurisdictions with results that indicate positive change in mathematics achievement are British Columbia, Alberta, Saskatchewan, Quebec, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador. Although the PCAP 2013 mathematics test included items from each of the four sub-domains in mathematics and a range of difficulties, the content coverage in PCAP 2013 is limited because mathematics was a minor domain in this assessment. Although caution must be used when analyzing the data for minor domains and with only two data points, jurisdictions could look toward changes to their curricula and their numeracy projects in order to identify the mathematics content areas that influenced these positive results within their jurisdictions.

CHART 6.5 **Changes over time in mathematics by jurisdiction**



French-language school systems continue to outperform English-language schools systems as shown in Chart 6.6. This is not surprising given the strong performance in mathematics in Quebec. This is consistent with results for Canada overall and in Quebec reported in PISA 2012 in which mathematics achievement in francophone school systems was higher than in the anglophone school systems (Brochu et al., 2013).

CHART 6.6 **Canadian changes over time in mathematics by language**



Although mathematics achievement improved overall in Canada for both language systems, there is variation both among and within jurisdictions as presented in Table 6.4. A significant positive change in mathematics achievement is seen in English-language schools in British Columbia, Alberta, Saskatchewan, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador. In French-language schools systems, a positive change over time is found in British Columbia, Saskatchewan and Quebec. Only Ontario French-language schools show a negative change in achievement between 2010 and 2013.

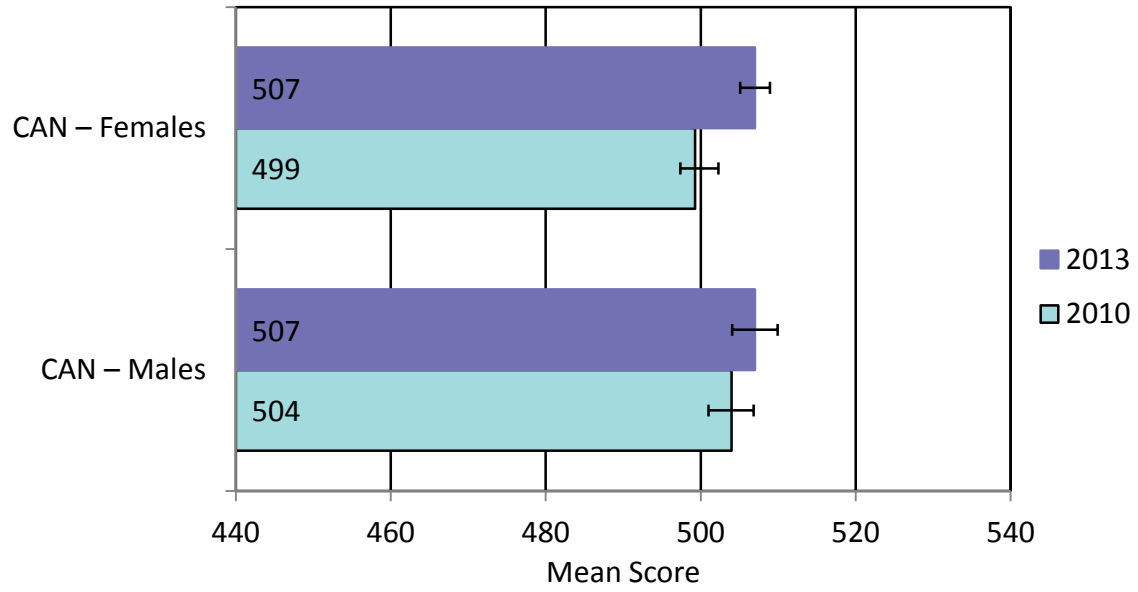
TABLE 6.4 **Changes over time in mathematics by jurisdiction and by language of the school system**

	2013		2010		Difference (2013–2010)
	Mean	CI	Mean	CI	
BCe	489	3.3	481	3.8	8*
BCf	513	6.2	504	5.0	9*
ABe	502	4.0	495	3.9	7*
ABf	502	3.6	504	5.3	-2
SKe	487	3.4	474	3.8	13*
SKf	518	2.1	498	7.1	20*
MBe	470	2.6	467	4.2	3
MBf	476	2.9	480	3.5	-4
ONe	512	2.9	507	4.7	5
ONf	500	3.9	511	3.7	-11*
QCe	509	4.0	507	6.6	2
QCf	529	3.5	516	3.5	13*
NBe	470	3.8	466	4.9	4
NBf	507	5.7	507	5.3	0
NSe	488	4.0	473	4.3	15*
NSf	499	3.6	503	3.2	-4
PEe	492	4.3	460	10.3	32*
NLe	487	4.7	472	5.2	15*
CANe	**501**	**1.9**	**495**	**2.4**	**6***
CANf	**526**	**3.0**	**515**	**3.8**	**11***

*denotes significant difference

Between 2010 and 2013, Canadian girls have shown a positive change in mathematics achievement over time, whereas there is no significant change for Canadian boys as shown in Chart 6.7.

CHART 6.7 **Canadian changes over time in mathematics by gender**



There is a very clear pattern favouring girls in jurisdictions in which there is a positive change in mathematics achievement over time as shown in Table 6.5. A positive change in performance for girls is found in Canada overall and in British Columbia, Alberta, Saskatchewan, Quebec, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador. Saskatchewan, Nova Scotia, and Newfoundland and Labrador are the only jurisdictions in which both girls and boys show a positive change in achievement in mathematics between 2010 and 2013.

TABLE 6.5 **Change in mathematics by jurisdiction and by gender**

		2013		2010		Difference (2013–2010)
		Mean	CI	Mean	CI	
BC	Females	491	4.3	475	4.9	16*
	Males	487	4.4	490	5.4	-3
AB	Females	504	5.1	491	4.8	13*
	Males	499	5.3	500	4.8	-1
SK	Females	487	4.6	475	5.3	12*
	Males	488	6.6	477	5.0	11*
MB	Females	470	3.8	468	5.1	2
	Males	471	4.1	470	6.0	1
ON	Females	511	5.3	509	6.1	2
	Males	514	5.6	508	5.8	6
QC	Females	528	4.8	513	4.6	15*
	Males	526	3.4	523	5.5	3
NB	Females	483	4.3	486	5.8	-3
	Males	477	5.2	473	5.3	4
NS	Females	489	4.0	478	4.6	11*
	Males	487	4.4	473	5.9	14*
PE	Females	498	5.9	453	11.1	45*
	Males	485	7.2	468	11.7	17
NL	Females	489	4.9	476	6.4	13*
	Males	484	6.8	471	8.0	13*
CAN	**Females**	**507**	**1.9**	**499**	**3.0**	**8***
	Males	**507**	**2.9**	**504**	**2.9**	**3**

*denotes significant difference

Summary

This chapter summarizes the performance of Canadian students on the PCAP 2013 assessment of the minor domain of mathematics. Alberta, Ontario, and Quebec continue to show very strong performance in mathematics. All other jurisdictions have mathematics achievement below the mean score for Canada overall. These results are similar to the baseline year for mathematics (PCAP 2010).

English-language schools in Alberta, Ontario, and Quebec continue to perform well in mathematics with achievement at or above the Canadian English mean. A significant positive change in results between 2010 and 2013 is found in British Columbia, Alberta, Saskatchewan, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador.

Only Quebec French-language schools performed at the Canadian mean in PCAP 2013, with all others below the Canadian mean score. In French-language schools, a significant positive change is mathematics achievement between 2010 and 2013 is found in British Columbia, Saskatchewan and Quebec; however, a significantly negative change was found in Ontario.

Although Canadian students consistently perform well in mathematics in international assessments, PISA 2012 identified a clear trend showing a decrease in average score in most provinces for 15-year-olds (Brochu et al, 2013). The trend for Grade 8/Secondary II students in TIMSS 2011 is less clear for the two participating provinces. For Ontario and Quebec, although the results in mathematics were significantly lower between 2003 and 2011, there was no significant difference in achievement between 2007 and 2011 (Mullis et al., 2012). Overall in Canada, Grade 8/Secondary II students assessed in PCAP 2013 showed small but significant improvement in mathematics achievement compared to PCAP 2010. The achievement results were quite variable among jurisdictions with positive changes ranging from 7 points in Alberta to 32 points in Prince Edward Island.

The most remarkable improvement was shown by Grade 8/Secondary II girls in PCAP 2013, with significant improvement in mathematics achievement in seven jurisdictions. At the international level, although boys were stronger in all of the content and process subscales for each province in PISA 2012 (Brochu et al., 2013), boys consistently outperformed girls in only one content subscale in TIMSS 2011. Grade 8/Secondary II girls either outperformed or were not significantly different from boys on the other three subscales (Mullis et al., 2012).

The observed improvement between 2010 and 2013 in mathematics achievement identified in this study may point toward the success of numeracy-focused programs currently in place in jurisdictions. Caution is necessary in interpreting these results, however, because of the limitation of drawing conclusions based on two data points and on the limited number of items that the assessment of a minor domain comprises. Further research is needed to provide insight into why student success in mathematics, and particularly the success of girls in mathematics, diminishes as they advance through their study of mathematics at the secondary level.

7 ASSESSMENT RESULTS BY JURISDICTION

This chapter presents the PCAP 2013 achievement results for all participating jurisdictions in Canada. There are 10 sections in this chapter, which are ordered to represent the jurisdictions from west to east. Each section begins with a context statement for the jurisdiction; the results are presented first for science, then for reading, and finally for mathematics. In addition to overall results, achievement is reported by the majority and minority language in the school system and by gender. For reading and mathematics, changes over time are also reported.

BRITISH COLUMBIA

Context Statement

Social context

British Columbia has a population of approximately four million. Eighty-six per cent of the population lives in urban areas, the largest portion of which is concentrated in the Greater Vancouver area. The province promotes equity and high achievement for all students, regardless of their backgrounds. (www.gov.bc.ca/bced).

Organization of the school system

Approximately 565,000 students are enrolled in the public school system; 74,000 are enrolled in independent schools; and 2,000 are in home schools. The province has 60 school districts, including one francophone school district.

The *Conseil scolaire francophone (CSF)* offers French-language educational programs to approximately 4,700 students whose parents choose to exercise their rights under Section 23 of the *Canadian Charter of Rights and Freedoms*. The CSF offers its programs in 37 schools across the province. The CSF program aims to help francophone students develop and maintain a sense of cultural identity in a social and educational context. The language of instruction in the schools is French, except for English language arts.

Science teaching

The BC curriculum for K–12 science is published in curriculum documents and is available in both English and French. The structure of the documents varies depending on when they were published. While some of the documents may contain additional teacher-support information, all of them contain the provincially prescribed curriculum (Prescribed Learning Outcomes or PLOs). Most provincial curriculum documents also contain achievement indicators, which are not mandated but which describe the breadth and depth of the PLOs.

BC students are required to take science from Kindergarten to Grade 10. In order to graduate, students are also required to complete a Grade 11- or Grade 12-level science course. The provincial science curriculum is aligned with the *Common Framework of Science Learning Outcomes, K to 12* (CMEC, 1997) and is organized around four curriculum strands: processes of science, life science, physical science, and earth and space science. Additional information, as well as the curriculum documents, can be found on the Ministry of Education Web site. (http://www.bced.gov.bc.ca/irp/subject.php?lang=en&subject=Sciences)

The science curriculum is also offered in French for students enrolled in the French Immersion program.

It is important to note that the provincial curriculum in BC is currently undergoing major transformation and is being redesigned. The redesign focuses on curriculum that is concept-based and competency-driven. This redesign will be completed and implemented in the coming years, and the changed emphasis will impact all areas, including science.

Science assessment

To graduate in BC, students are required to write five course-based exams, including a Grade 10 science exam. The exam score at Grade 10 counts for 20 per cent of the final grade. (www.bced.gov.bc.ca/exams/)

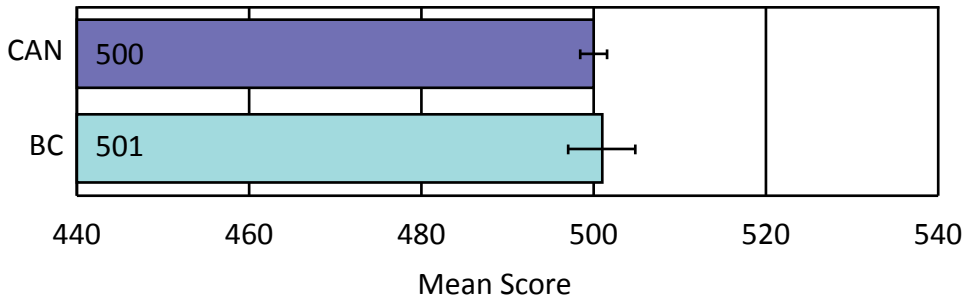
BC students also participate in international assessments: the Progress in International Reading Literacy Study and the Programme for International Student Assessment. (www.bced.gov.bc.ca/assessment/nat_int_pubs.htm)

Results in science

The performance of British Columbia students in science is compared to that of Canadian students overall. Results are presented both by mean score and by performance level. The following charts present student achievement in science overall, by language of the school system, and by gender.

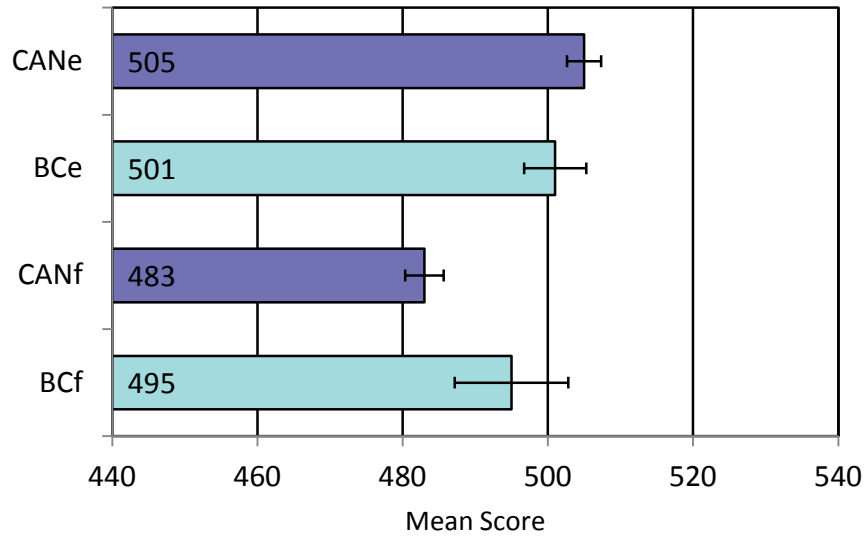
As presented in the following chart, the mean score of British Columbia students who completed the PCAP 2013 Science Assessment is statistically the same as that of Canadian students overall.

CHART BC.1 **Canada – British Columbia: Mean score in science**



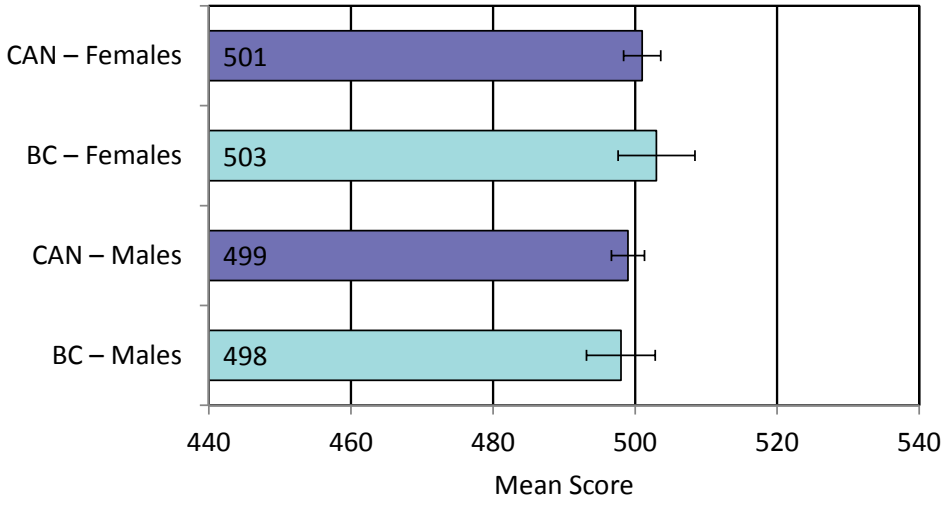
British Columbia students enrolled in English-language schools achieve similar results to their Canadian counterparts. The mean score for students enrolled in French-language schools is statistically higher than the overall Canadian French mean.

CHART BC.2 **Canada – British Columbia: Results in science by language**



In British Columbia, there is no significant difference in science achievement between boys and girls either within the province or when compared to other Canadian students.

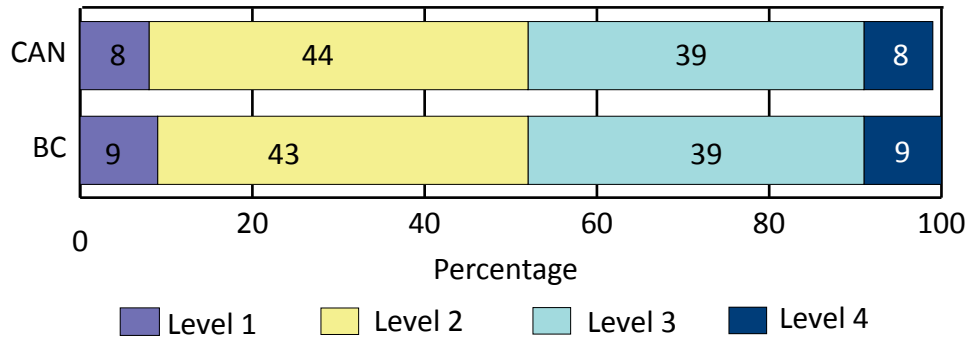
CHART BC.3 **Canada – British Columbia: Results in science by gender**



The percentage of students at each of the four performance levels in science is examined by jurisdiction, by language of the school system, and by gender, as presented in the next three charts. Level 2 is the expected level of achievement in science for Grade 8/Secondary II students in Canada.

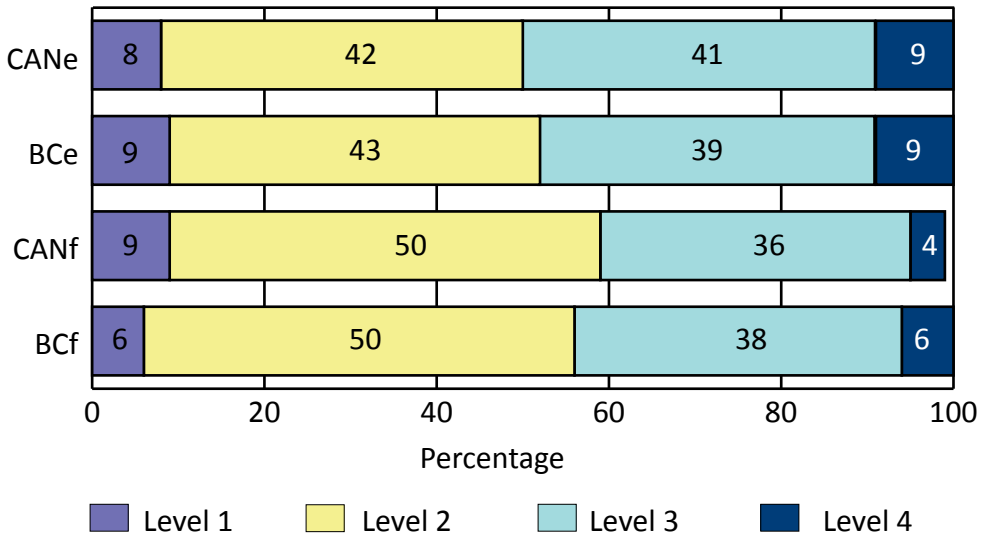
In British Columbia, 91 per cent of students achieve level 2 or above. The percentage of students who perform at level 2 is similar in British Columbia and in Canada overall; and similar proportions of students achieve the higher levels of performance in Canada and British Columbia.

CHART BC.4 **Canada – British Columbia: Percentage of students by performance level in science**



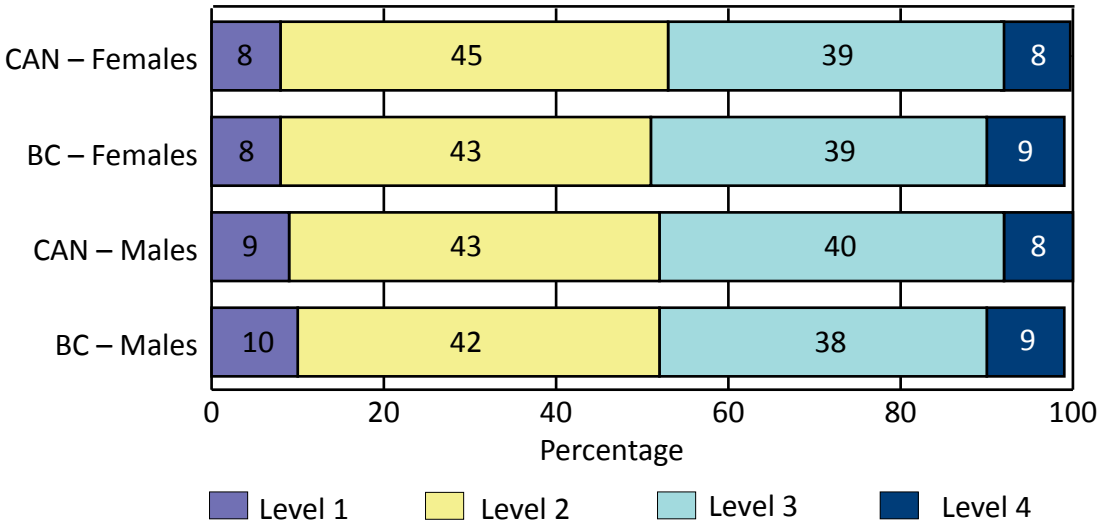
In British Columbia, 91 per cent of English-language students and 94 per cent of French-language students perform at level 2 or above. Compared to the Canadian results, a similar proportion of students in English- and French-language schools achieve at the higher levels of performance.

CHART BC.5 **Canada – British Columbia: Comparison by level of performance in science by language**



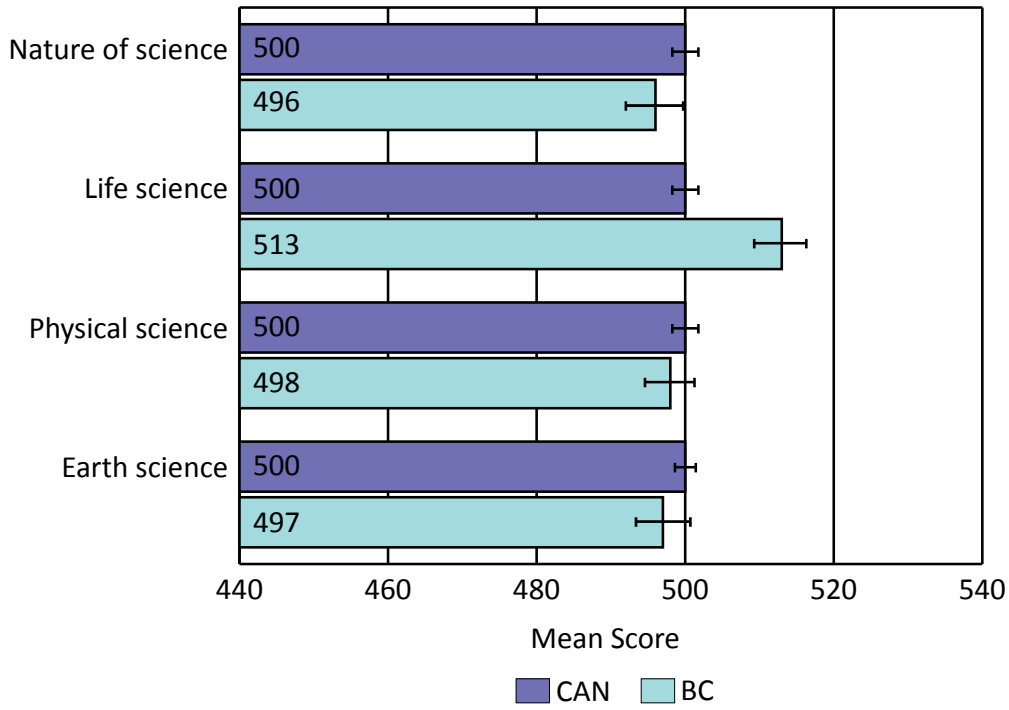
In British Columbia, 91 per cent of girls and 89 per cent of boys perform at level 2 and above, and there is no gender difference at the higher levels of performance. Compared to the Canadian results, a similar proportion of both girls and boys achieve at levels 3 and 4.

CHART BC.6 **Canada – British Columbia: Comparison by level of performance in science by gender**



When the results are examined by sub-domain in science, achievement in life science is significantly higher in British Columbia than in Canada overall.

CHART BC.7 **Canada – British Columbia: Results by sub-domain in science**



As presented in the table below, British Columbia students enrolled in the English-language school system achieve lower scores in nature of science than Canadian English-language students. In French-language school systems, student achievement is higher in nature of science and in life science compared to the Canadian means. Within British Columbia, there is no significant difference in each of the four subdomains between the two language systems.

TABLE BC.1 **Canada – British Columbia: Results by sub-domain and language**

	Nature of science		Life science		Physical science		Earth science	
	Mean	CI	Mean	CI	Mean	CI	Mean	CI
CANe	504	2.2	506	2.6	504	2.3	502	2.5
BCe	496	4.7	513	4.6	498	3.9	497	3.9
Difference	**8***		7		6		5	
CANf	487	2.6	481	3.0	488	3.3	492	2.4
BCf	499	8.0	503	8.8	494	8.6	488	7.2
Difference	**12***		**22***		6		4	
BCe	496	4.7	513	4.6	498	3.9	497	3.9
BCf	499	8.0	503	8.8	494	8.6	488	7.2
Difference	3		10		4		9	

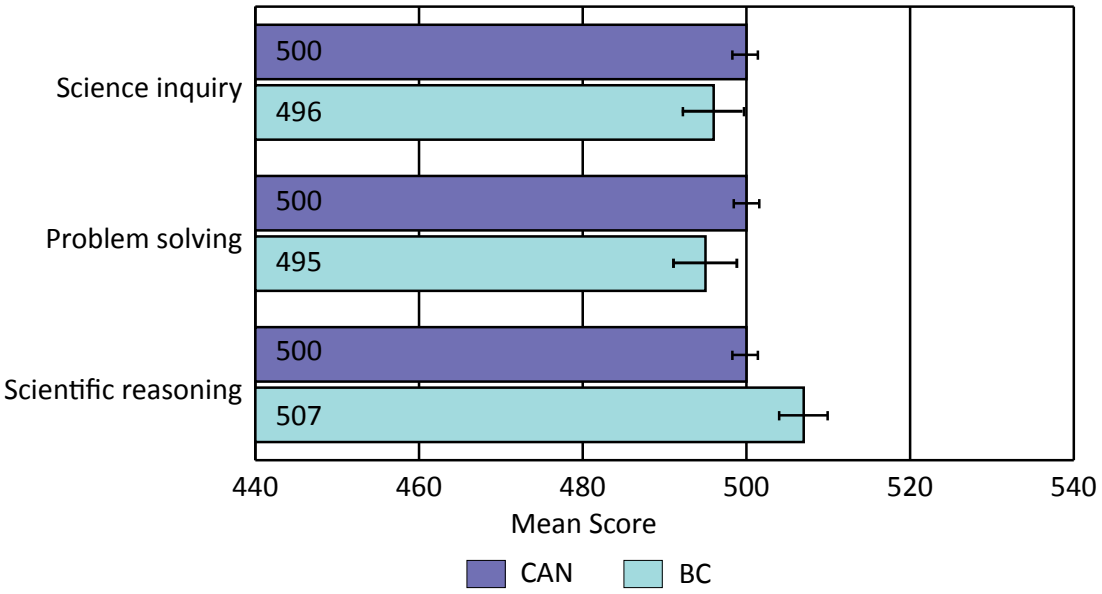
Both boys and girls in British Columbia have higher achievement in life science compared to the Canadian means. Within the province, girls outperform boys in life science.

TABLE BC.2 **Canada – British Columbia: Results by sub-domain and gender**

	Nature of science		Life science		Physical science		Earth science	
	Mean	CI	Mean	CI	Mean	CI	Mean	CI
CAN – Females	501	2.7	501	2.5	499	2.5	501	3.3
BC – Females	497	5.0	517	4.9	500	5.7	497	5.2
Difference	4		**16***		1		4	
CAN – Males	499	2.8	499	2.1	501	2.4	500	2.9
BC – Males	495	6.1	508	5.0	496	5.5	497	4.6
Difference	4		**9***		5		3	
BC – Females	497	5.0	517	4.9	500	5.7	497	5.2
BC – Males	495	6.1	508	5.0	496	5.5	497	4.6
Difference	2		**9***		4		0	

When results are examined by competency in science, students in British Columbia achieve statistically higher results in scientific reasoning compared to the other two competencies and compared to the Canadian mean.

CHART BC.8 **Canada – British Columbia: Results by competency in science**



British Columbia students enrolled in English-language schools have lower achievement in science inquiry and problem solving than their Canadian counterparts. In French-language schools, students have higher scores in both science inquiry and scientific reasoning compared to the Canadian French means. Within British Columbia, there is no significant difference in each of the three competencies between the two language systems.

TABLE BC.3 **Canada – British Columbia: Results by competency and language**

	Science inquiry		Problem solving		Scientific reasoning	
	Mean	**CI**	**Mean**	**CI**	**Mean**	**CI**
CANe	504	2.0	503	2.1	505	1.9
BCe	496	4.0	495	3.8	507	4.0
Difference	**8***		**8***		2	
CANf	487	2.8	490	3.2	482	2.7
BCf	501	8.9	491	7.2	496	8.7
Difference	**14***		1		**14***	
BCe	496	4.0	495	3.8	507	4.0
BCf	501	8.9	491	7.2	496	8.7
Difference	5		4		11	

Compared to the Canadian results, British Columbia girls have higher achievement in scientific reasoning. Within British Columbia, girls outperform boys in science inquiry.

TABLE BC.4 **Canada – British Columbia: Results by competency and gender**

	Science inquiry		Problem solving		Scientific reasoning	
	Mean	**CI**	**Mean**	**CI**	**Mean**	**CI**
CAN – Females	503	2.6	499	3.0	499	2.5
BC – Females	501	5.2	497	4.9	507	4.5
Difference	2		2		**8***	
CAN – Males	497	3.3	501	2.4	501	2.7
BC – Males	492	6.4	493	5.2	507	5.4
Difference	5		8		6	
BC – Females	501	5.2	497	4.9	507	4.5
BC – Males	492	6.4	493	5.2	507	5.4
Difference	**9***		4		0	

Reading and mathematics results

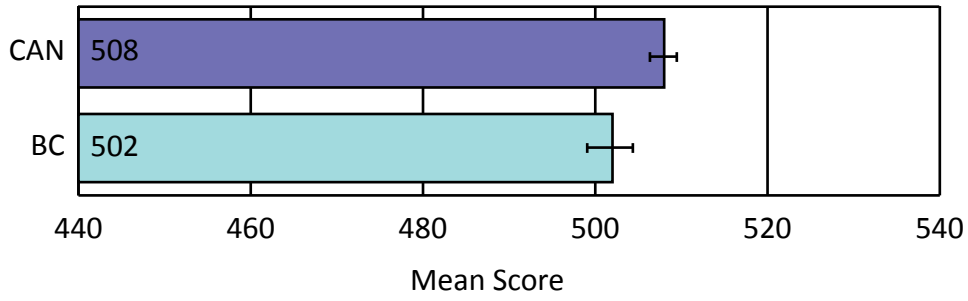
In PCAP 2013, reading and mathematics are both minor domains. Results are reported overall, by language of the school system, and by gender. Finally, multiple comparisons over time between PCAP assessments are reported.

Results in reading

The following charts present student achievement for Canada and British Columbia in reading overall, by language of the school system, and by gender.

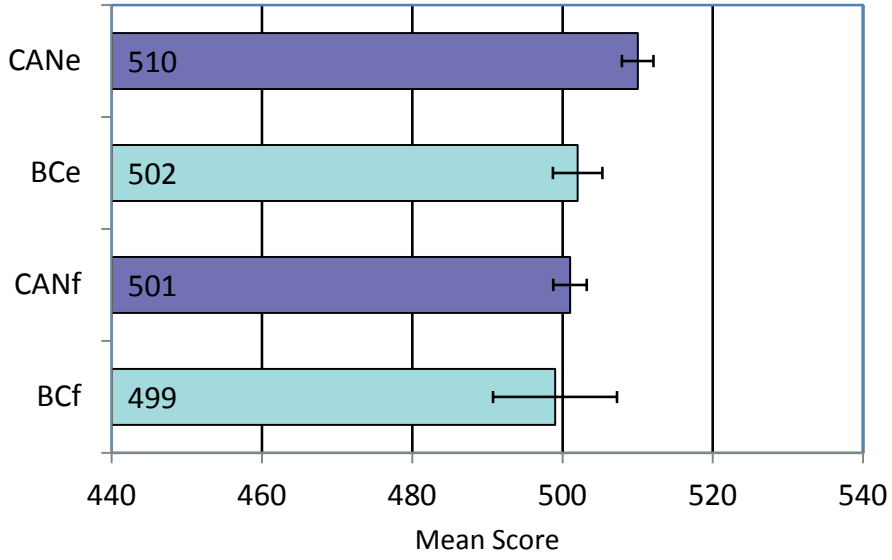
In PCAP 2013, reading achievement in British Columbia is significantly lower than the Canadian mean score, as shown in the chart below.

CHART BC.9 **Canada – British Columbia: Mean score in reading**



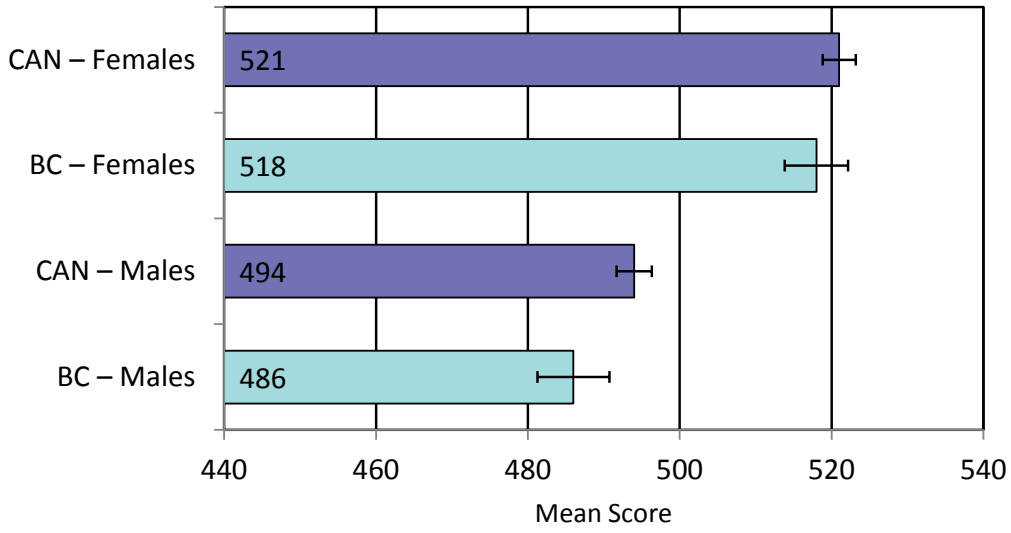
As shown in the following chart, reading scores in English-language schools in British Columbia are significantly lower than the Canadian English mean; however, there is no significant difference between students in British Columbia French-language schools and their Canadian counterparts. Within the province, achievement results are statistically similar between the majority and minority language systems.

CHART BC.10 **Canada – British Columbia: Results in reading by language**



Reading achievement for girls in British Columbia is statistically similar to Canadian students overall, whereas boys achieve lower scores than Canadian boys overall. Girls outperform boys in reading both within the province (by 32 points) and in Canada overall (by 27 points) as shown in the PCAP 2013 assessment of reading.

CHART BC.11 **Canada – British Columbia: Results in reading by gender**

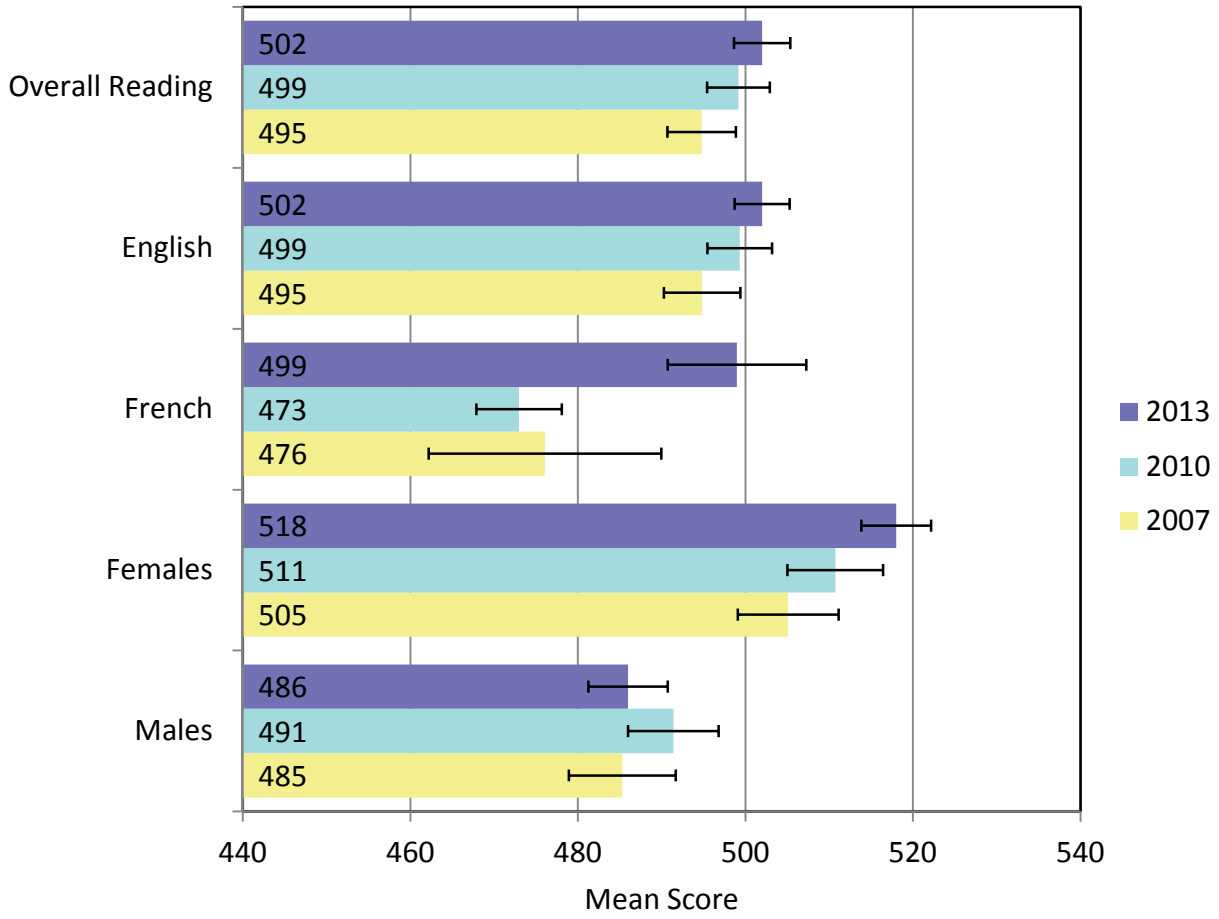


Comparison of reading results: 2007, 2010, and 2013

Reading was a major domain in PCAP 2007. As a minor domain in 2010 and 2013, the assessment comprised fewer reading items; however, common items among the three assessments allow the reporting of changes over time for reading achievement.

As shown in the following chart, reading achievement shows a positive change over time for British Columbia French-language students and for girls. There are no other significant changes over time in reading achievement at the jurisdiction level.

CHART BC.12 **Canada – British Columbia: Changes over time in reading**

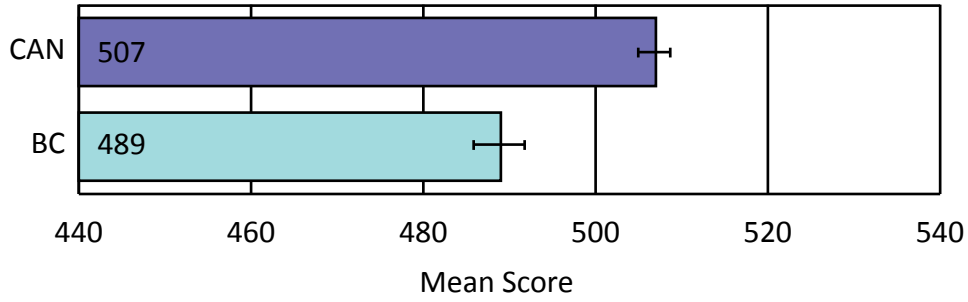


Results in mathematics

The following charts present student achievement for Canada and British Columbia in mathematics overall, by language of the school system, and by gender.

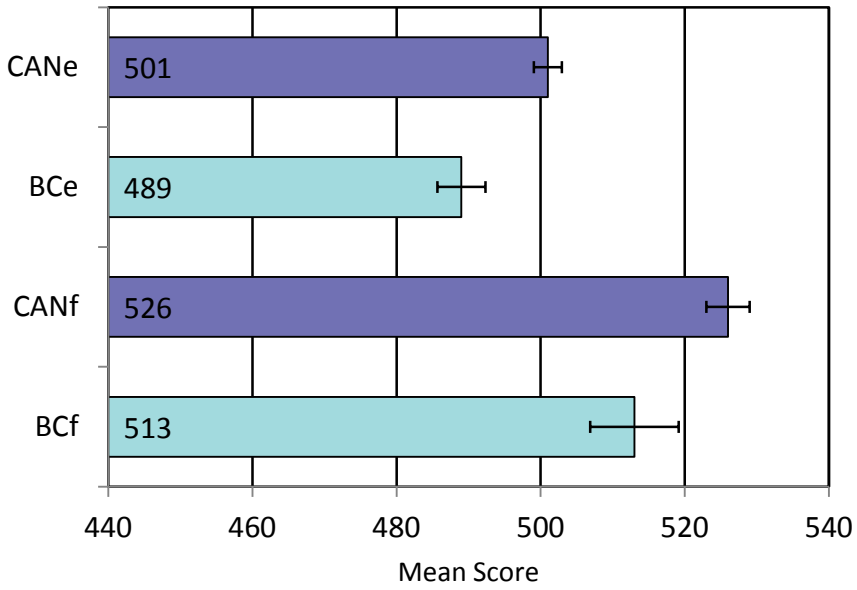
In PCAP 2013, mathematics achievement in British Columbia is significantly lower than in Canada overall, as shown in the chart below.

CHART BC.13 **Canada – British Columbia: Mean score in mathematics**



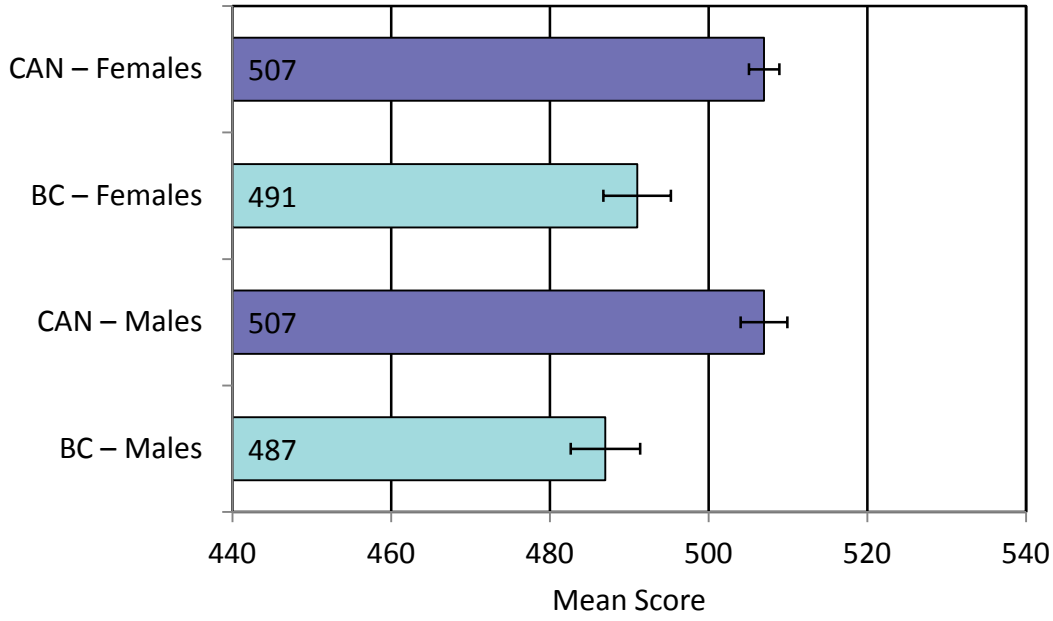
As shown in the following chart, mathematics scores in both English- and French-language schools are significantly lower than the respective Canadian means. Within the province, students in French-language schools outperform those in English-language schools in mathematics.

CHART BC.14 **Canada – British Columbia: Results in mathematics by language**



In British Columbia, as in Canada overall, there is no gender gap in mathematics; however, both boys and girls have lower achievement in mathematics compared to Canadian boys and girls overall.

CHART BC.15 **Canada – British Columbia: Results in mathematics by gender**

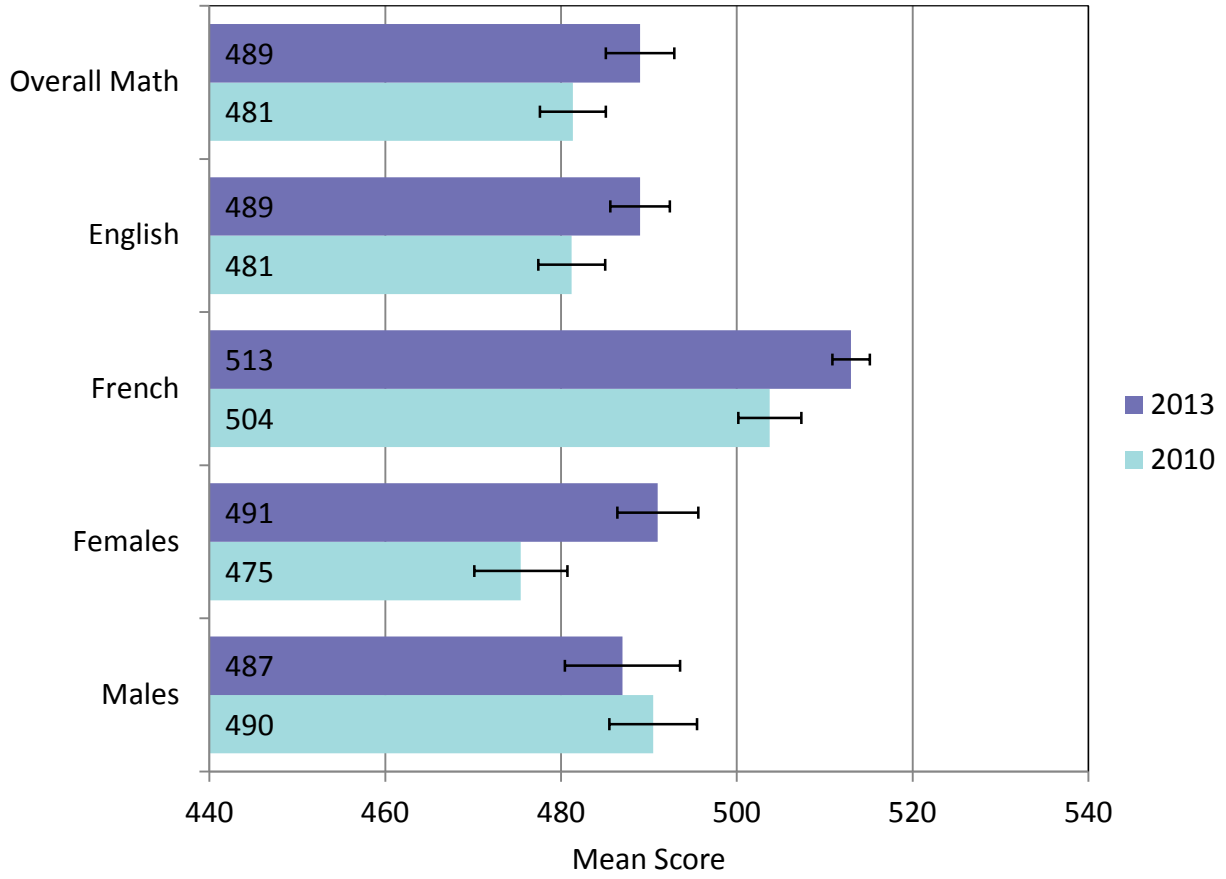


Comparison of mathematics results: 2010 and 2013

Mathematics was a major domain in PCAP 2010, which was the baseline year. As a minor domain in 2013, the assessment comprised fewer mathematics items; however, common items between the two assessments allow the reporting of changes over time for mathematics achievement.

As shown in the PCAP 2013 assessment of mathematics, there have been significant positive changes over time in British Columbia. The mathematics achievement results in 2013 are higher than those for 2010 in mathematics overall, for both English- and French-language schools, and for girls. There is no significant difference between the two administrations for boys in British Columbia.

CHART BC.16 **Canada – British Columbia: Changes over time in mathematics**



ALBERTA

Context Statement

Social context

Alberta is home to a culturally diverse population of more than four million people with recent growth due mainly to record levels of interprovincial and international migration into the province. Also, Alberta has a relatively young population with a median age of approximately 36 years, the lowest median age of all Canadian provinces.

The Government of Alberta has the primary responsibility for education in Kindergarten through Grade 12, and it shares this responsibility with local school boards.

Organization of the school system

Several school choices exist in Alberta, including public, separate, francophone, private, and charter schools. In Alberta, separate schools, which can be either Roman Catholic (in most cases) or Protestant, are all funded on the same basis as public schools. Students also have access to a number of unique and innovative programs including home education, online or virtual schools, outreach programs, and alternative programs. Students in Alberta are required to attend school from ages 6 to16, although parents may choose to homeschool their children.

In the 2012-2013 school year, 616,375 students were registered in 2,155 schools in Alberta. Of these students, 69 per cent attended public schools; 23 per cent attended separate schools; and the remaining 6 per cent attended a variety of private, charter, special, and federal schools. Approximately 6,300 students (1 per cent) were enrolled in French-first-language programs offered by the four francophone school authorities.

The elementary and secondary science programs help prepare students for life in a rapidly changing world — a world of expanding knowledge and technology in which new challenges and opportunities continually arise.

The purpose of the elementary science program is to encourage and stimulate children's learning by nurturing their sense of wonder, by developing skill and confidence in investigating their surroundings, and by building a foundation of experience and understanding upon which later learning can be based.

The secondary science program is guided by the vision that all students have the opportunity to develop scientific literacy. The goal of scientific literacy is to develop the science-related knowledge, skills and attitudes that students need to solve problems and make decisions, and at the same time help them become lifelong learners.

To support the development of science literacy, school programs must provide a foundation of learning experiences that address critical aspects of science and its application. These critical areas — the foundations of the program — provide general direction for the program and identify major components of its structure.

Science teaching

Alberta Education's elementary science program (Grades 1 to 6) engages students in a process of inquiry and problem-solving in which they develop both knowledge and skills. The elementary science program is based on the following principles:

- Children's curiosity provides a national starting point for learning.
- Children's learning builds on what they currently know and can do.
- Communication is essential for science learning.
- Students learn best when they are challenged and actively involved.
- Confidence and self-reliance are important outcomes of learning.

The junior high science program of study (Grades 7 to 9) is guided by the vision that all students have the opportunity to develop scientific literacy. The goals of this program work toward achieving this vision:

- encouraging students at all grade levels to develop a critical sense of wonder and curiosity about scientific and technical endeavours;
- enabling students to use science and technology to acquire new knowledge and solve problems in order to improve the quality of their own lives and the lives of others;
- preparing students to critically address science-related societal, economic, ethical, and environmental issues;
- providing students with a foundation in science that creates opportunities for them to pursue progressively higher levels of study, and prepares them for science-related hobbies appropriate to their interests and abilities; and
- enabling students of varying aptitudes and interests to develop knowledge of the wide spectrum of careers related to science, technology, and the environment.

To support the development of scientific literacy, each unit of study for each grade is structured around the following four foundational areas that address the critical aspects of science and its application:

- Foundation 1: Science, Technology, and Society — Students develop an understanding of the nature of science and technology, the relationships between science and technology, and the social and environmental contexts of science and technology;
- Foundation 2: Knowledge — Students construct knowledge and conceptual understanding in life science, physical science, and Earth and space science, and apply this understanding to interpret, integrate, and extend their knowledge;
- Foundation 3: Skills — Students develop the skills required for scientific and technological inquiry, for problem-solving, for communicating scientific ideas and results, for working collaboratively, and for making informed decisions; and

- Foundation 4: Attitudes — Students will be encouraged to develop attitudes that support the responsible acquisition and application of scientific and technological knowledge to the mutual benefit of self, society, and the environment.

Each unit has an identified science, technology, and society emphasis through which the other foundations can be developed. Units with a nature of science emphasis focus on the processes by which scientific knowledge is developed and tested, and on the nature of scientific knowledge itself. The skills emphasized in these units are scientific-inquiry skills. The science and technology emphasis encourages students to seek solutions to practical problems by developing and testing prototypes, products, and techniques to meet a given need. Problem-solving skills in combination with scientific-inquiry skills are emphasized. Finally, in units with a social and environmental emphasis, students focus on issues and decisions relating to applications of science and technology. In these units, emphasis is placed on using research and inquiry skills to inform the decision-making process.

Knowledge and Employability science courses (Grades 8, 9, 10-4, and 20-4) are focused on developing and applying essential science skills, knowledge, and attitudes needed for everyday living at home, in the workplace, and in the community. The courses emphasize career and life skills, teamwork, communication skills, and thinking processes.

The senior high science programs (Science 10, Science 14-24, Biology 20-30, and Chemistry 20-30, Physics 20-30, and Science 20-30) will help all students attain the scientific awareness needed to function as effective members of society. Students will be able to pursue further studies and careers in science, and develop a better understanding of themselves and the world around them. The expected student knowledge, skills, and attitudes are approached from a common philosophical position in each science course.

Courses in the senior high school sciences incorporate Aboriginal perspectives in order to develop, in all students, an appreciation of the cultural diversity and achievements of First Nations, Métis, and Inuit (FNMI) peoples.

Current graduation requirements for an Alberta High School Diploma require a student to successfully complete a 20-level course in science. The science requirement can also be met with a combination of Science 14 and Science 10.

Science assessment

Alberta participated in three previous School Achievement Indicators Program (SAIP) science assessments, as well as the Pan-Canadian Assessment Program (PCAP) in 2010 (mathematics focus) and 2007 (reading focus).

Alberta has also participated in a number of international studies of achievement including the International Association for the Evaluation of Educational Achievement's (IEA) Trends in International Mathematics and Science Study (TIMSS) since 1995 and the Organisation for Economic Co-operation and Development's (OECD) Programme for International Student Assessment (PISA) since 2000. Through its active involvement in these international studies and the ensuing trend analyses of student achievement levels, Alberta is able to identify and understand its students' strengths and weaknesses in an international context compared to other participating countries and jurisdictions.

In addition to extensive classroom assessment, student achievement in science has been monitored through curriculum-based Provincial Achievement Tests (PATs) that are administered annually at the end of Grades 6 and 9. As well, each of the provincial Diploma Examinations, which account for 50 per cent of a student's final mark in the Grade 12 science courses including Biology 30, Chemistry 30, Physics 30, and Science 30, are administered three times a year in January, June, and August, while some are also administered in April or November. These tests and examinations are jointly developed by departmental staff and classroom teachers using provincial programs of study and provide information on the degree to which students meet provincial standards. Following each major test administration, based on the data collected from the provincial assessment, detailed reports at the district, school, class, and individual student levels are generated and sent back to schools. Teachers and other school and jurisdictional personnel use these reports to help identify their students' strengths and areas for instructional improvement.

Alberta's vision of Inspiring Education is to support students to become engaged thinkers and ethical citizens with an entrepreneurial spirit. Alberta Education is leading a Curriculum Redesign initiative that will help build Alberta and bring the vision of Inspiring Education to life by supporting teachers' best practices and encouraging innovation to ensure all students have the opportunity to reach their full potential. Curriculum Redesign involves revising the provincial programs of study, assessment, and learning and teaching resources, as well as the development process. New digitally based curriculum will have a greater focus on developing cross-curricular competencies and ensuring literacy and numeracy are foundational in student learning. These changes mean moving from what students know to how student apply what they know in life and in work. As provincial programs of study change, provincial standardized tests will also change.

Beginning in the 2014-2015 school year, new provincial assessments, called Student Learning Assessments (SLAs), will be phased in to replace the existing Provincial Achievement Tests (PATs). The new SLAs, which will be administered digitally at the start of Grades 3, 6, and 9, will better inform parents and teachers of a student's strengths and areas needing improvement in literacy, numeracy, and how well students demonstrate competencies such as critical thinking and problem solving.

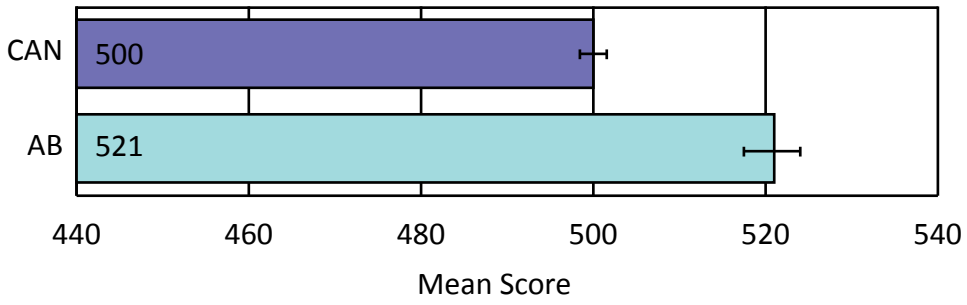
For more information, see Alberta Education's Web site at
http://education.alberta.ca/home.aspx (English) or
http://education.alberta.ca/francais.aspx (French).

Results in science

The performance of Alberta students in science is compared to that of Canadian students overall. Results are presented both by mean score and by performance level. The following charts present student achievement in science overall, by language of the school system, and by gender.

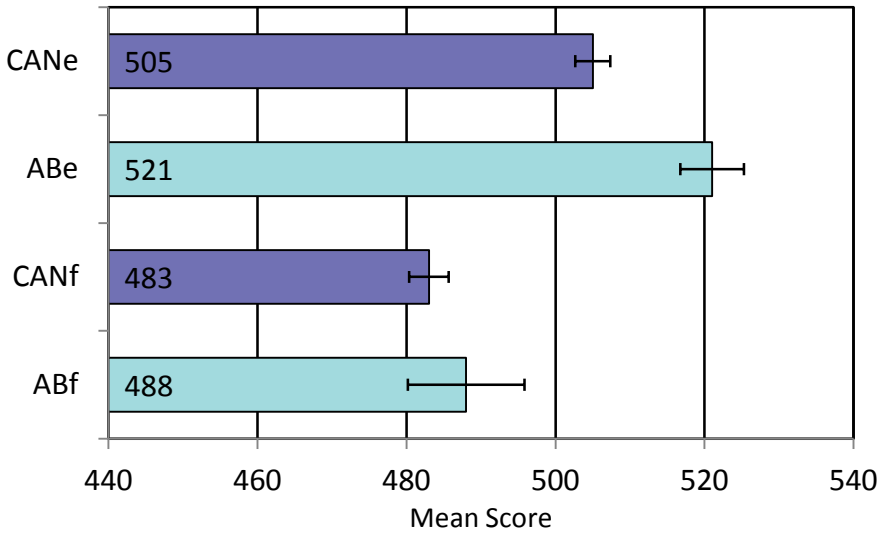
The mean score of Alberta students who completed the PCAP 2013 Science Assessment is significantly higher than that of Canadian students overall, as shown in the chart below.

CHART AB.1 **Canada – Alberta: Mean score in science**



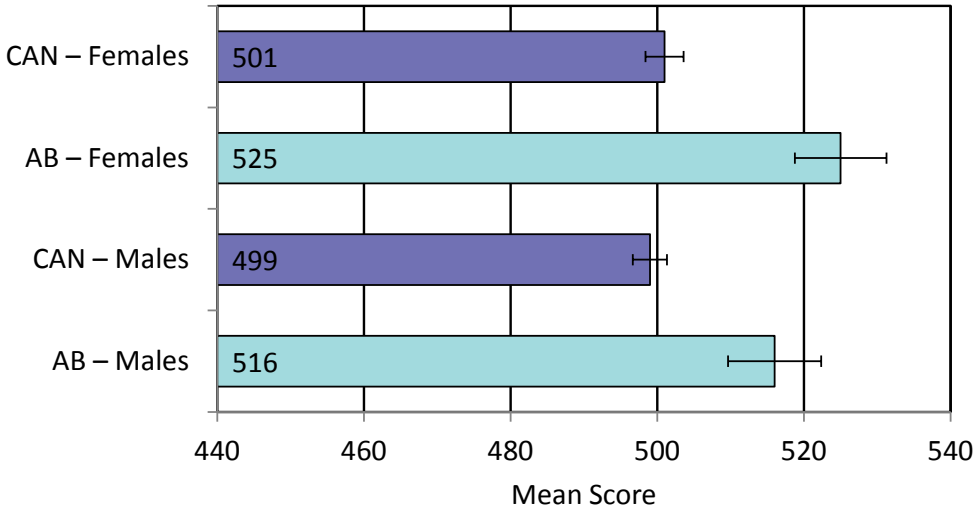
Alberta students enrolled in English-language schools perform significantly better in science than those in Canada overall. Within the province, students in the English-language school system outperform those in French-language schools.

CHART AB.2 **Canada – Alberta: Results in science by language**



In Alberta, both boys and girls achieve significantly higher scores than those in Canada overall. Within the province, girls outperform boys in science.

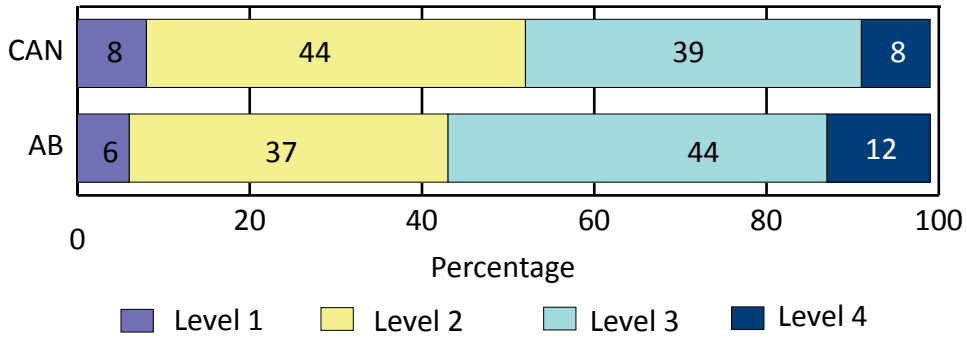
CHART AB.3 **Canada – Alberta: Results in science by gender**



The percentage of students at each of the four performance levels in science is examined by jurisdiction, by language of the school system, and by gender, as presented in the next three charts. Level 2 is the expected level for Grade 8/Secondary II students in Canada.

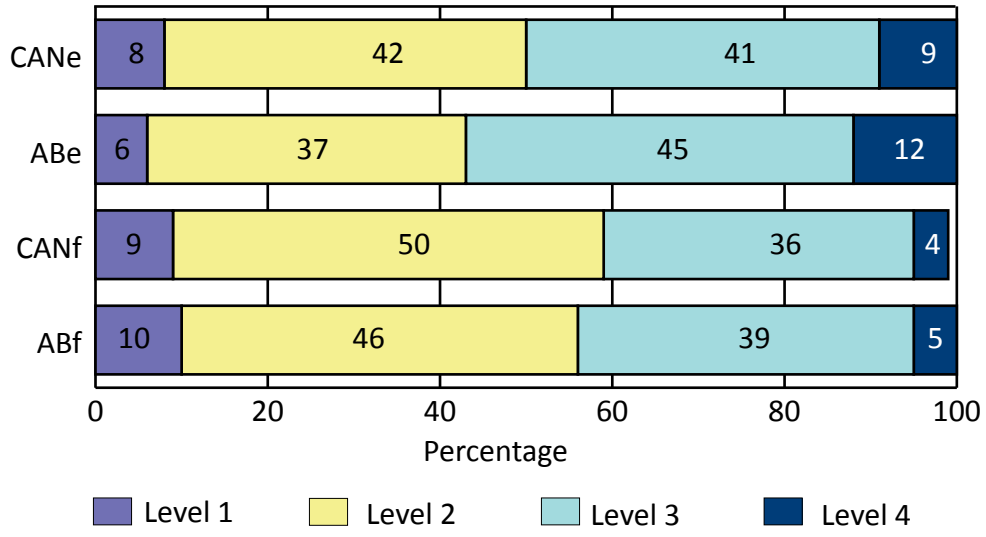
In Alberta, a higher proportion of students achieve at or above the expected level of performance compared to Canada overall. Indeed, 12 per cent of Alberta students achieve at the highest level in science compared to 8 per cent in Canada overall.

CHART AB.4 **Canada – Alberta: Percentage of students by performance level in science**



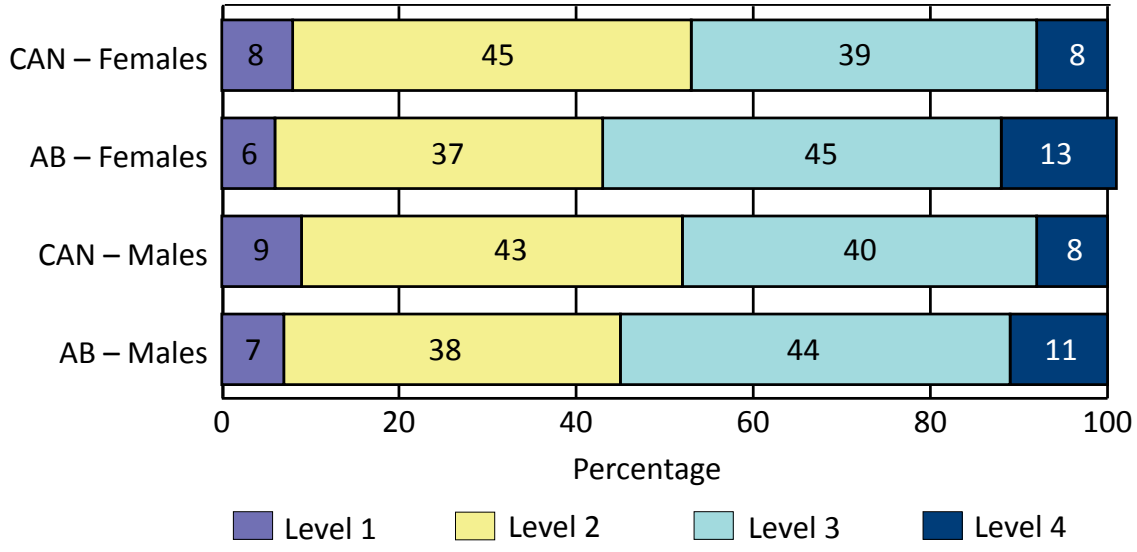
In Alberta, 94 per cent of English-language students and 90 per cent of French-language students perform at level 2 or above. Compared to the Canadian results, more students in both English- and French-language schools achieve at the higher levels of performance.

CHART AB.5 **Canada – Alberta: Comparison by level of performance in science by language**



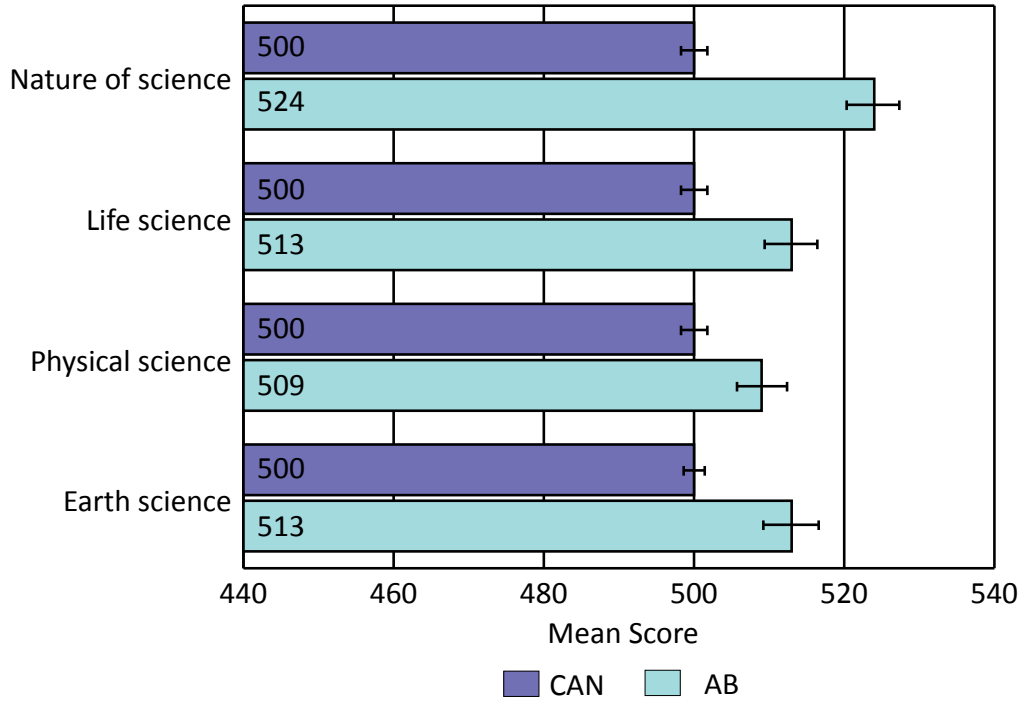
In Alberta, 95 per cent of girls and 93 per cent of boys perform at level 2 and above; however, a higher proportion of girls achieve at the higher levels. Compared to the Canadian results, a higher percentage of both girls and boys achieve at levels 3 and 4.

CHART AB.6 **Canada – Alberta: Comparison by level of performance in science by gender**



When the results are examined by sub-domain in science, students in Alberta achieve significantly higher scores in all four sub-domains compared to the Canadian means. Within the province, student achievement is significantly higher in nature of science compared to the other three sub-domains.

CHART AB.7 **Canada – Alberta: Results by sub-domain in science**



In English-language schools in Alberta, student scores are significantly higher than the Canadian mean in nature of science, life science, and Earth science. Students in French-language schools have higher achievement in nature of science and lower achievement in Earth science compared to their French Canadian counterparts. Within the province, students in English-language schools have higher achievement in each of the four sub-domains compared to students in French-language schools.

TABLE AB.1 **Canada – Alberta: Results by sub-domain and language**

	Nature of science		Life science		Physical science		Earth science	
	Mean	**CI**	**Mean**	**CI**	**Mean**	**CI**	**Mean**	**CI**
CANe	504	2.2	506	2.6	504	2.3	502	2.5
ABe	524	5.1	513	4.5	509	4.0	514	4.2
Difference	**20***		**7***		5		**12***	
CANf	487	2.6	481	3.0	488	3.3	492	2.4
ABf	499	4.5	483	4.7	496	6.0	479	4.0
Difference	**12***		2		8		**13***	
ABe	524	5.1	513	4.5	509	4.0	514	4.2
ABf	499	4.5	483	4.7	496	6.0	479	4.0
Difference	**25***		**30***		**13***		**35***	

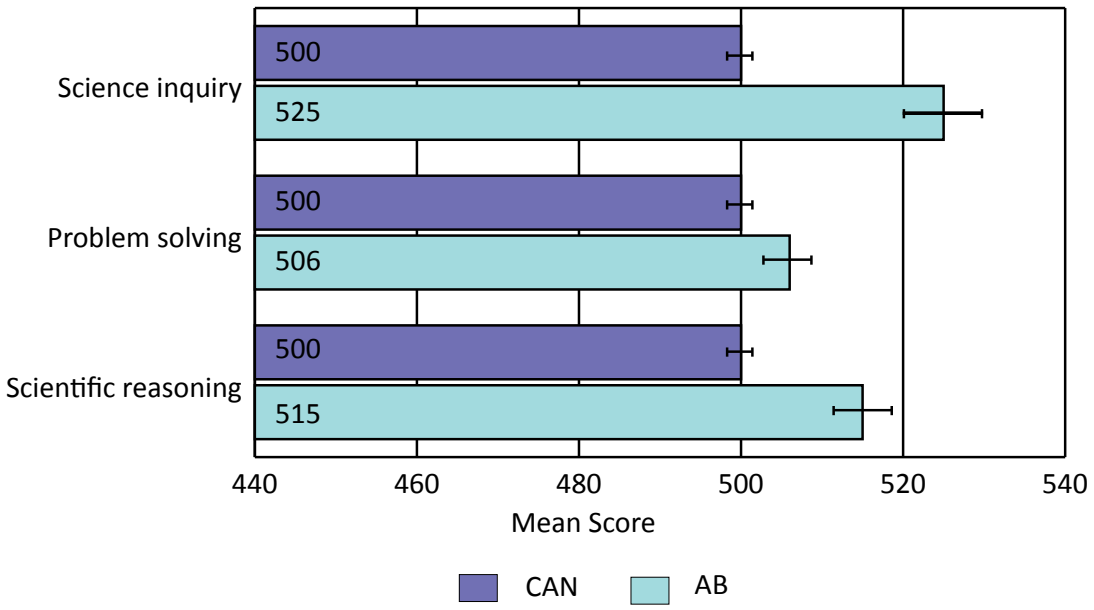
In Alberta, girls have higher achievement in all four sub-domains, and boys have higher achievement in nature of science compared to the Canadian means. Within the province, girls outperform boys in life science and Earth science.

TABLE AB.2 **Canada – Alberta: Results by sub-domain and gender**

	Nature of science		Life science		Physical science		Earth science	
	Mean	**CI**	**Mean**	**CI**	**Mean**	**CI**	**Mean**	**CI**
CAN – Female	501	2.7	501	2.5	499	2.5	501	3.3
AB – Female	526	6.2	517	5.7	509	6.6	519	6.1
Difference	**25***		**16***		**10***		**18***	
CAN – Male	499	2.8	499	2.1	501	2.4	500	2.9
AB – Male	521	7.0	508	6.2	510	6.9	507	6.1
Difference	**22***		9		9		7	
AB – Female	526	6.2	517	5.7	509	6.6	519	6.1
AB – Male	521	7.0	508	6.2	510	6.9	507	6.1
Difference	5		**9***		1		**12***	

When the results are examined by competency in science, students in Alberta achieve significantly higher scores in all three competencies compared to the Canadian means.

CHART AB.8 **Canada – Alberta: Results by competency in science**



Compared to the Canadian English mean, students in Alberta English-language schools have higher achievement in science inquiry and scientific reasoning. In French-language schools, students achieve higher scores in science inquiry. Within the province, students in English-language schools achieve higher scores in all three competencies compared to their French-language counterparts.

TABLE AB.3 **Canada – Alberta: Results by competency and language**

	Science inquiry		Problem solving		Scientific reasoning	
	Mean	**CI**	**Mean**	**CI**	**Mean**	**CI**
CANe	504	2.0	503	2.1	505	1.9
ABe	525	2.1	506	2.0	515	2.1
Difference	**21***		3		**10***	
CANf	487	2.8	490	3.2	482	2.7
ABf	501	1.9	484	2.2	483	2.6
Difference	**14***		6		1	
ABe	525	2.1	506	2.0	515	2.1
ABf	501	1.9	484	2.2	483	2.6
Difference	**24***		**22***		**32***	

Compared to the Canadian means, Alberta girls have higher achievement in science inquiry and scientific reasoning, and boys have higher achievement in science inquiry. Within the province, girls outperform boys in science inquiry and scientific reasoning.

TABLE AB.4 **Canada – Alberta: Results by competency and gender**

	Science inquiry		Problem solving		Scientific reasoning	
	Mean	**CI**	**Mean**	**CI**	**Mean**	**CI**
CAN – Females	503	2.6	499	3.0	499	2.5
AB – Females	530	6.3	506	5.1	518	5.5
Difference	**27***		7		**19***	
CAN – Males	497	3.3	501	2.4	501	2.7
AB – Males	520	5.8	506	5.4	511	7.5
Difference	**23***		5		10	
AB – Females	530	6.3	506	5.1	518	5.5
AB – Males	520	5.8	506	5.4	511	7.5
Difference	**10***		0		**7***	

Reading and mathematics results

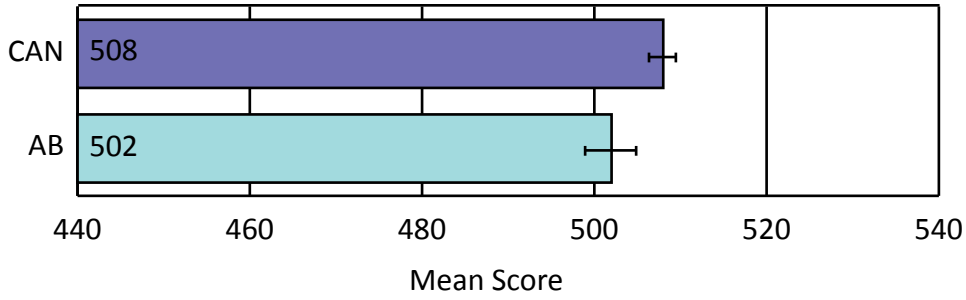
In PCAP 2013, reading and mathematics are both minor domains. Results are reported overall, by language, and by gender. Finally, multiple comparisons over time between PCAP assessments are reported.

Results in reading

The following charts present student achievement for Canada and Alberta in reading overall, by language of the school system, and by gender.

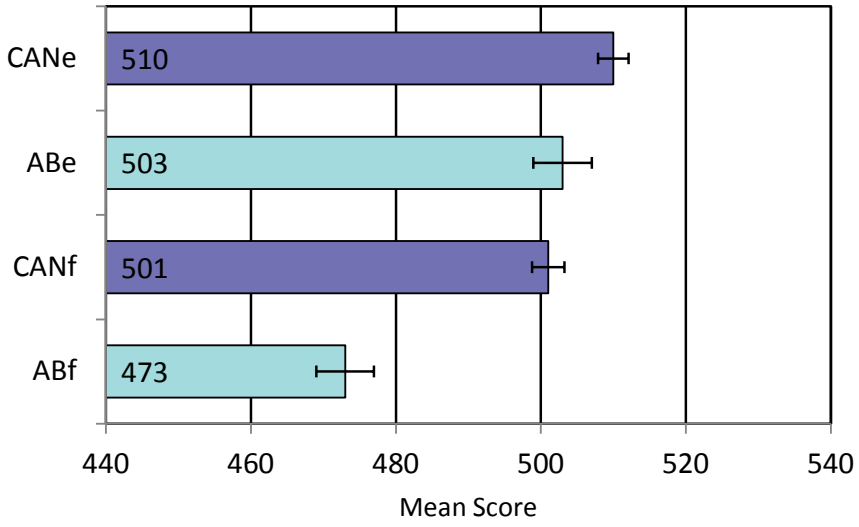
As shown in the PCAP 2013 assessment of reading, Alberta students have lower mean scores than Canadian students overall in reading, as shown in the chart below.

CHART AB.9 **Canada – Alberta: Mean score in reading**



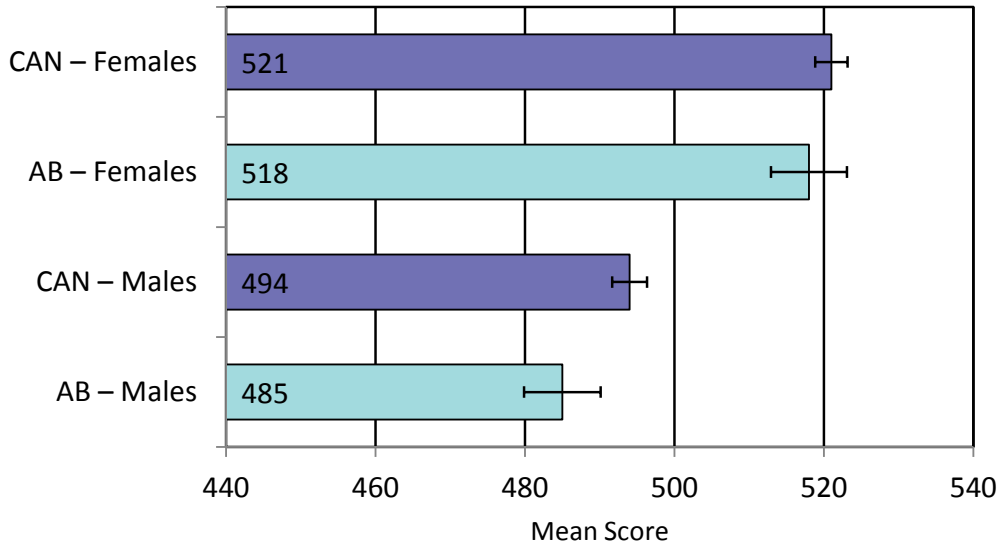
Alberta students in both the English- and French-language schools systems achieve significantly lower scores in reading than their Canadian counterparts. Within the province, English-language students outperform French-language students as shown in the PCAP 2013 assessment of reading.

CHART AB.10 **Canada – Alberta: Results in reading by language**



Reading achievement for girls in Alberta is statistically similar to Canadian girls overall, whereas Alberta boys achieve lower scores than their Canadian counterparts. Girls outperform boys in reading both within the province (by 33 points) and in Canada overall (by 27 points) as shown in the PCAP 2013 assessment of reading.

CHART AB.11 **Canada – Alberta: Results in reading by gender**

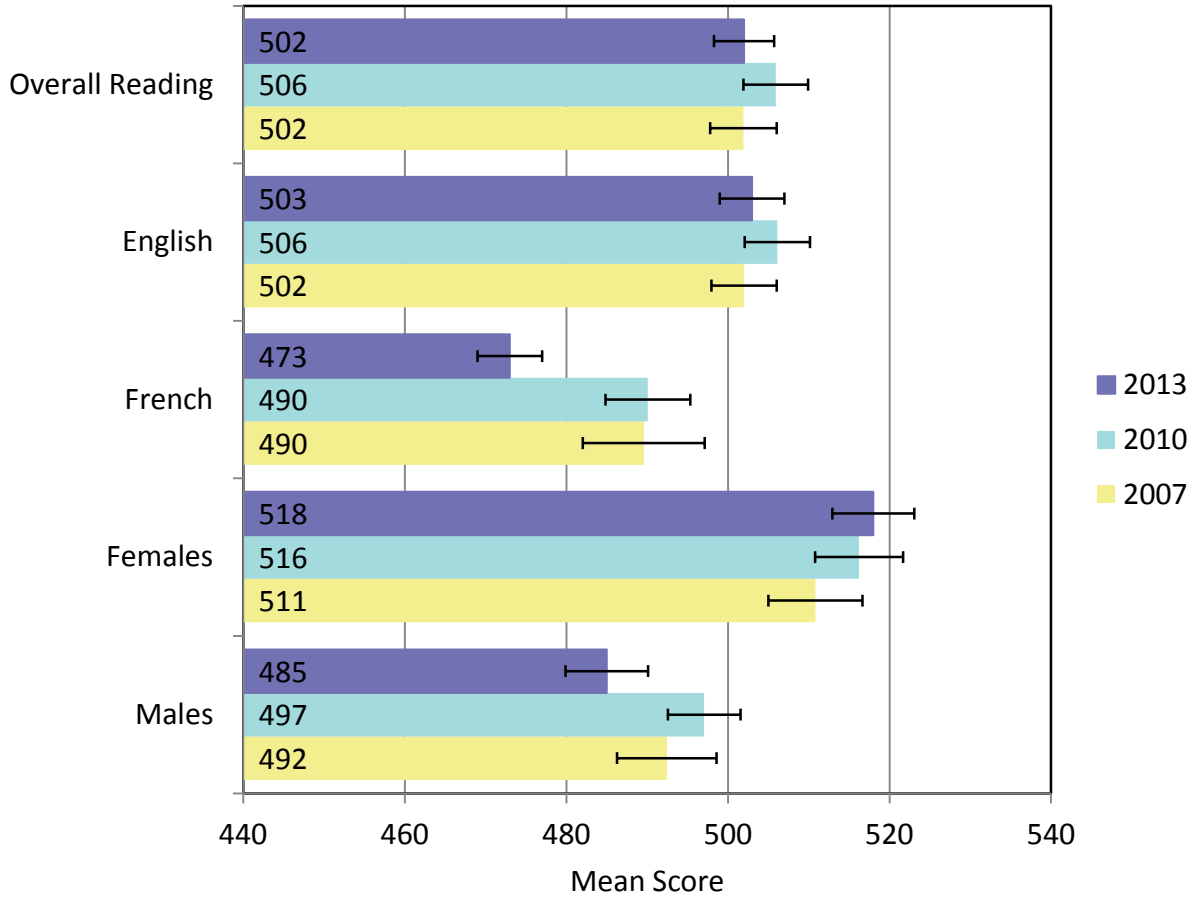


Comparison of reading results: 2007, 2010, and 2013

Reading was a major domain in PCAP 2007. As a minor domain in 2010 and 2013, the assessment comprised fewer reading items; however, common items among the three assessments allow the reporting of changes over time for reading achievement.

As shown in the PCAP 2013 reading assessment, results in reading over time have been consistent in Alberta with no significant changes in reading overall, for English-language schools, or for girls. For French-language schools and for boys in reading, there was a significant negative change between 2010 and 2013, although there is no significant difference for reading between 2007 and 2010.

CHART AB.12 **Canada – Alberta: Changes over time in reading**

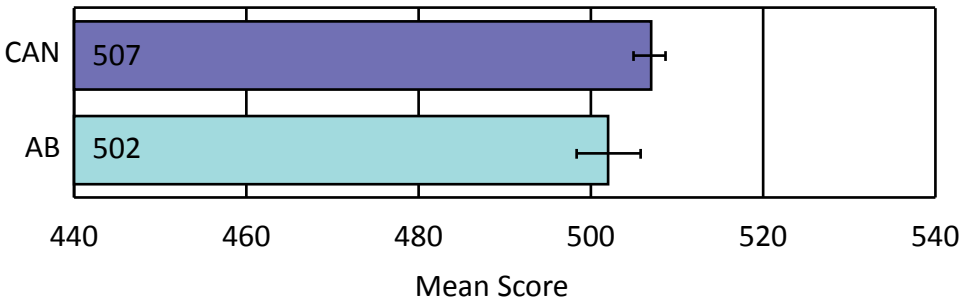


Results in mathematics

The following charts present student achievement for Canada and Alberta in mathematics overall, by language of the school system, and by gender.

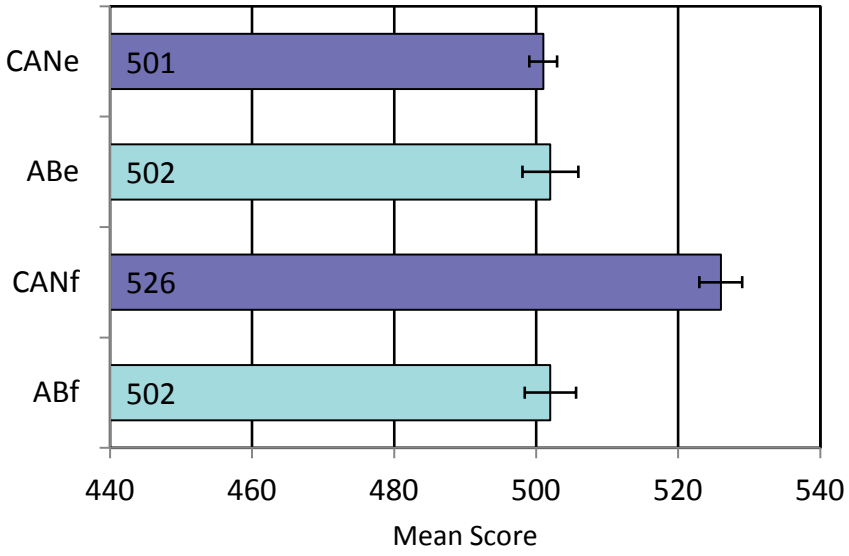
As presented in the chart below, mathematics achievement for Alberta students is statistically similar to Canadian students overall, as shown in the chart below.

CHART AB.13 **Canada – Alberta: Mean score in mathematics**



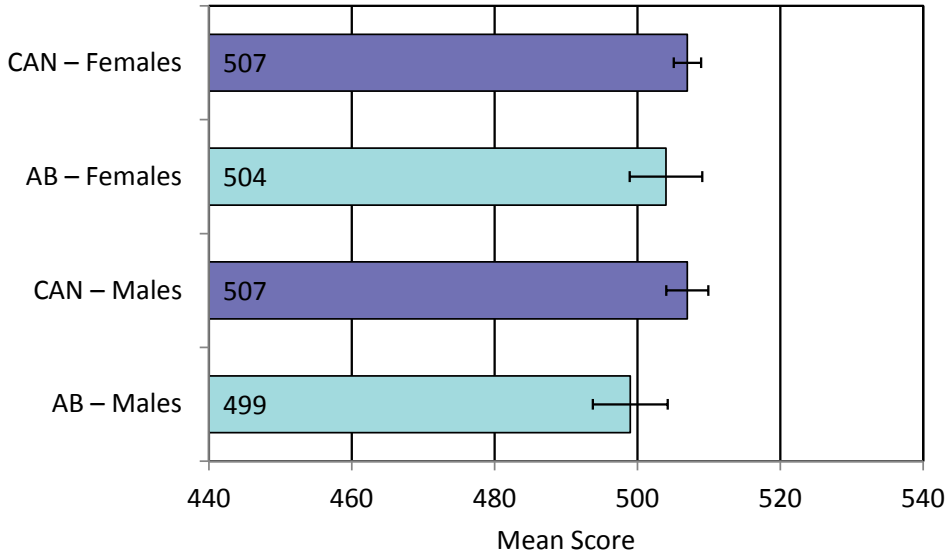
As shown in the chart below, English-language students in Alberta achieve similar results compared to the Canadian English mean; however, French-language students have significantly lower scores in mathematics compared to their Canadian French-language counterparts. Within the province, there is no significant difference between the two language systems for achievement in mathematics in PCAP 2013.

CHART AB.14 **Canada – Alberta: Results in mathematics by language**



In this assessment, there was no significant gender difference in mathematics achievement either nationally or within Alberta as presented in the following chart.

CHART AB.15 **Canada – Alberta: Results in mathematics by gender**

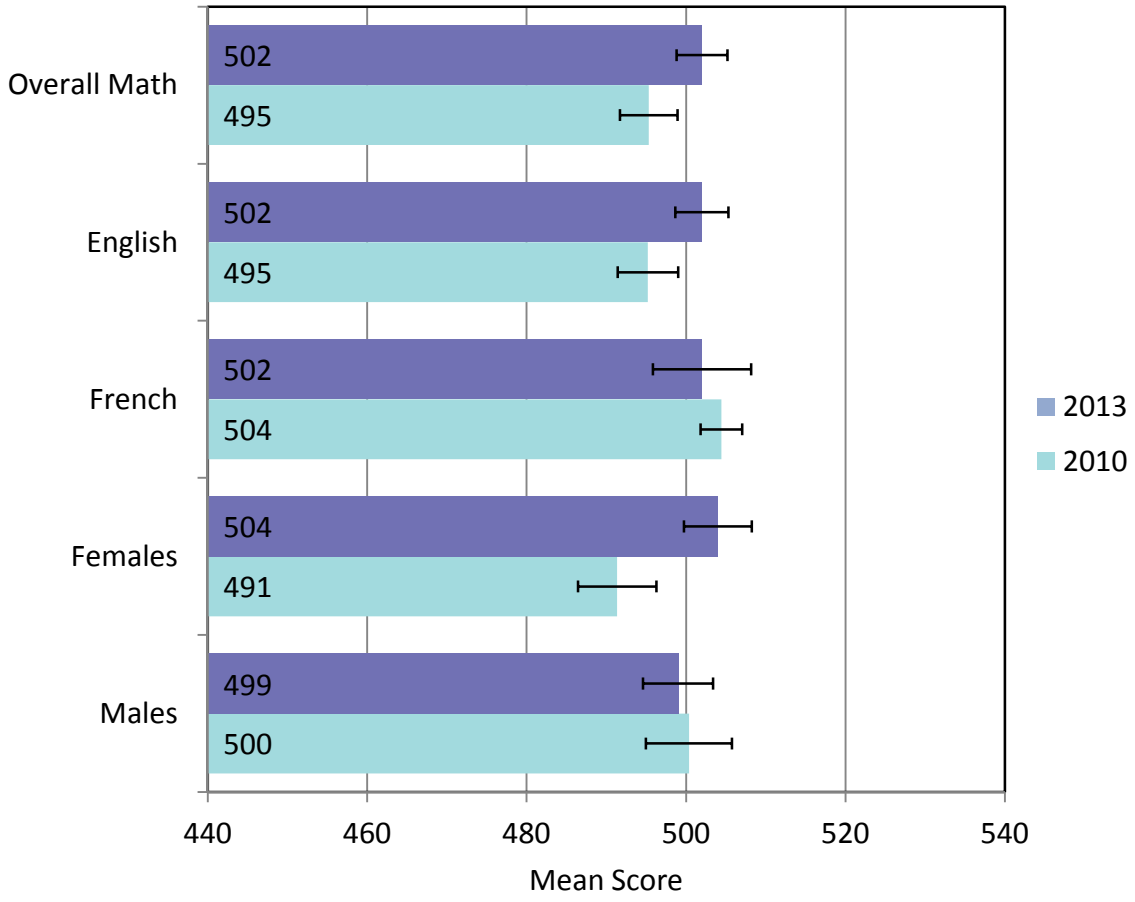


Comparison of mathematics results: 2010 and 2013

Mathematics was a major domain in PCAP 2010, which was the baseline year. As a minor domain in 2013, the assessment comprised fewer mathematics items; however, common items between the two assessments allow the reporting of changes over time for mathematics achievement at the holistic level.

As shown in the PCAP 2013 mathematics assessment, significant positive change over time has occurred for mathematics overall, for English-language students, and for Alberta girls.

CHART AB.16 **Canada – Alberta: Changes over time in mathematics**



SASKATCHEWAN

Context Statement

Social context

Saskatchewan has a population of just under 1.1 million, its largest population in the past 60 years, which is spread throughout a vast geographic area. About half of Saskatchewan's population lives in towns, villages, rural municipalities, or on First Nations reserves, giving a strong rural influence in the province. Potash and uranium mining, oil production, agriculture, and forestry are the major industries. Saskatchewan has a diverse cultural and ethnic heritage, including a large and growing First Nation and Métis population and an increased number of immigrants from around the world.

Organization of the school system

Saskatchewan has approximately 185,000 Kindergarten to Grade 12 students. About 90 per cent of elementary/secondary students attend 750 publicly funded provincial schools; 8 per cent attend First Nation schools; and the remainder attend independent schools or are home-schooled. The provincial average class size is 19.5 students per class with the typical rural classroom having about three fewer students than the typical urban classroom.

Science teaching

The aim of K-12 science education is to enable all Saskatchewan students to develop scientific literacy. Scientific literacy today embraces Euro-Canadian and Indigenous heritages, both of which have developed an empirical and rational knowledge of nature. A Euro-Canadian way of knowing about the natural and constructed world is called science, while First Nations and Métis ways of knowing nature are found within the broader category of Indigenous knowledge.

Diverse learning experiences based on the outcomes in the curriculum provide students with many opportunities to explore, analyze, evaluate, synthesize, appreciate, and understand the interrelationships among science, technology, society, and the environment (STSE) that will affect their personal lives, their careers, and their future.

The four goals of K-12 science education are to:

- Understand the Nature of Science and STSE Interrelationships – Students will develop an understanding of the nature of science and technology, their interrelationships, and their social and environmental contexts, including interrelationships between the natural and constructed worlds.
- Construct Scientific Knowledge – Students will construct an understanding of concepts, principles, laws, and theories in life science, in physical science, in Earth and space science, and in Indigenous Knowledge of nature, and then apply these understandings to interpret, integrate, and extend their knowledge.
- Develop Scientific and Technological Skills – Students will develop the skills required for scientific and technological inquiry, problem solving, and communicating; for working collaboratively; and for making informed decisions.

- Develop Attitudes that Support Scientific Habits of Mind – Students will develop attitudes that support the responsible acquisition and application of scientific, technological, and Indigenous knowledge to the mutual benefit of self, society, and the environment.

Science assessment

Classroom teachers in Saskatchewan are responsible for assessment, evaluation, and promotion of students from Kindergarten through Grade 11. At the Grade 12 level, teachers are responsible for at least 60 per cent of each student's final mark, and those teachers accredited in Biology, Chemistry, and Physics are responsible for assigning 100 per cent of the Grade 12 final mark.

Students are assessed on the full range of knowledge, understandings, skills, attitudes, and values they have been using and developing during instruction. Teachers are encouraged to develop diversified evaluation plans that reflect the various instructional methods they use in adapting instruction to each class and each student.

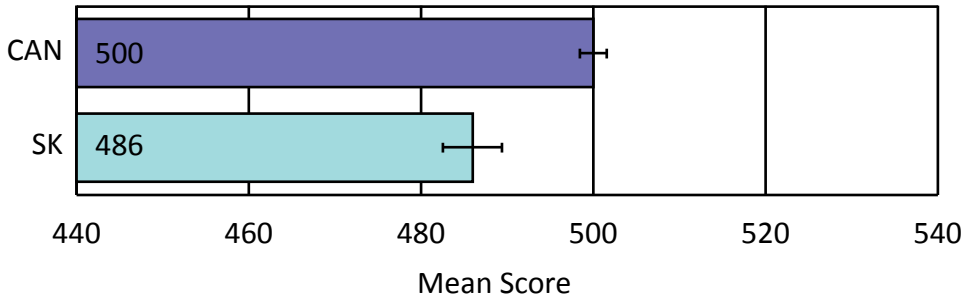
For more information about education in Saskatchewan, visit the Ministry of Education's Web site at www.education.gov.sk.ca.

Results in science

The performance of Saskatchewan students in science is compared to that of Canadian students overall. Results are presented both by mean score and by performance level. The following charts present student achievement in science overall, by language of the school system, and by gender.

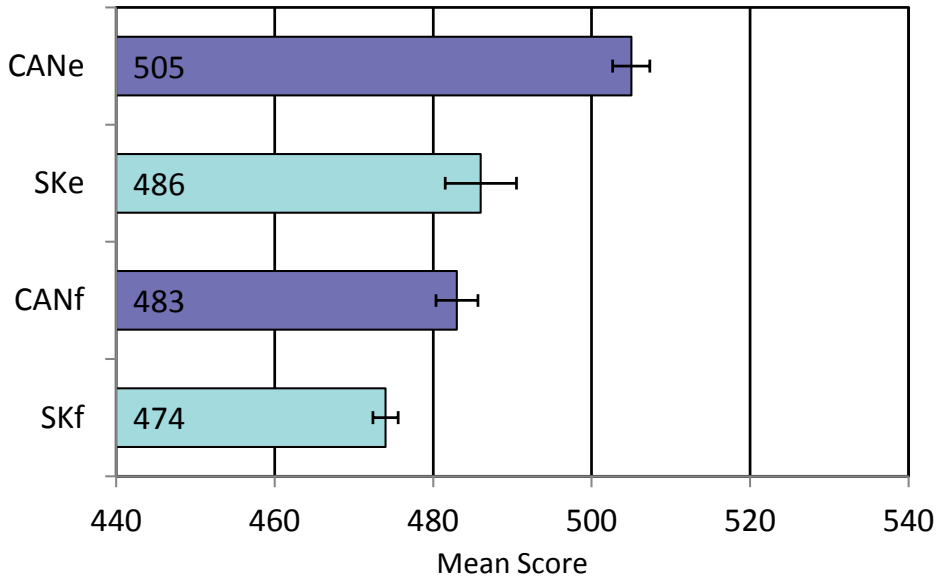
The mean score of Saskatchewan students who completed the PCAP 2013 Science Assessment is significantly lower than that of Canadian students overall, as shown in the chart below.

CHART SK.1 **Canada – Saskatchewan: Mean score in science**



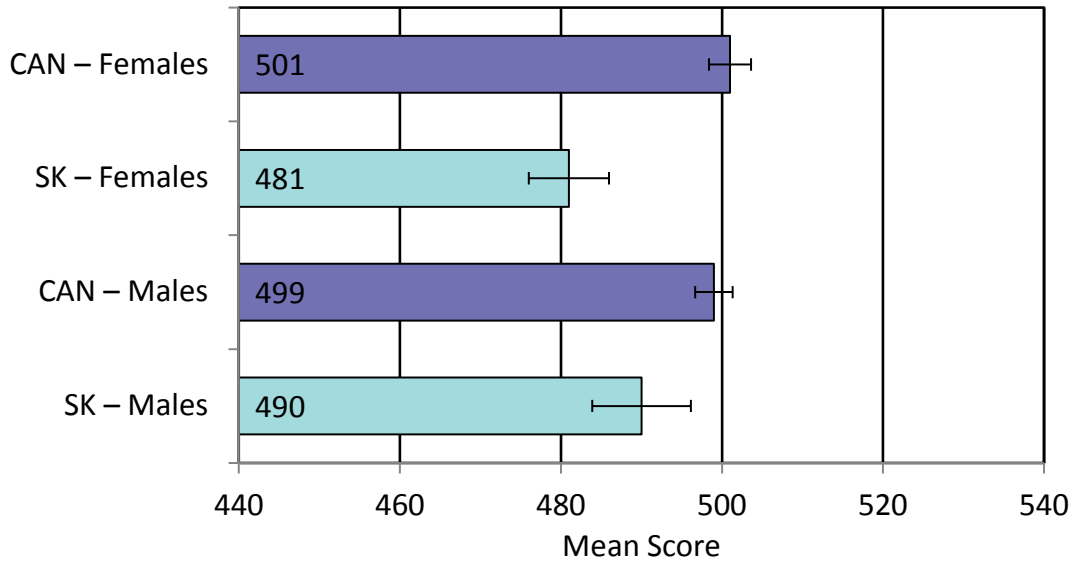
When compared to the Canadian means, the achievement of Saskatchewan students in both English- and French-language schools is lower than the Canadian means. Within the province, students in English-language schools achieve significantly higher results than their counterparts in French-language schools.

CHART SK.2 **Canada – Saskatchewan: Results in science by language**



Within Saskatchewan, boys outperform girls in science. Girls in Saskatchewan achieve mean scores that are significantly lower than the Canadian mean, whereas there is no significant difference for boys when compared to their Canadian counterparts.

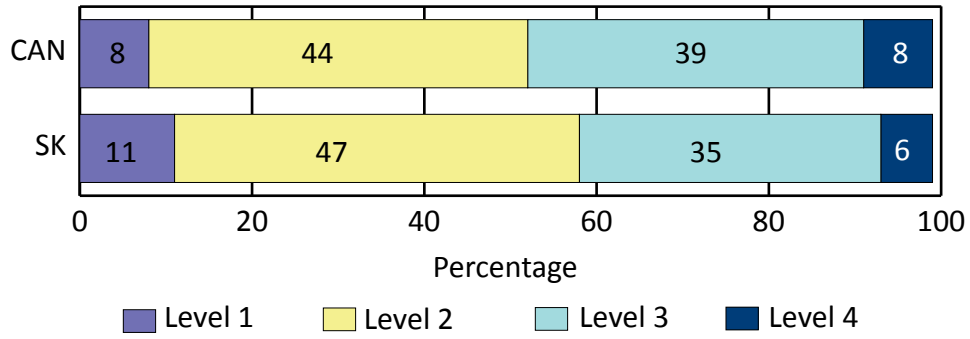
CHART SK.3 **Canada – Saskatchewan: Results in science by gender**



The percentage of students at each of the four performance levels in science is examined by jurisdiction, by language of the school system, and by gender, as presented in the next three charts.

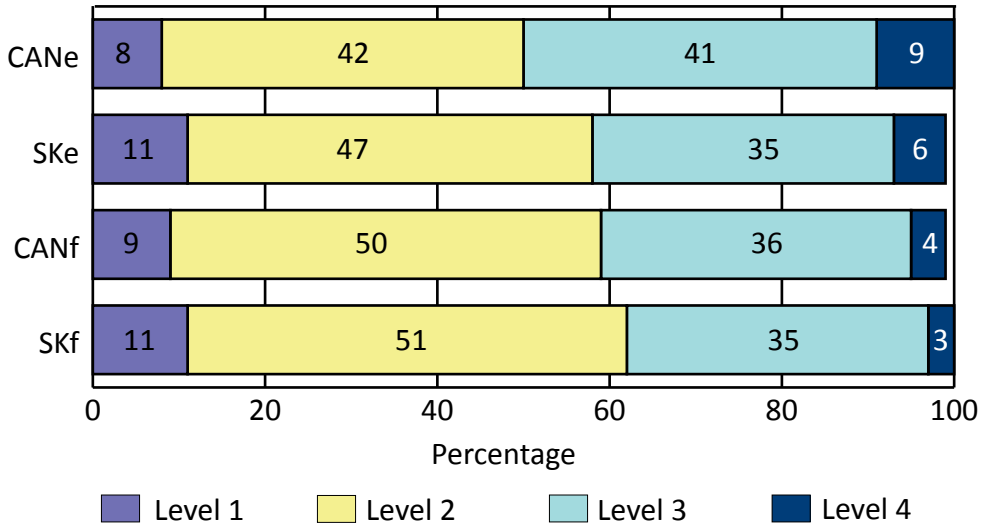
In Saskatchewan, 88 per cent of students achieve level 2 or above. The proportion of Saskatchewan students who achieve at levels 1 and 2 is higher than in Canada overall, whereas the proportion achieving at the higher levels is lower than the Canadian results.

CHART SK.4 **Canada – Saskatchewan: Percentage of students at performance levels in science**



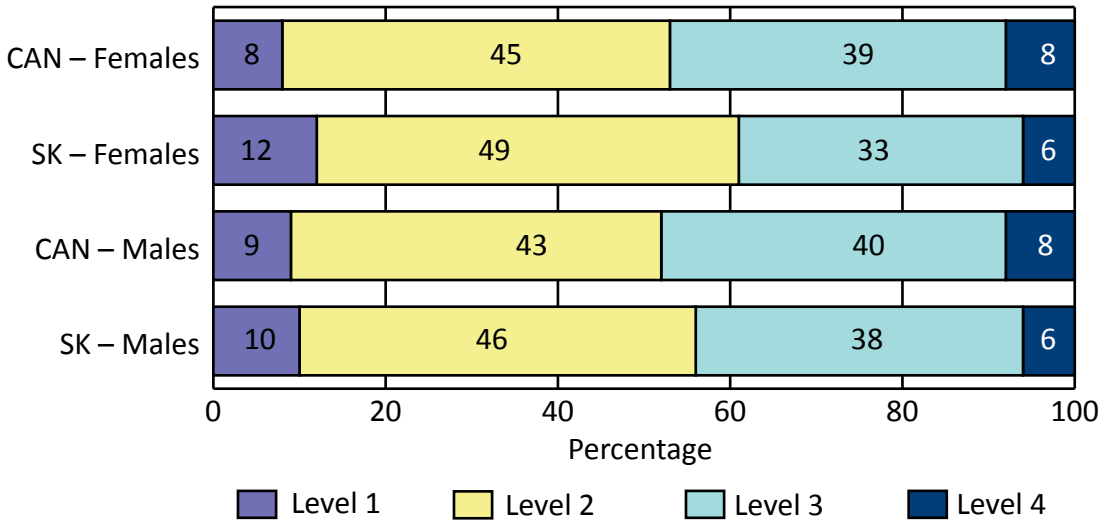
In Saskatchewan, 88 per cent of English-language students and 89 per cent of French-language students perform at level 2 or above. Compared to the Canadian results, fewer students in English-language schools and similar proportions of students in French-language schools achieve at the higher levels of performance.

CHART SK.5 **Canada – Saskatchewan: Comparison by level of performance in science by language**



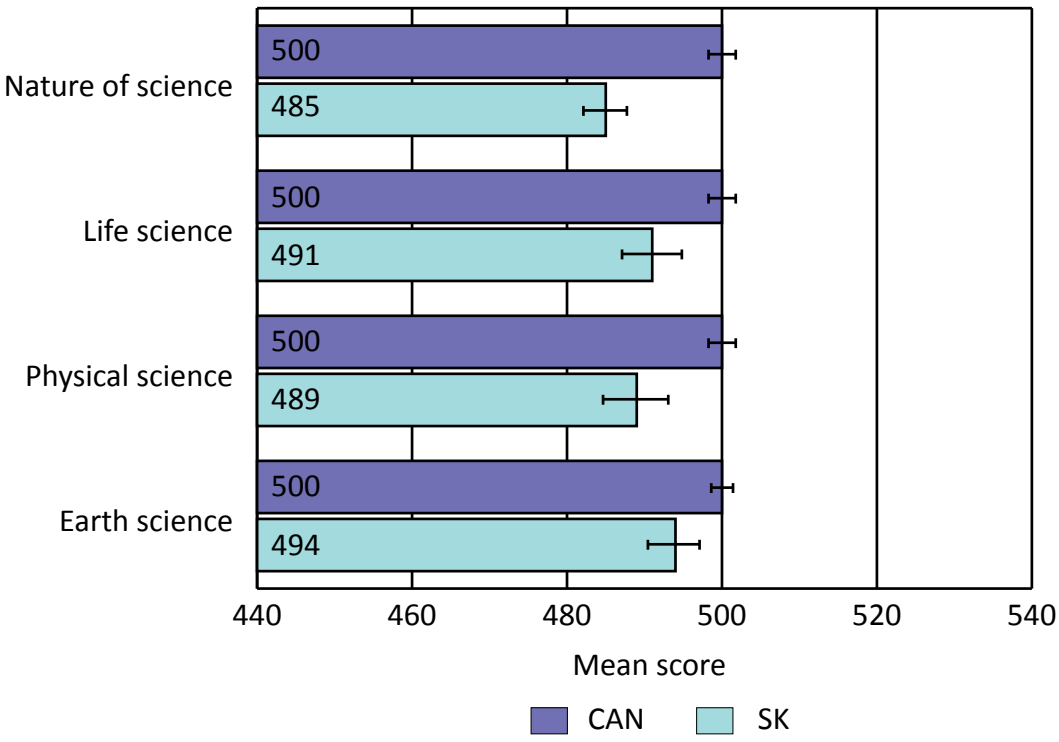
In Saskatchewan, 88 per cent of girls and 90 per cent of boys perform at level 2 and above, and a greater proportion of boys achieve higher levels of performance. Compared to the Canadian results, a lower percentage of both girls and boys achieve at levels 3 and 4.

CHART SK.6 **Canada – Saskatchewan: Comparison by level of performance in science by gender**



When the results are examined by sub-domain in science, no significant differences are found among the sub-domains within the province; however, student achievement is significantly lower than the Canadian mean for each of the four sub-domains.

CHART SK.7 **Canada – Saskatchewan: Results by sub-domain in science**



In Saskatchewan, students enrolled in English-language schools have significantly lower achievement in all four sub-domains compared to their Canadian counterparts. In French-language schools, Saskatchewan students are at the Canadian mean for three sub-domains, and achieve lower scores in physical science compared to the Canadian mean. Within the province, English-language students outperform French-language students in life science and physical science.

TABLE SK.1 **Canada – Saskatchewan: Results by sub-domain and language**

	Nature of science		Life science		Physical science		Earth science	
	Mean	**CI**	**Mean**	**CI**	**Mean**	**CI**	**Mean**	**CI**
CANe	504	2.2	506	2.6	504	2.3	502	2.5
SKe	485	3.1	491	4.5	489	3.7	494	3.6
Difference	**19***		**15***		**15***		**8***	
CANf	487	2.6	481	3.0	488	3.3	492	2.4
SKf	484	1.7	480	2.0	470	1.9	492	1.8
Difference	3		1		**18***		0	
SKe	485	3.1	491	4.5	489	3.7	494	3.6
SKf	484	1.7	480	2.0	470	1.9	492	1.8
Difference	1		**11***		**19***		2	

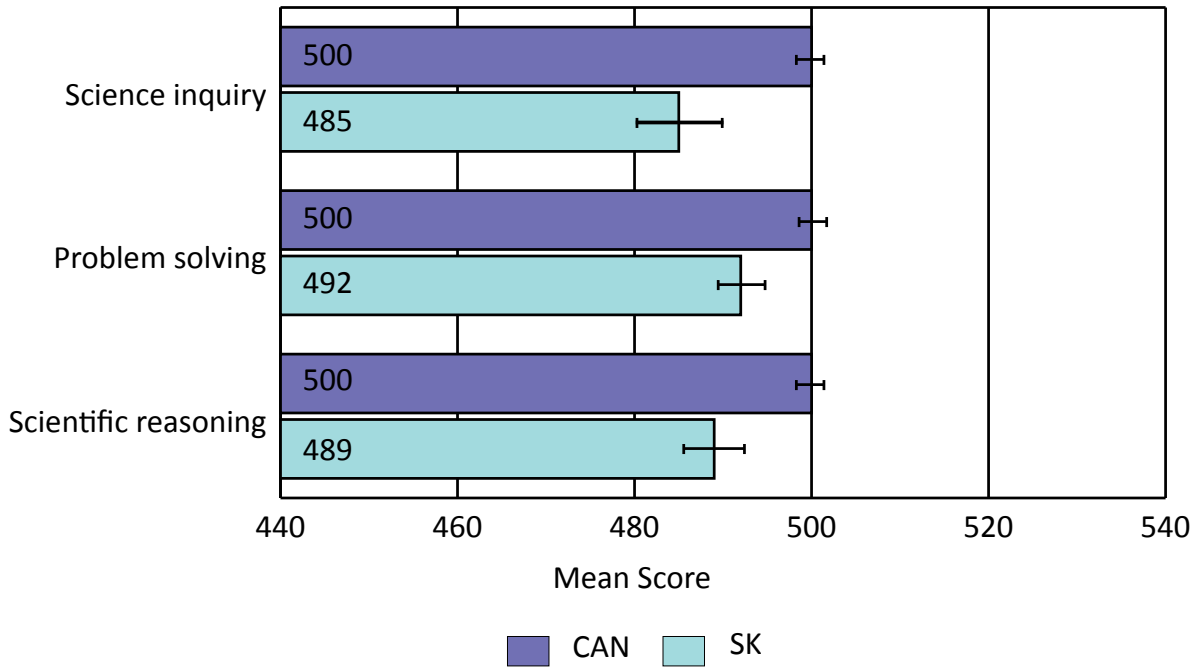
Within Saskatchewan, boys achieve higher scores in physical science and Earth science. When compared to the Canadian means, Saskatchewan girls had lower achievement in all four sub-domains; however, Saskatchewan boys were lower only in the sub-domain of nature of science.

TABLE SK.2 **Canada – Saskatchewan: Results by sub-domain and gender**

	Nature of science		Life science		Physical science		Earth science	
	Mean	**CI**	**Mean**	**CI**	**Mean**	**CI**	**Mean**	**CI**
CAN – Female	501	2.7	501	2.5	499	2.5	501	3.3
SK – Female	482	4.8	487	4.1	484	4.7	489	4.5
Difference	**19***		**14***		**15***		**12***	
CAN – Male	499	2.8	499	2.1	501	2.4	500	2.9
SK – Male	488	3.8	494	9.1	493	6.1	498	4.8
Difference	**11***		5		8		2	
SK – Female	482	4.8	487	4.1	484	4.7	489	4.5
SK – Male	488	3.8	494	9.1	493	6.1	498	4.8
Difference	6		7		**9***		**9***	

Students within Saskatchewan achieve similar results in each of the three competencies in science. There is significantly lower achievement in each competency when compared to Canadian students overall.

CHART SK.8 **Canada – Saskatchewan: Results by competency in science**



English-language students in Saskatchewan have lower achievement in each of the three competencies when compared to English-language schools in Canada overall. In French-language schools, achievement was lower in Saskatchewan for problem solving compared to the Canadian mean. Within the province, English-language schools outperformed French-language schools in problem solving and scientific reasoning.

TABLE SK.3 **Canada – Saskatchewan: Results by competency and language**

	Science inquiry		Problem solving		Scientific reasoning	
	Mean	**CI**	**Mean**	**CI**	**Mean**	**CI**
CANe	504	2.0	503	2.1	505	1.9
SKe	485	3.3	492	3.6	489	4.3
Difference	**19***		**11***		**16***	
CANf	487	2.8	490	3.2	482	2.7
SKf	484	2.0	474	2.1	478	1.6
Difference	3		**16***		4	
SKe	485	3.3	492	3.6	489	4.3
SKf	484	2.0	474	2.1	478	1.6
Difference	1		**18***		**11***	

Saskatchewan girls have lower achievement in each of the competencies compared to the Canadian means, whereas boys are statistically similar to their Canadian counterparts. Within the province, boys outperform girls in problem solving and scientific reasoning.

TABLE SK.4 **Canada – Saskatchewan: Results by competency and gender**

	Science inquiry		Problem solving		Scientific reasoning	
	Mean	CI	Mean	CI	Mean	CI
CAN – Females	503	2.6	499	3.0	499	2.5
SK – Females	483	4.8	485	4.8	486	5.2
Difference	**20***		**14***		**13***	
CAN – Males	497	3.3	501	2.4	501	2.7
SK – Males	488	6.0	498	5.4	493	6.8
Difference	9		3		8	
SK – Females	483	4.8	485	4.8	486	5.2
SK – Males	488	6.0	498	5.4	493	6.8
Difference	5		**13***		**7***	

Reading and mathematics results

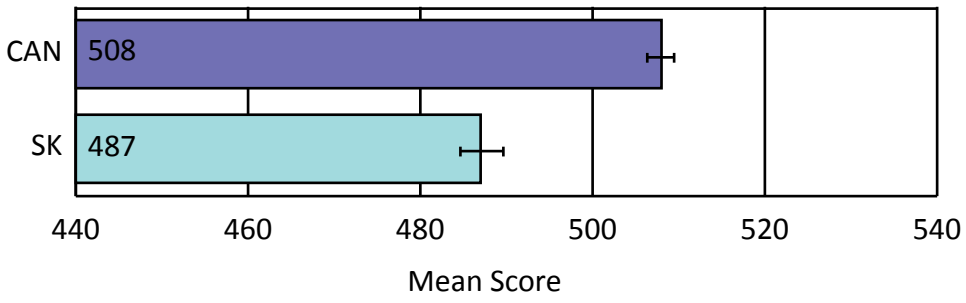
In PCAP 2013, reading and mathematics are both minor domains. Results are reported overall, by language of the school system, and by gender. Finally, multiple comparisons over time between PCAP assessments are reported.

Results in reading

The following charts present student achievement for Canada and Saskatchewan in reading overall, by language of the school system, and by gender.

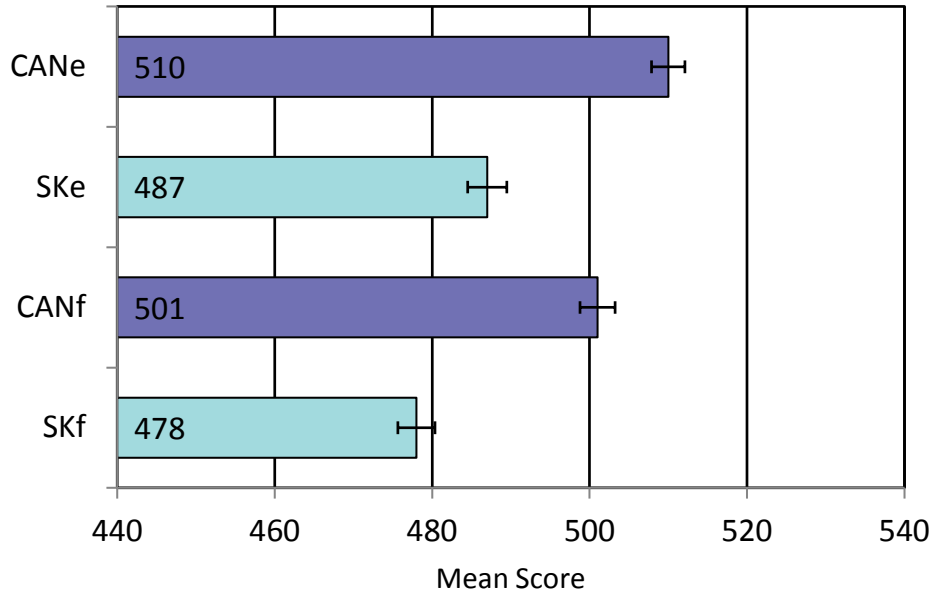
In PCAP 2013, reading achievement in Saskatchewan is significantly lower than the Canadian mean score, as shown in the chart below.

CHART SK.9 **Canada – Saskatchewan: Mean score in reading**



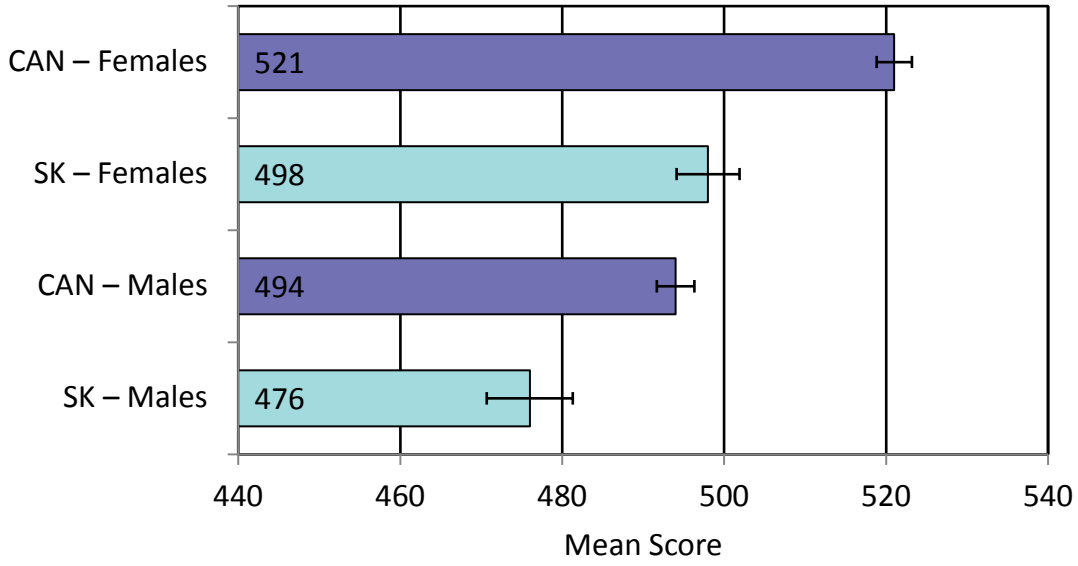
As shown in the following chart, reading scores in both English- and French-language school systems in Saskatchewan are significantly lower compared to the Canadian means. Within the province, English-language school outperform French-language schools in reading.

CHART SK.10 **Canada – Saskatchewan: Results in reading by language**



Reading achievement for both girls and boys in Saskatchewan is significantly lower than Canadian students overall. Girls outperform boys in reading both within the province (by 22 points) and in Canada overall (by 27 points) as shown in the PCAP 2013 assessment of reading.

CHART SK.11 **Canada – Saskatchewan: Results in reading by gender**

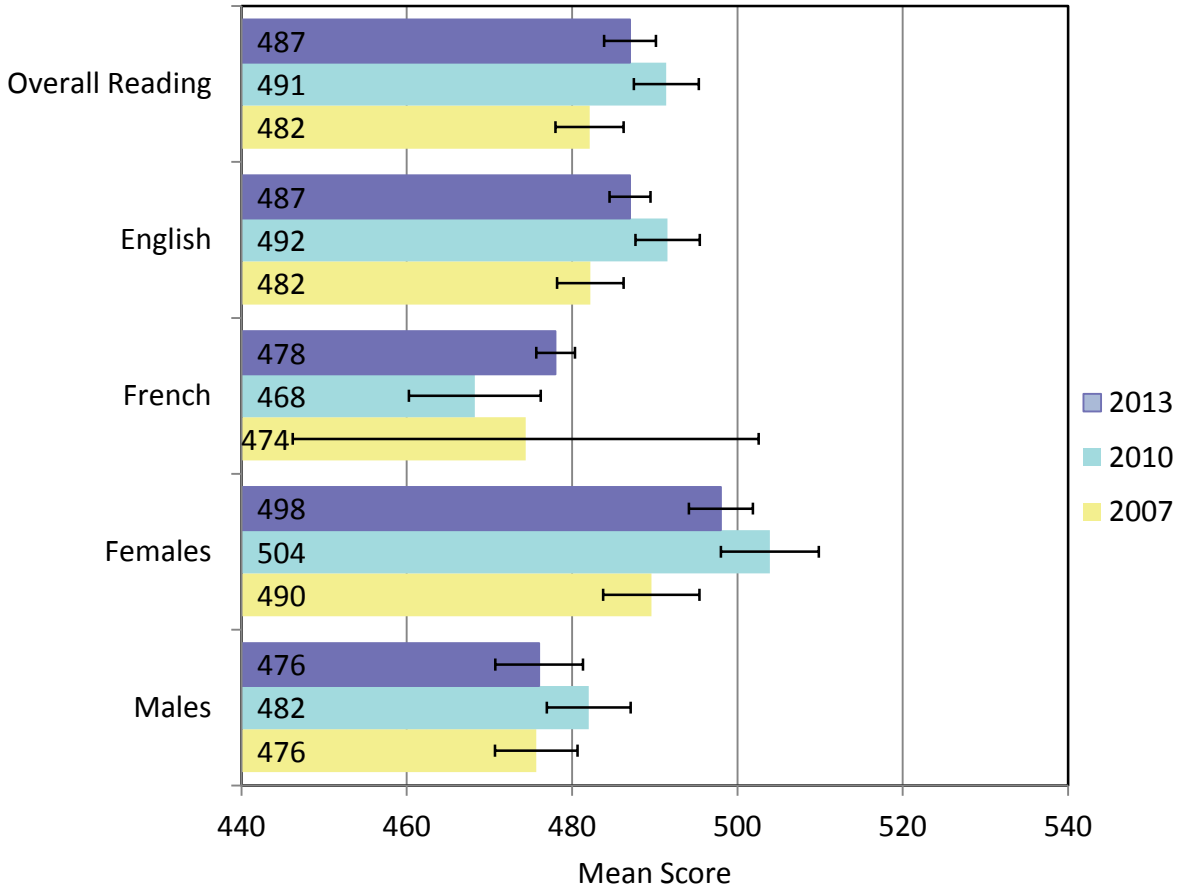


Comparison of reading results: 2007, 2010, and 2013

Reading was a major domain in PCAP 2007. As a minor domain in 2010 and 2013, the assessment comprised fewer reading items; however, common items among the three assessments allow the reporting of changes over time for reading achievement.

As shown in the following chart, there are few significant changes in reading achievement in Saskatchewan between 2010 and 2013 and between 2007 and 2013. Positive changes occur between 2010 and 2013 for French-language students.

CHART SK.12 **Canada – Saskatchewan: Changes over time in reading**

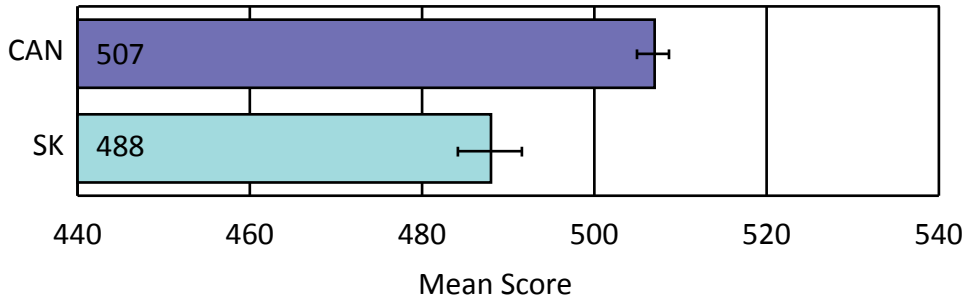


Results in mathematics

The following charts present student achievement for Canada and Saskatchewan in mathematics overall, by language of the school system, and by gender.

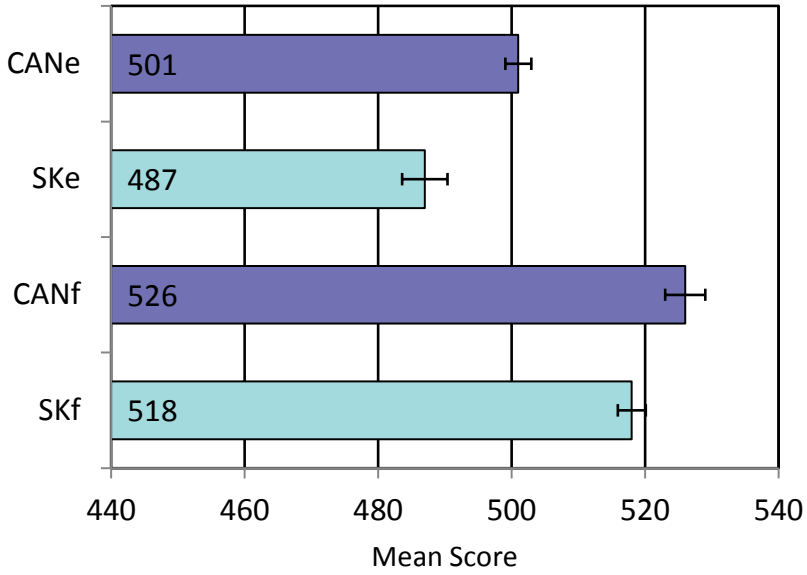
In PCAP 2013, mathematics achievement in Saskatchewan is significantly lower than that in Canada overall as presented in the chart below.

CHART SK.13 **Canada – Saskatchewan: Mean score in mathematics**



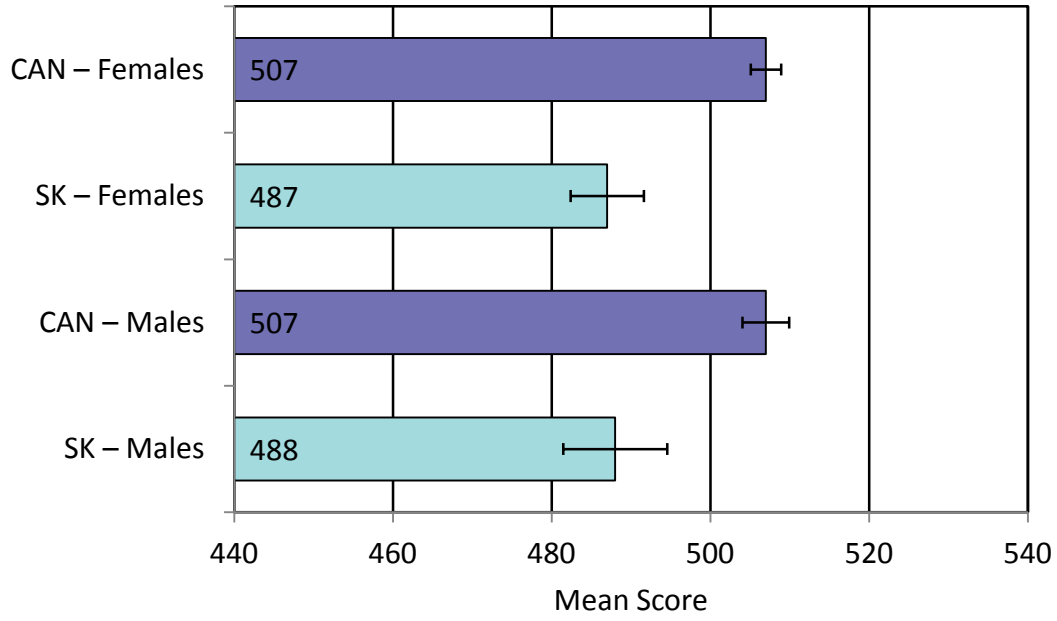
As shown in the following chart, mathematics scores in both English- and French-language schools are significantly lower than the Canadian means. Within the province, students in French-language schools outperform those in English-language schools in mathematics.

CHART SK.14 **Canada – Saskatchewan: Results in mathematics by language**



In Saskatchewan, as in Canada overall, there is no gender gap in mathematics; however, both boys and girls have lower achievement in mathematics compared to Canadian boys and girls overall.

CHART SK.15 **Canada – Saskatchewan: Results in mathematics by gender**

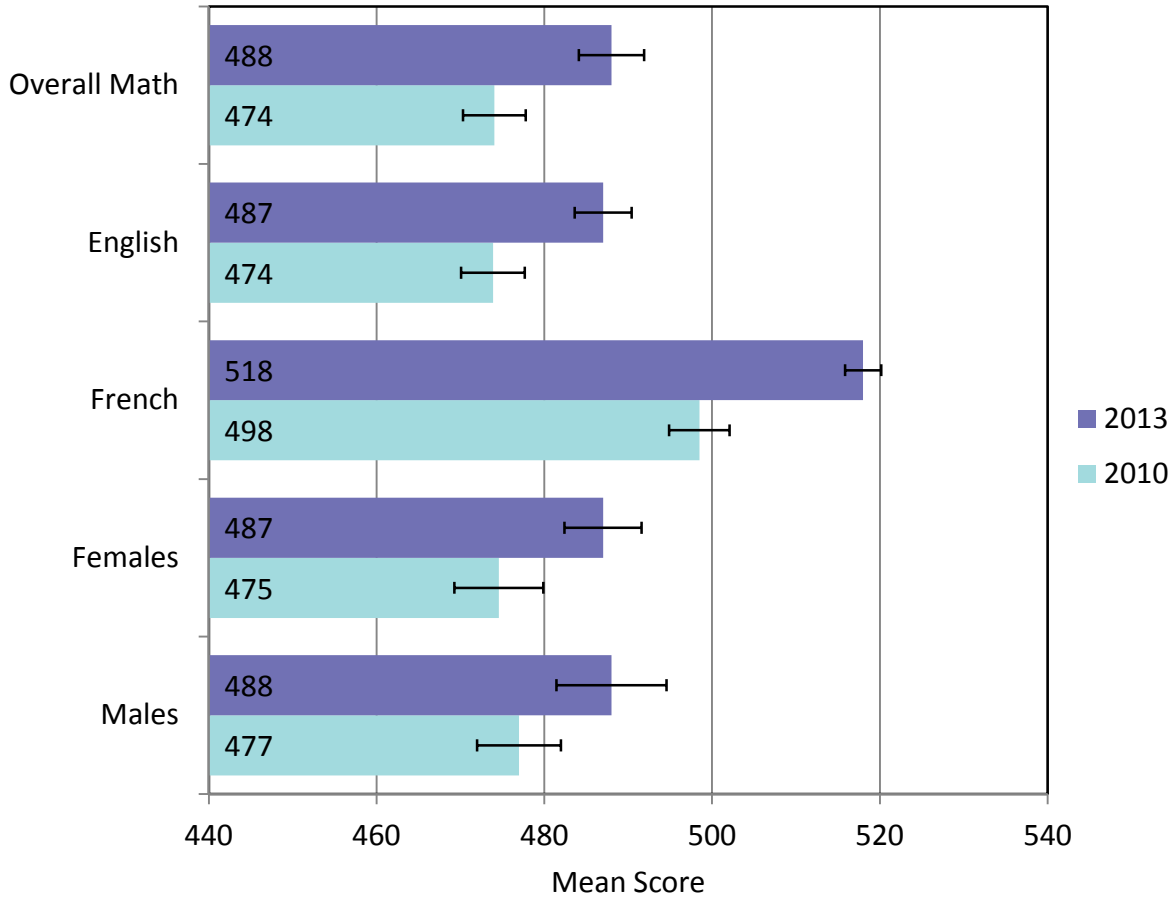


Comparison of mathematics results: 2010 and 2013

Mathematics was a major domain in PCAP 2010, which was the baseline year. As a minor domain in 2013, the assessment comprised fewer mathematics items; however, common items between the two assessments allow the reporting of changes over time for mathematics achievement.

As shown in the PCAP 2013 assessment of mathematics, there have been significant positive changes over time in Saskatchewan. The mathematics achievement results in 2013 are higher than those for 2010 in mathematics overall, in English- and French-language schools, and for girls and boys.

CHART SK.16 **Canada – Saskatchewan: Changes over time in mathematics**



MANITOBA

Context Statement

Social context

Manitoba has a population of approximately 1.2 million people, about 60 per cent of whom reside in the capital city of Winnipeg. Manitoba's population comprises a wide range of ethnic and cultural groups, including a strong Franco-Manitoban community and an Aboriginal community, in both rural and urban areas. Manitoba has a broad and diverse economic base.

Organization of the school system

Manitoba's public and funded independent school system enrols about 196,000 students in Kindergarten to Grade 12 and employs about 13,000 teachers in 37 school divisions plus funded independent schools. Students may choose courses from four school programs — English Program, *Français* Program (about 3 per cent of students), French Immersion Program (about 11.9 per cent of students), and Senior Years Technology Education Program. Children of a francophone parent may attend the non-geographical *Division scolaire franco-manitobaine,* which offers the *Français* Program. Other educational options include non-funded independent schools, home schooling, and federally funded on-reserve schools for First Nation students. Schools are encouraged to group grades according to early years (Kindergarten to Grade 4), middle years (Grades 5 to 8), and senior years (Grades 9 to 12). Public schools and provincially funded independent schools participated in PCAP (www.edu.gov.mb.ca/k12). Students in the *Français* Program participated in French. French Immersion students participated in either language, at the choice of the school; their results, however, are included with Manitoba English.

Science teaching & learning

Manitoba's science curricula were developed following the province's co-lead involvement in the sciences (along with British Columbia) with the CMEC Pan-Canadian Protocol for Collaboration on School Curriculum – a process that led to the development and publication of the *Common Framework of Science Learning Outcomes, K-12* (CMEC, 1997). Guidance for, and development of, Manitoba-specific science learning outcomes commenced shortly after the release of The Common Framework with the publication of: *Kindergarten to Grade 4 Science: A Manitoba Curriculum Framework of Outcomes in 2009; Grades 5-8 Science: A Manitoba Curriculum Framework of Outcomes in 2000*, and similar frameworks of science learning outcomes for Grades 9 and 10 in 2000 and 2001, respectively. In the case of Grades 11–12 discipline-specific courses including biology, chemistry, and physics, Manitoba developed province-specific curriculum frameworks in these disciplines in the period 2002 to 2006 with close alignment to the learning outcomes of The Common Framework. For the *Français* and French Immersion programs in Manitoba, simultaneous development of curriculum frameworks in science was established, with close collaboration with the English Program.

The conceptual framework for K–12 sciences in Manitoba is founded on five foundations for broad-spectrum approaches to science literacy, including: Nature of Science and Technology; Science, Technology, Society and the Environment (STSE); Scientific and Technological Skills and Attitudes; Essential Science Knowledge; and the Unifying Concepts (Manitoba Education, http://www.edu.gov.mb.ca/k12/cur/science/scicurr.html). Though these five foundations share equal status conceptually, Manitoba science curricula when enacted place particular emphases on STSE connections, scientific enquiry, the technological design process, and the establishment of Aboriginal perspectives in the teaching and learning contexts.

Science assessment

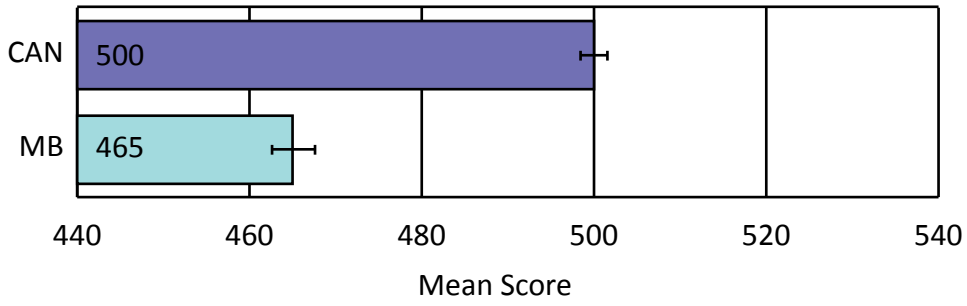
Manitoba does not have a provincial science assessment. More information about the assessment program in Manitoba can be found at http://www.edu.gov.mb.ca/k12/assess/assess_program.html.

Results in science

The performance of Manitoba students in science is compared to that of Canadian students overall. Results are presented both by mean score and by performance level. The following charts present student achievement in science overall, by language of the school system, and by gender.

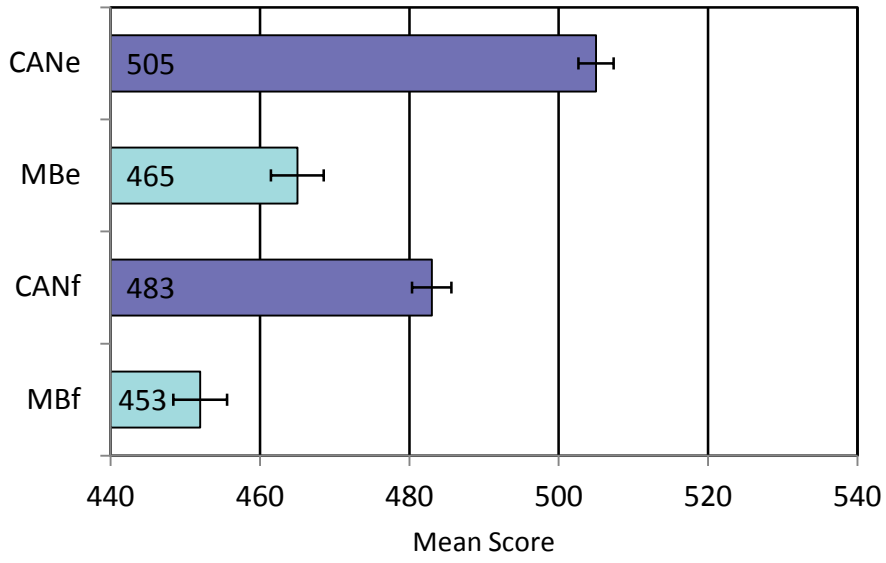
The mean score of Manitoba students who completed the PCAP 2013 Science Assessment is significantly lower than that of Canadian students overall as shown in the following chart.

CHART MB.1 **Canada – Manitoba: Mean score in science**



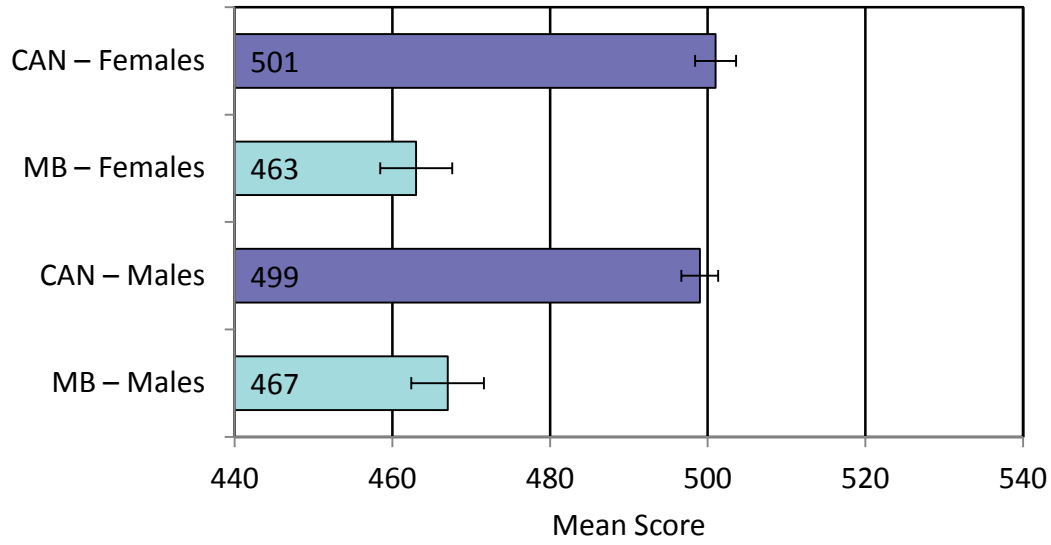
Manitoba students enrolled in both English- and French-language schools perform significantly lower in science than those in Canada overall. Students enrolled in English-language schools achieve significantly higher results than their counterparts in French-language schools.

CHART MB.2 **Canada – Manitoba: Results in science by language**



Within Manitoba, there is no significant gender difference in achievement in science. Compared to the Canadian means, both girls and boys have lower achievement than Canadian students overall.

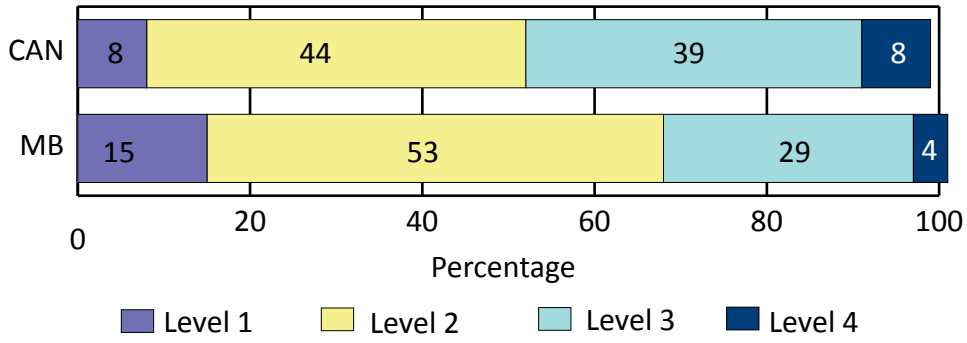
CHART MB.3 **Canada – Manitoba: Results in science by gender**



The percentage of students at each of the four performance levels in science was examined by jurisdiction, by language of the school system, and by gender, as presented in the next three charts. Level 2 is the expected level for Grade 8/Secondary II students in Canada.

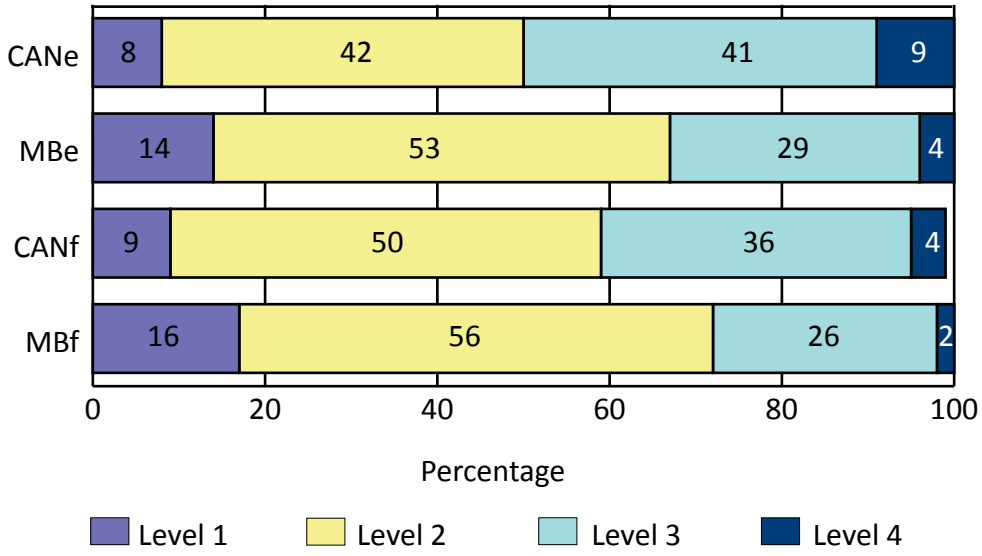
In Manitoba, 86 per cent of students achieve at the expected level of performance or above; however, there is a higher proportion of students at level 1 and a lower proportion of students at levels 3 and 4 than in Canada overall.

CHART MB.4 **Canada – Manitoba: Percentage of students at performance levels in science**



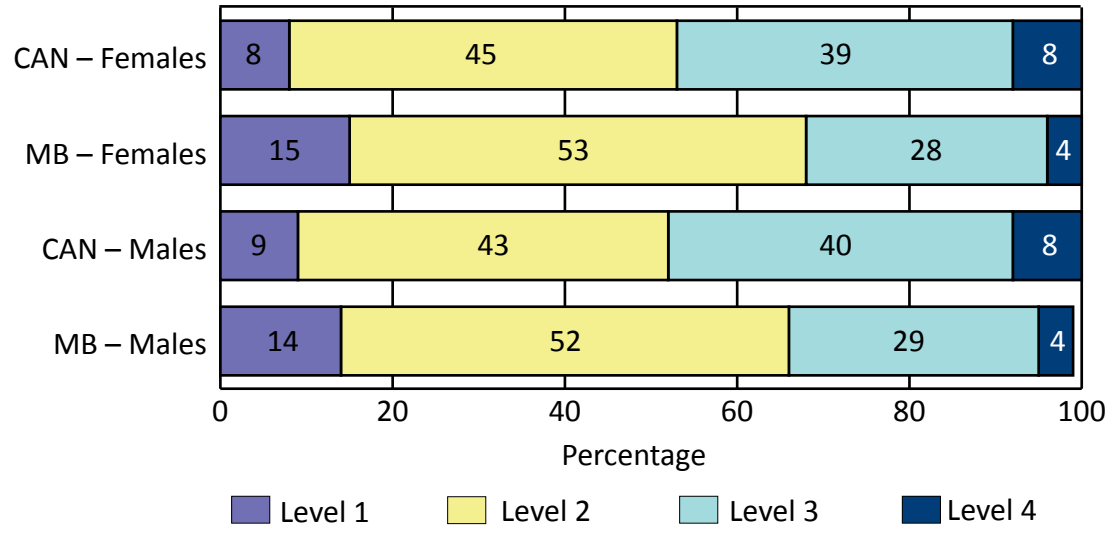
In Manitoba, 86 per cent of English-language students and 84 per cent of French-language students perform at level 2 or above. Compared to the Canadian results, proportionally fewer students in both English- and French-language schools achieve at the higher levels of performance.

CHART MB.5 **Canada – Manitoba: Comparison by level of performance in science by language**



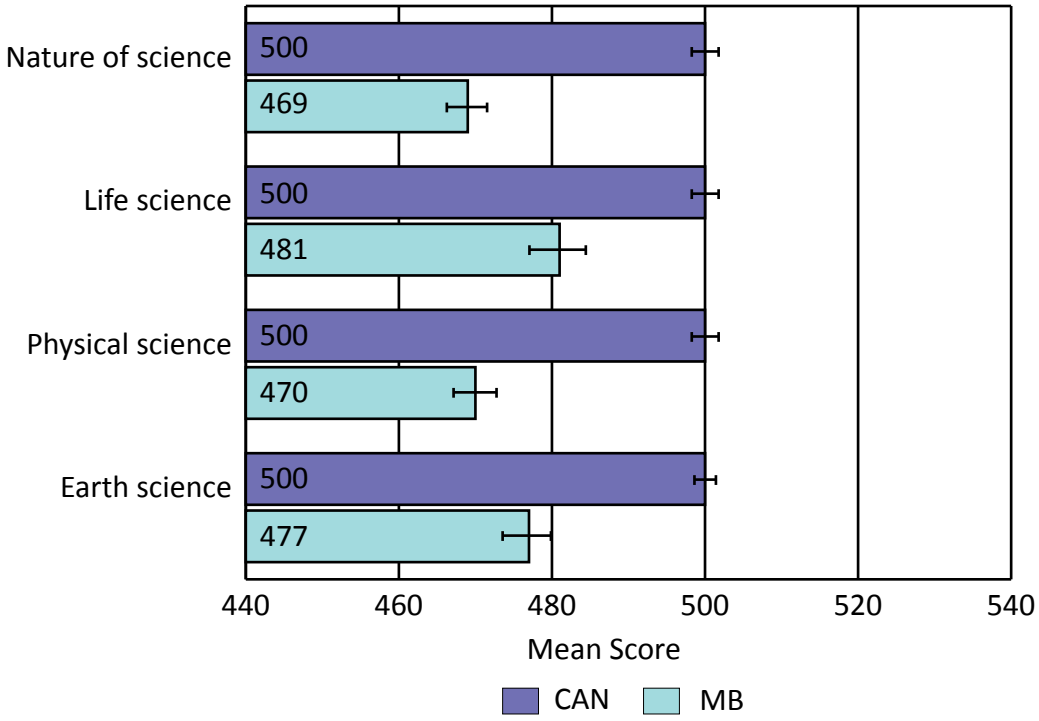
In Manitoba, 85 per cent of both girls and boys perform at level 2 and above, and about the same proportion of boys and girls achieve the higher levels of performance. Compared to the Canadian results, a lower percentage of both girls and boys achieve at levels 3 and 4.

CHART MB.6 **Canada – Manitoba: Comparison by level of performance in science by gender**



When the results are examined by sub-domain in science, students in Manitoba have higher achievement in life science and Earth science. When compared to their Canadian counterparts, achievement scores are lower than the Canadian means in each sub-domain.

CHART MB.7 **Canada – Manitoba: Results by sub-domain in science**



Compared to the Canadian English means, Manitoba students in English-language schools achieve lower scores in each of the four sub-domains. Students enrolled in French-language schools achieve similar results in life science compared to their Canadian counterparts; however, achievement is lower in nature of science, physical science, and Earth science. When the two language systems are compared within the province, students in English-language schools have higher achievement in three sub-domains compared to their counterparts in French-language schools.

TABLE MB.1 **Canada – Manitoba: Results by sub-domain and language**

	Nature of science		Life science		Physical science		Earth science	
	Mean	**CI**	**Mean**	**CI**	**Mean**	**CI**	**Mean**	**CI**
CANe	504	2.2	506	2.6	504	2.3	502	2.5
MBe	470	4.4	481	3.3	471	4.7	477	3.7
Difference	**34***		**25***		**33***		**25***	
CANf	487	4.4	481	3.3	488	4.7	492	3.7
MBf	463	2.6	468	4.2	462	3.6	468	2.4
Difference	**24***		13		**26***		**24***	
MBe	470	4.4	481	3.3	471	4.7	477	3.7
MBf	463	2.6	468	4.2	462	3.6	468	2.4
Difference	7		**13***		**9***		**9***	

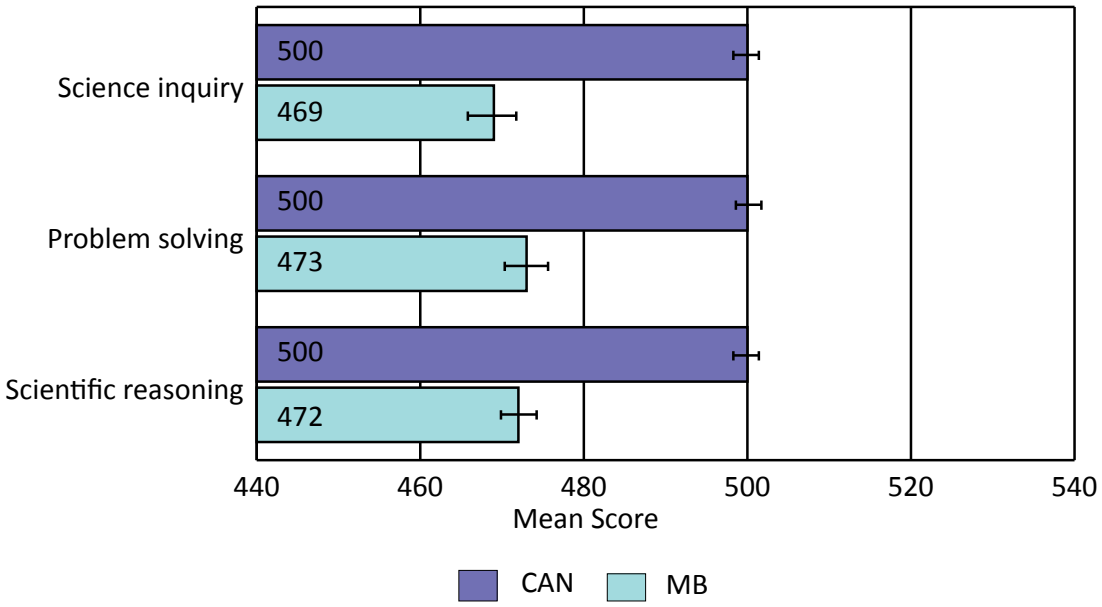
Within Manitoba, there are no significant gender differences for three sub-domains in science, although boys outperform girls in physical science. Both girls and boys have lower achievement in each sub-domain when compared to the Canadian means for the sub-domains.

TABLE MB.2 **Canada – Manitoba: Results by sub-domain and gender**

	Nature of science		Life science		Physical science		Earth science	
	Mean	**CI**	**Mean**	**CI**	**Mean**	**CI**	**Mean**	**CI**
CAN – Females	501	2.7	501	2.5	499	2.5	501	3.3
MB – Females	470	4.9	478	4.9	466	5.7	475	5.3
Difference	**31***		**23***		**33***		**26***	
CAN – Males	499	2.8	499	2.1	501	2.4	500	2.9
MB – Males	469	5.4	484	5.4	475	5.7	479	4.9
Difference	**30***		**15***		**26***		**21***	
MB – Females	470	4.9	478	4.9	466	5.7	475	5.3
MB – Males	469	5.4	484	5.4	475	5.7	479	4.9
Difference	1		6		**9***		4	

When the results are examined by competency in science, there are no significant differences among the three competencies within the province; however, Manitoba students achieved significantly lower scores when compared to the Canadian results overall.

CHART MB.8 **Canada – Manitoba: Results by competency in science**



When the results for the three competencies are compared between Manitoba and Canadian students for schools in both language systems, Manitoba students have significantly lower achievement. Within the province, English-language schools have significantly higher achievement in problem solving and scientific reasoning.

TABLE MB.3 **Canada – Manitoba: Results by competency and language**

	Science inquiry		Problem solving		Scientific reasoning	
	Mean	**CI**	**Mean**	**CI**	**Mean**	**CI**
CANe	504	2.0	503	2.1	505	1.9
MBe	469	4.3	473	4.3	473	4.3
Difference	**35***		**30***		**32***	
CANf	487	2.8	490	3.2	482	2.7
MBf	463	3.8	463	3.5	459	3.8
Difference	**24***		**27***		**23***	
MBe	469	4.3	473	4.3	473	4.3
MBf	463	3.8	463	3.5	459	3.8
Difference	6		**10***		**14***	

Within the Manitoba, boys have higher achievement than girls in problem solving and scientific reasoning. When compared to Canadian students, Manitoba girls and boys have significantly lower scores than their Canadian counterparts in each of the three competencies.

TABLE MB.4 **Canada – Manitoba: Results by competency and gender**

	Science inquiry		Problem solving		Scientific reasoning	
	Mean	CI	Mean	CI	Mean	CI
CAN – Females	503	2.6	499	3.0	499	2.5
MB – Females	471	5.1	469	6.3	468	5.7
Difference	**32***		**30***		**31***	
CAN – Males	497	3.3	501	2.4	501	2.7
MB – Males	467	5.3	476	4.6	477	4.7
Difference	**30***		**25***		**24***	
MB – Females	471	5.1	469	6.3	468	5.7
MB – Males	467	5.3	476	4.6	477	4.7
Difference	4		**7***		**9***	

Reading and mathematics results

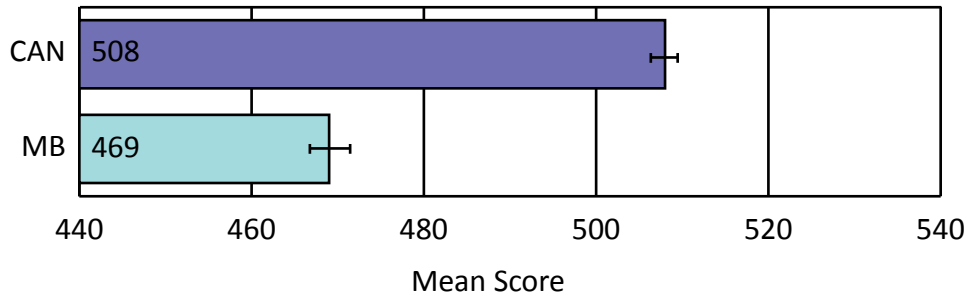
In PCAP 2013, reading and mathematics are both minor domains. Results are reported overall, by language of the school system, and by gender. Finally, multiple comparisons over time between PCAP assessments are reported.

Results in reading

The following charts present student achievement in reading overall, by language of the school system, and by gender.

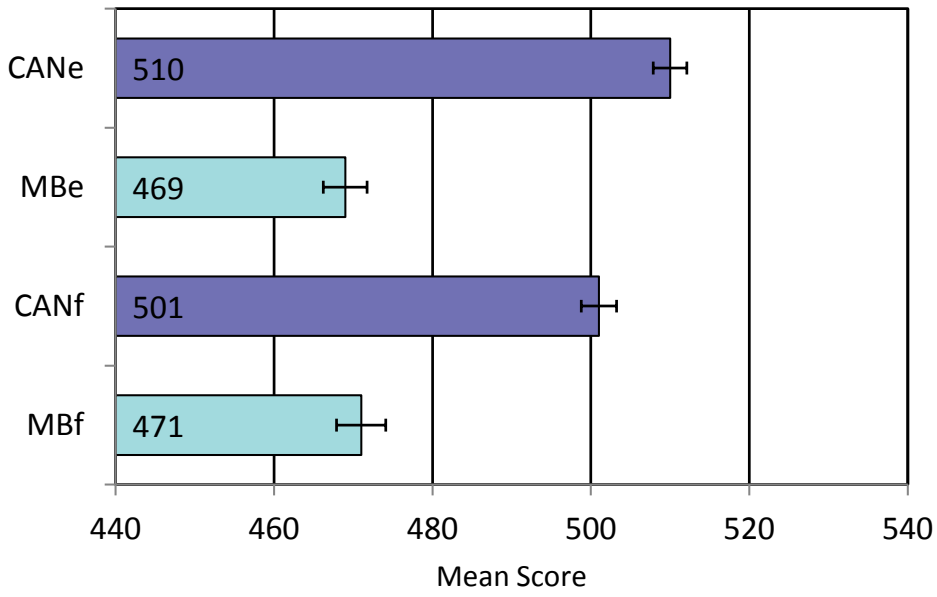
In PCAP 2013, reading achievement in Manitoba is significantly lower than the Canadian mean score.

CHART MB.9 **Canada – Manitoba: Mean score in reading**



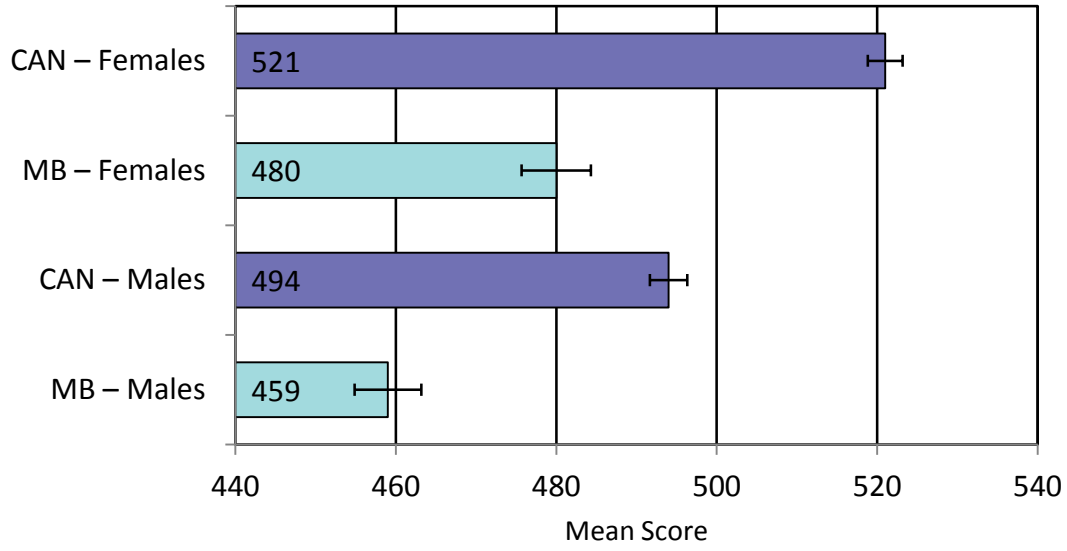
As shown in the following chart, reading scores in both English- and French-language schools in Manitoba are significantly lower than the Canadian means. Within the province, achievement results are statistically similar between the majority and minority language systems.

CHART MB.10 **Canada – Manitoba: Results in reading by language**



Reading achievement for both girls and boys in Manitoba is significantly lower than Canadian students overall. Girls outperform boys in reading both within the province (by 21 points) and in Canada overall (by 27 points), as shown in the PCAP 2013 assessment of reading.

CHART MB.11 **Canada – Manitoba: Results in reading by gender**

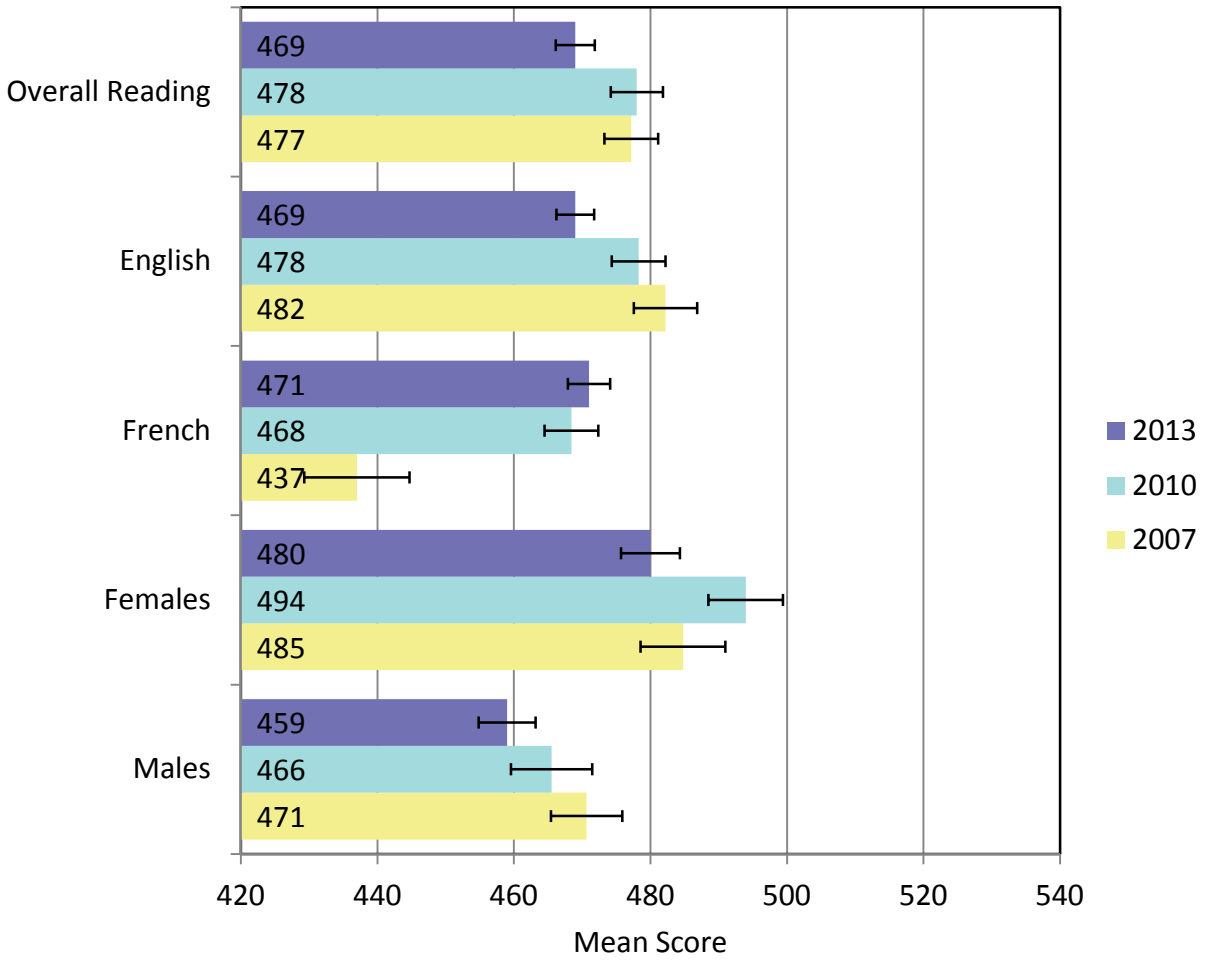


Comparison of reading results: 2007, 2010, and 2013

Reading was a major domain in PCAP 2007. As a minor domain in 2010 and 2013, the assessment comprised fewer reading items; however, common items among the three assessments allow the reporting of changes over time for reading achievement.

Reading achievement in Manitoba was consistent between 2007 and 2010. Negative changes between 2007 and 2013 have occurred in reading overall and for English-language schools in reading. Between 2010 and 2013, negative changes are seen in reading overall, English-language schools, and for girls.

CHART MB.12 **Canada – Manitoba: Changes over time in reading**

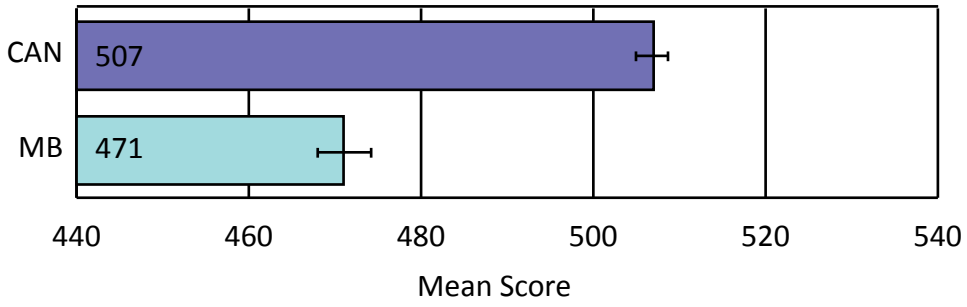


Results in mathematics

The following charts present student achievement for Canada and Manitoba in mathematics overall, by language of the school system, and by gender.

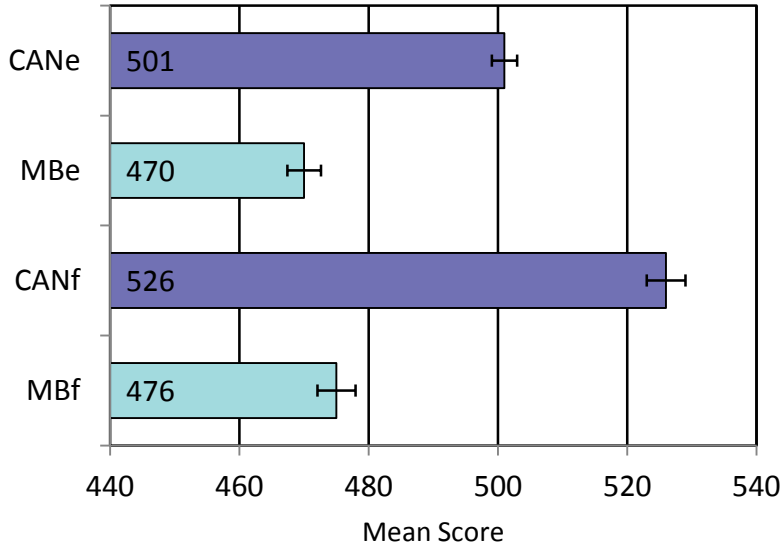
In PCAP 2013, mathematics achievement in Manitoba is significantly lower than that in Canada overall, as shown in the chart below.

CHART MB.13 **Canada – Manitoba: Mean score in mathematics**



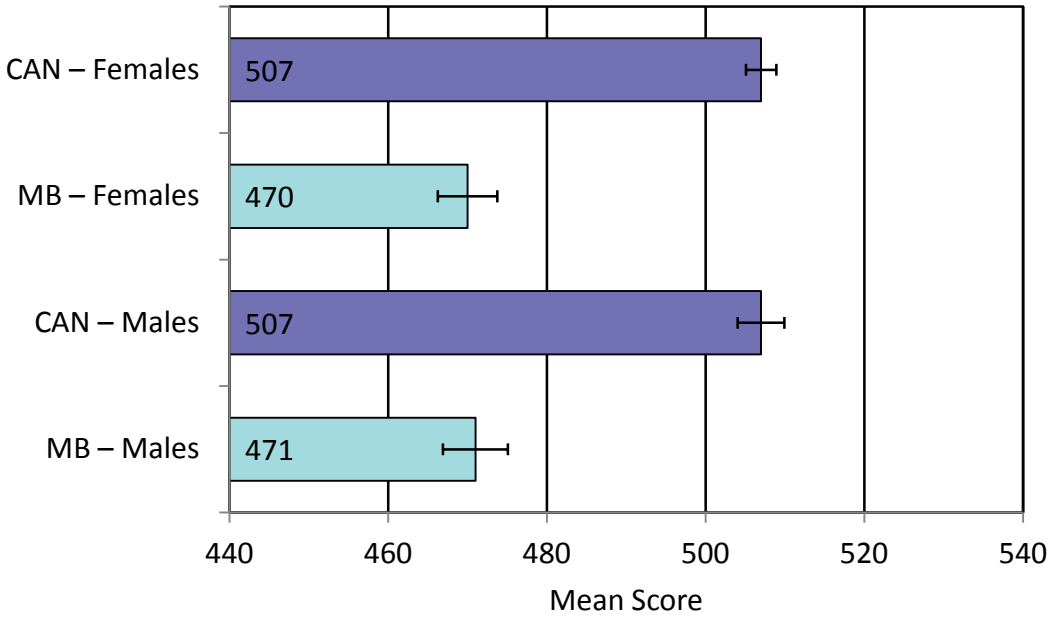
As shown in the following chart, mathematics scores in both English- and French-language schools are significantly lower than the Canadian means. Within the province, there is no significant difference between the two language systems.

CHART MB.14 **Canada – Manitoba: Results in mathematics by language**



In Manitoba, as in Canada overall, there is no gender gap in mathematics; however, both girls and boys have lower achievement in mathematics compared to Canadian girls and boys overall.

CHART MB.15 **Canada – Manitoba: Results in mathematics by gender**

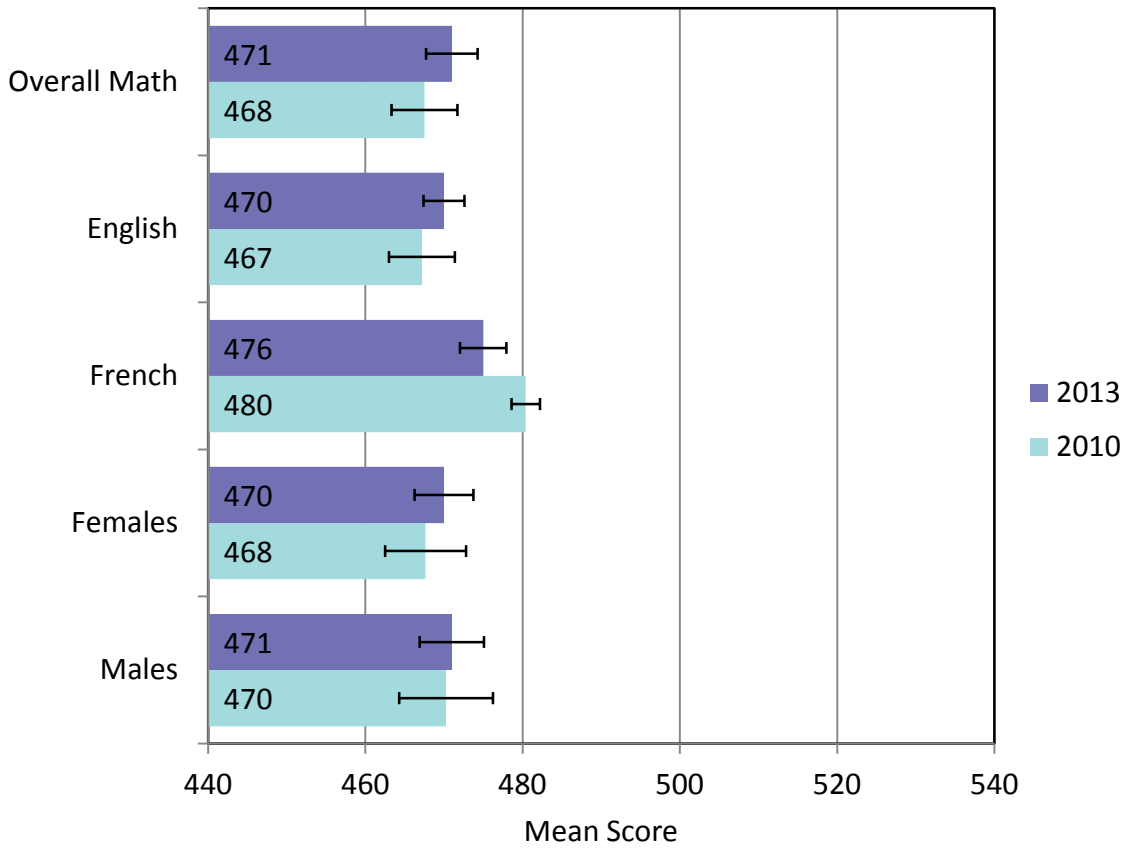


Comparison of mathematics results: 2010 and 2013

Mathematics was a major domain in PCAP 2010, which was the baseline year. As a minor domain in 2013, the assessment comprised fewer mathematics items; however, common items between the two assessments allow the reporting of changes over time for mathematics achievement.

As shown in the PCAP 2013 assessment of mathematics, there have been no significant changes in mathematics achievement between the baseline year in 2010 and 2013.

CHART MB.16 **Canada – Manitoba: Changes over time in mathematics**



ONTARIO

Context Statement

Social context

In 2012, Ontario's population was 13.5 million. English is Ontario's official language and French language rights have been extended to the legal and educational systems. According to the 2011 census by Statistics Canada, the six languages most commonly spoken at home in Ontario for ages 5–19 are English (1,936,345), French (50,830), Punjabi (19,085), Urdu (17,740), Spanish (16,610) and Arabic (14,610). An estimated 64,000 Aboriginal students between the ages of 5 and 19 attend provincially funded elementary and secondary schools.

The Ministry of Education works to promote successful outcomes for all students, including students whose first language is neither English nor French; students with special education needs; First Nations, Métis, and Inuit students; and students who are economically disadvantaged.

Organization of the school system

Ontario has 72 district school boards of which 60 are English-language and 12 are French-language boards. There are 31 public and 29 Catholic district school boards in the English-language system, and 4 public and 8 Catholic district school boards in the French-language system. In addition, there are 11 School Authorities, consisting of 4 geographically isolated boards, 6 hospital-based school authorities, and the Provincial Schools Authority.

In 2011-2012, there were 2,043,117 students enrolled in publicly funded education in Ontario. There were 1,343,616 students enrolled in elementary schools and 699,501 students enrolled in secondary schools. As of 2011-2012, there were 3,988 elementary and 911 secondary schools. Approximately 68 per cent of students were enrolled in public school boards and 32 per cent in Catholic school boards. Approximately 4.7 per cent of students were enrolled in the French-language education system.

In 2010-2011, Ontario introduced full-day Kindergarten for four- and five-year-olds in nearly 600 schools. By September 2014, all elementary schools will offer full-day Kindergarten.

In Ontario, children are required to attend school once they turn six years old, and to stay in school until they graduate or turn 18. The levels are Primary (Grades 1-3), Junior (Grades 4-6), Intermediate (Grades 7-10), and Senior (Grades 11 and 12).

Science teaching

The *Ontario Curriculum, Grades 1-8 Science and Technology (2007)* and *Le curriculum de l'Ontario – Sciences et technologie, 1re à 8e année (2007)* are consistent with the goals of science education in Canada outlined in the *Common Framework of Science Learning Outcomes, K-12* (CMEC, 1997). The learning outcomes are intended to develop the scientific literacy of Canadian students.

Ontario's elementary science and technology curriculum is structured around the relationships between fundamental concepts, big ideas, and the goals of science and technology to provide

a framework for teaching overall and specific expectations. The French-language curriculum is developed, implemented, and revised in parallel with the English-language curriculum. A distinct feature of the French-language education system is the *Aménagement linguistique policy*, which is intended to promote, enhance, and expand the use of the French language and culture in a minority setting, in all spheres of activity.

Ontario's elementary science and technology curriculum has three goals: to relate science and technology to society and the environment; to develop the skills, strategies, and habits of mind required for scientific investigation and technological problem solving; and to understand the basic concepts of science and technology. The three goals and their interrelationship within the curriculum expectations reinforce the notion that learning in science and technology cannot be viewed as merely the learning of facts. Rather, science and technology is a subject in which students learn, in age-appropriate ways, to consider both the knowledge and the skills that will help them to understand and consider critically the impact of developments in science and technology on modern society and the environment. These three goals extend into the secondary curriculum and promote a continuous and consistent approach to learning science throughout the school careers of Ontario students.

The science and technology curriculum expectations are organized into four strands: Understanding Life Systems, Understanding Structures and Mechanisms, Understanding Matter and Energy, and Understanding Earth and Space Systems. The content strands in the Grades 9 and 10 secondary science curriculum (Biology, Chemistry, Earth and Space Science, and Physics) are closely aligned with the elementary science and technology curriculum. In Grades 11 and 12 students are able to specialize and select courses that focus specifically on one or more of the major areas of knowledge and skills of science.

The curriculum policy documents may be found at the following Web sites:

Ontario Curriculum, Grades 1-8 Science and Technology (2007)
http://www.edu.gov.on.ca/eng/curriculum/elementary/scientec18currb.pdf
Le curriculum de l'Ontario – Sciences et technologie, 1re à 8e année (2007)
http://www.edu.gov.on.ca/fre/curriculum/elementary/scientec18currbf.pdf
Ontario Curriculum, Sciences, Grades 9 and 10 (2008)
http://www.edu.gov.on.ca/eng/curriculum/secondary/science910_2008.pdf
Le curriculum de l'Ontario – Sciences, 9e et 10e année (2008)
http://www.edu.gov.on.ca/fre/curriculum/secondary/science910_2008fr.pdf
The Ontario Curriculum, Sciences, Grades 11 and 12 (2008)
http://www.edu.gov.on.ca/eng/curriculum/secondary/2009science11_12.pdf
Le curriculum de l'Ontario – Sciences, 11e et 12e année (2008)
http://www.edu.gov.on.ca/fre/curriculum/secondary/2009science11_12Fr.pdf

Assessment of Science

In Ontario, classroom teachers are responsible for classroom assessment and evaluation to improve student learning. Teachers bring varied assessment and evaluation approaches to the classroom including assessment for, as, and of learning. In the curriculum policy documents, teachers are provided with an achievement chart that identifies four categories of knowledge and skills in science and technology (knowledge and understanding, thinking, application, and communication). The

achievement chart is a standard province-wide guide used by teachers to make judgments about student work that are based on clear performance standards and on a body of evidence collected over time.

Ontario participates in large-scale assessments of science through the Programme for International Student Assessment (PISA), the Trends in International Mathematics and Science Study (TIMSS), and the Pan-Canadian Assessment Program (PCAP).

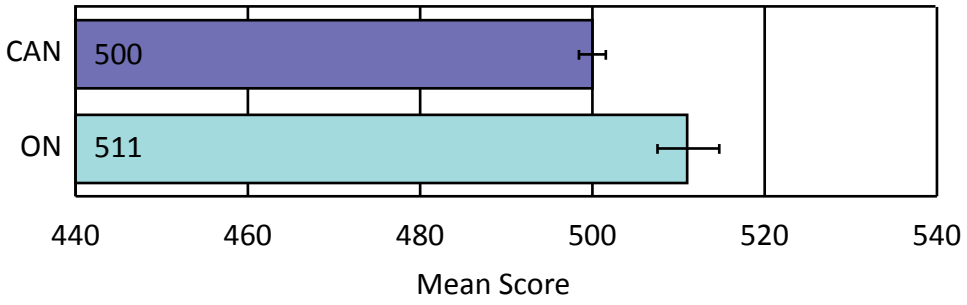
More information on provincial, national, and international assessments in Ontario may be found on the Web site of the Education Quality and Accountability Office (EQAO):
http://www.eqao.com/NIA/NIA.aspx?status=logout&Lang=E (English)
http://www.eqao.com/NIA/NIA.aspx?status=logout&Lang=F (French)

Results in science

The performance of Ontario students in science is compared to that of Canadian students overall. Results are presented both by mean score and by performance level. The following charts present student achievement in science overall, by language of the school system, and by gender.

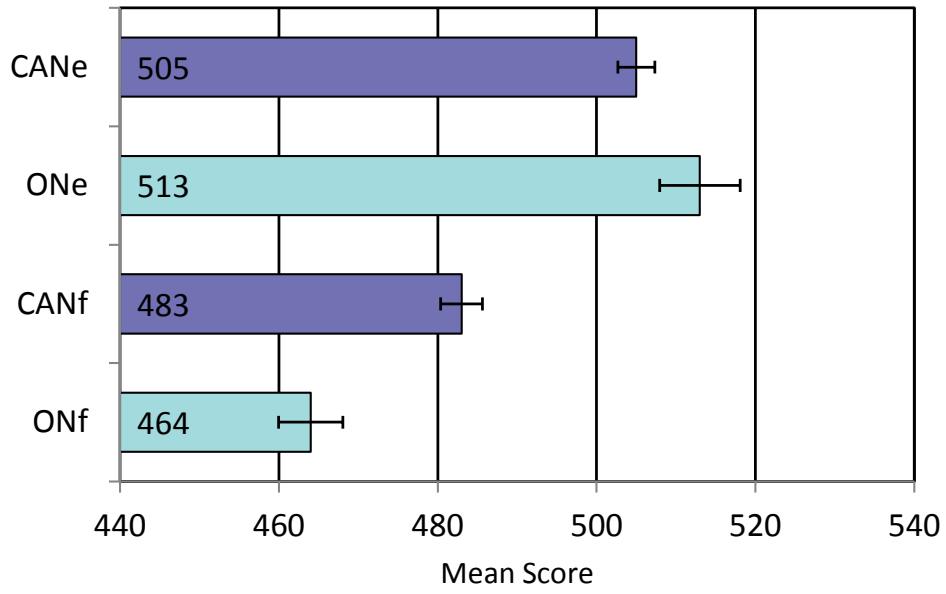
The mean score of Ontario students who completed the PCAP 2013 Science Assessment is significantly higher than that of Canadian students overall, as presented in the following chart.

CHART ON.1 **Canada – Ontario: Mean score in science**



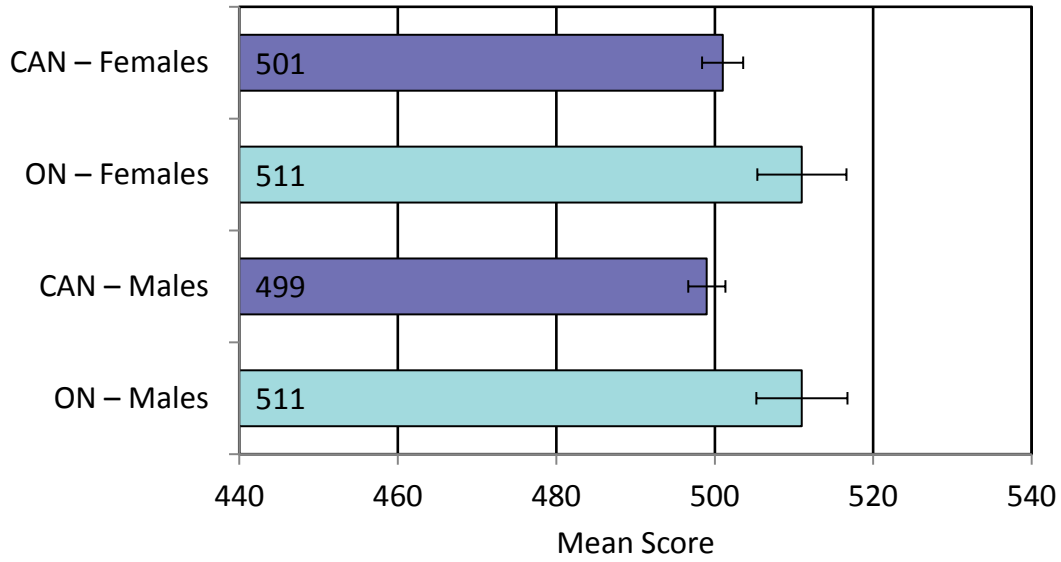
Ontario students enrolled in English-language schools perform better in science than those in Canada overall, whereas students in French-language schools have lower achievement than their Canadian counterparts. Within the province, achievement in English-language schools is significantly higher than that in French-language schools.

CHART ON.2 **Canada – Ontario: Results in science by language**



Both boys and girls in Ontario have higher achievement compared to the Canadian means. Within the provinces there is no gender difference in achievement in science.

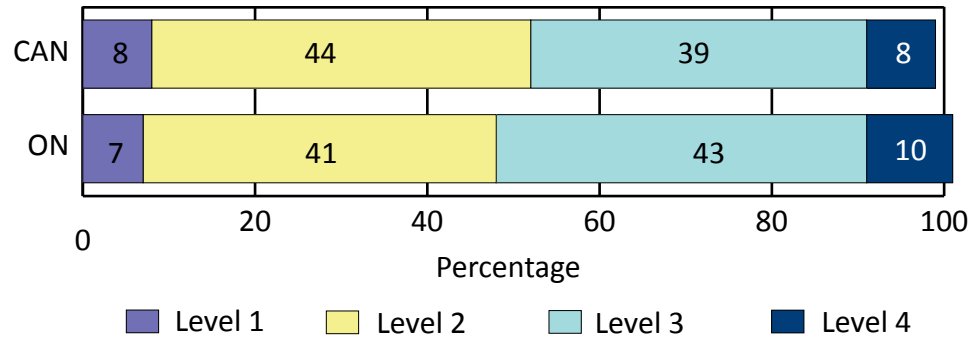
CHART ON.3 **Canada – Ontario: Results in science by gender**



The percentage of students at each of the four performance levels in science was examined by jurisdiction, by language of the school system, and by gender, as presented in the next three charts. Level 2 is the expected level for Grade 8/Secondary II students in Canada.

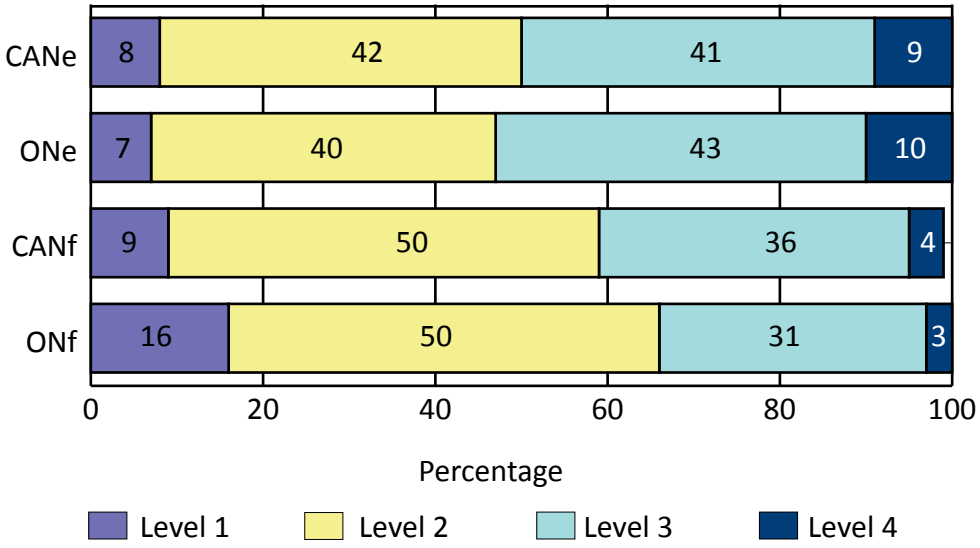
In Ontario, 94 per cent of students achieve at the expected level of performance or above and the percentage of students at the higher performance levels is higher than the percentage in Canada overall.

CHART ON.4 **Canada – Ontario: Percentage of students by performance level in science**



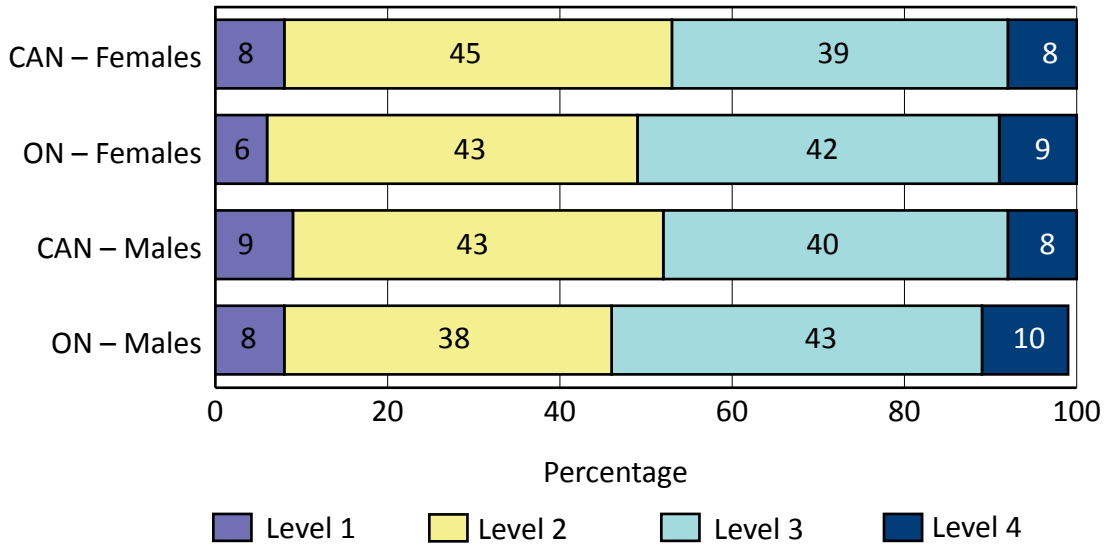
In Ontario, 93 per cent of English-language students and 84 per cent of French-language students perform at level 2 or above. Compared to the Canadian results, proportionally more Ontario students in English-language schools achieve the higher levels of performance, whereas the opposite is found in French-language schools in which fewer students perform at levels 3 and 4.

CHART ON.5 **Canada – Ontario: Comparison by level of performance in science by language**



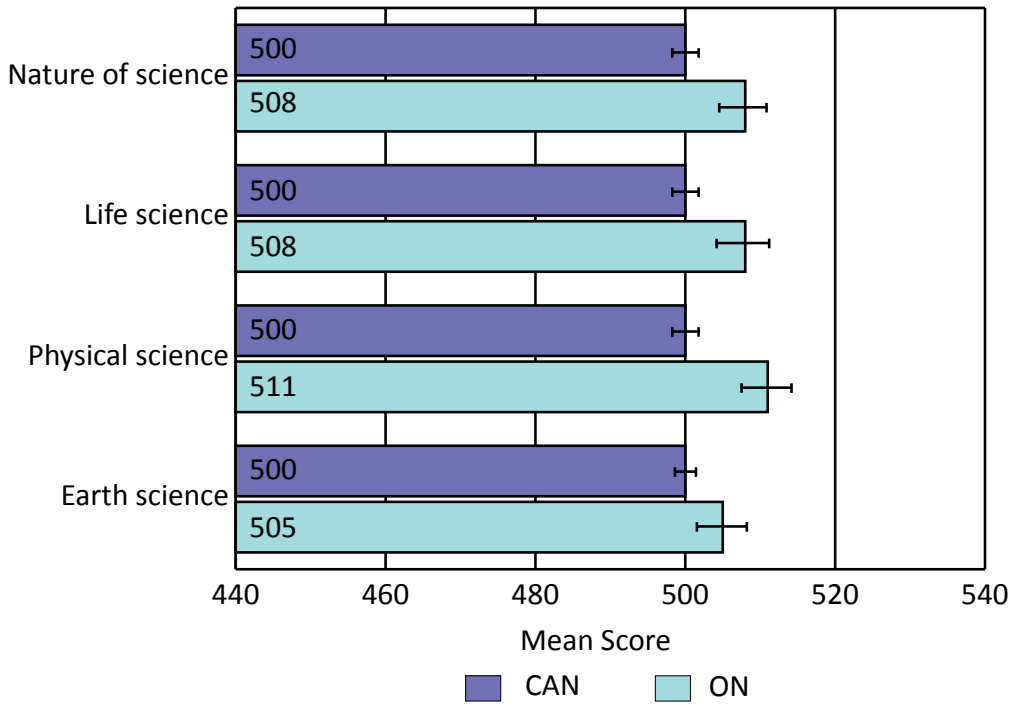
In Ontario, 94 per cent of girls and 91 per cent of boys perform at level 2 and above. Compared to the Canadian results, the same proportion of both girls and boys achieve at levels 3 and 4.

CHART ON.6 **Canada – Ontario: Comparison by level of performance in science by gender**



When the results are examined by sub-domain in science, students in Ontario achieve higher results than Canadian students overall in nature of science, life science, and physical science. There are no significant differences in achievement among the four sub-domains within the province.

CHART ON.7 **Canada – Ontario: Results by sub-domain in science**



Ontario students in English-language schools achieve higher results in physical science when compared to the Canadian mean. In French-language schools, Ontario students have significantly lower achievement in nature of science, physical science, and Earth science compared to the Canadian results. Within the province, English-language schools have significantly higher achievement than French-language schools for all four sub-domains.

TABLE ON.1 **Canada – Ontario: Results by sub-domain and language**

	Nature of science		Life science		Physical science		Earth science	
	Mean	**CI**	**Mean**	**CI**	**Mean**	**CI**	**Mean**	**CI**
CANe	504	2.2	506	2.6	504	2.3	502	2.5
ONe	510	5.1	509	4.5	512	4.5	507	5.7
Difference	6		3		**8***		5	
CANf	487	2.6	481	3.0	488	3.3	492	2.4
ONf	470	4.6	474	4.8	479	4.5	468	3.5
Difference	**17***		7		**9***		**24***	
ONe	510	5.1	509	4.5	512	4.5	507	5.7
ONf	470	4.6	474	4.8	479	4.5	468	3.5
Difference	**40***		**35***		**33***		**39***	

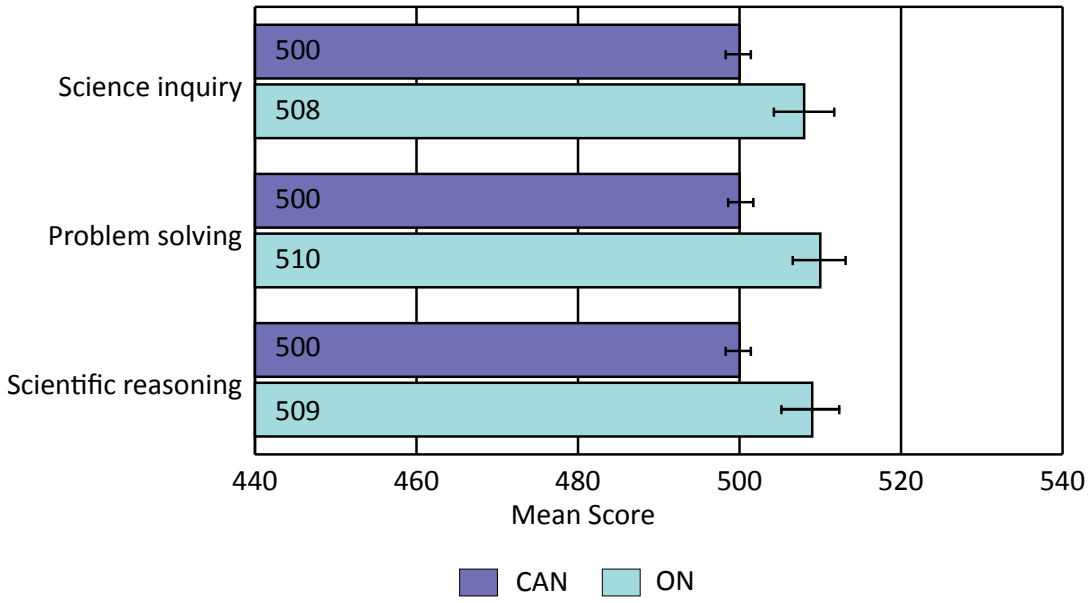
No significant gender difference is found among the four sub-domains within Ontario. When compared to the Canadian means, Ontario girls have higher achievement in physical science, and Ontario boys have higher achievement in nature of science, life science, and physical science than their Canadian counterparts.

TABLE ON.2 **Canada – Ontario: Results by sub-domain and gender**

	Nature of science		Life science		Physical science		Earth science	
	Mean	**CI**	**Mean**	**CI**	**Mean**	**CI**	**Mean**	**CI**
CAN – Females	501	2.7	501	2.5	499	2.5	501	3.3
ON – Females	508	6.3	506	5.1	511	5.5	506	6.1
Difference	7		5		**12***		5	
CAN – Males	499	2.8	499	2.1	501	2.4	500	2.9
ON – Males	509	7.0	510	4.7	511	5.7	504	5.6
Difference	**10***		**11***		**10***		4	
ON – Females	508	6.3	506	5.1	511	5.5	506	6.1
ON – Males	509	7.0	510	4.7	511	5.7	504	5.6
Difference	1		4		0		2	

Ontario students achieved significantly higher results in each of the three competencies compared to the Canadian results. Within the province, there are no significant differences among the competencies.

CHART ON.8 **Canada – Ontario: Results by competency in science**



In Ontario, students enrolled in English-language schools have significantly higher achievement in each of the three competencies compared to those in French-language schools. When compared to the Canadian means, students in English-language schools have higher mean scores in problem solving than their Canadian counterparts. In French-language schools, achievement is significantly lower in the three competencies compared to the Canadian mean scores.

TABLE ON.3 **Canada – Ontario: Results by competency and language**

	Science inquiry		Problem solving		Scientific reasoning	
	Mean	**CI**	**Mean**	**CI**	**Mean**	**CI**
CANe	504	2.0	503	2.1	505	1.9
ONe	509	5.4	512	5.1	511	4.8
Difference	5		**9***		6	
CANf	487	2.8	490	3.2	482	2.7
ONf	470	3.9	475	5.7	469	3.6
Difference	**17***		**15***		**13***	
ONe	509	5.4	512	5.1	511	4.8
ONf	470	3.9	475	5.7	469	3.6
Difference	**39***		**37***		**42***	

No significant gender difference is found among the three competencies within Ontario. When compared to the Canadian means, both Ontario girls and boys have higher achievement in problem solving and scientific reasoning than their Canadian counterparts.

TABLE ON.4 **Canada – Ontario: Results by competency and gender**

	Science inquiry		Problem solving		Scientific reasoning	
	Mean	CI	Mean	CI	Mean	CI
CAN – Females	503	2.6	499	3.0	499	2.5
ON – Females	510	6.7	509	5.5	508	5.1
Difference	7		**10***		**9***	
CAN – Males	497	3.3	501	2.4	501	2.7
ON – Males	505	5.1	512	5.7	512	6.1
Difference	8		**11***		**11***	
ON – Females	510	6.7	509	5.5	508	5.1
ON – Males	505	5.1	512	5.7	512	6.1
Difference	5		3		4	

Reading and mathematics results

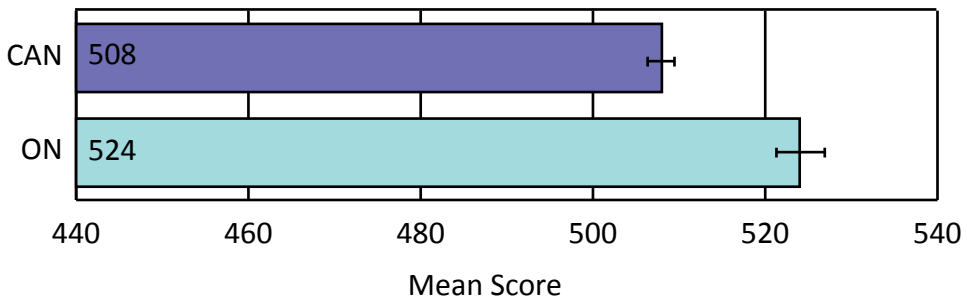
In PCAP 2013, reading and mathematics are both minor domains. Results are reported overall, by language of the school system, and by gender. Finally, multiple comparisons over time between PCAP assessments are reported.

Results in reading

The following charts present student achievement in reading overall, by language of the school system, and by gender.

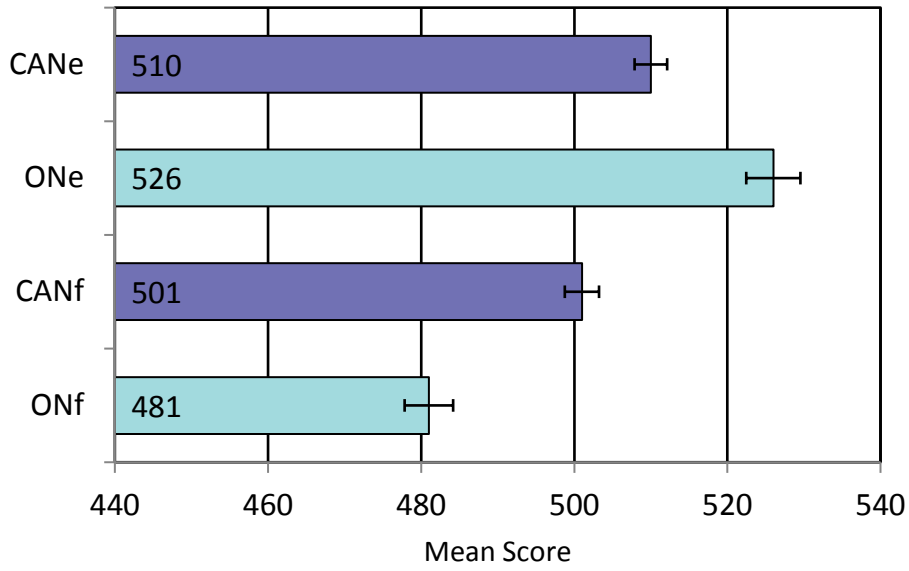
In PCAP 2013, reading achievement in Ontario is significantly higher than the Canadian mean score, as shown in the chart below.

CHART ON.9 **Canada – Ontario: Mean score in reading**



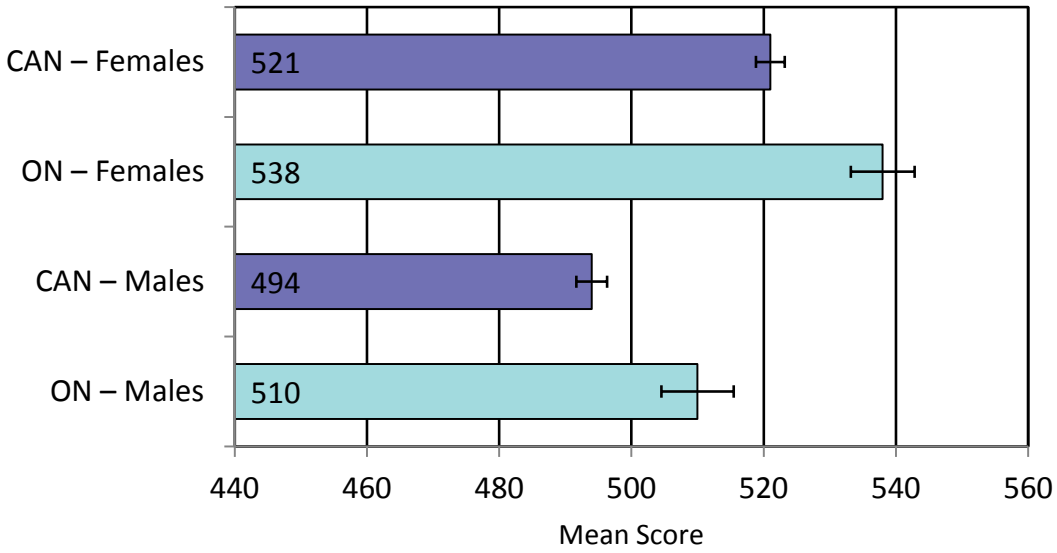
As shown in the following chart, reading scores in English-language schools in Ontario are significantly higher than the Canadian English mean; however, the opposite occurs in French-language schools, where student achievement is significantly lower compared to the Canadian French mean. Ontario results in English-language schools are 45 points higher than in French-language schools.

CHART ON.10 **Canada – Ontario: Results in reading by language**



Reading achievement for both girls and boys in Ontario is statistically higher than Canadian students overall. Girls outperform boys in reading both within the province (by 28 points) and in Canada overall (by 27 points) as shown in the PCAP 2013 assessment of reading.

CHART ON.11 **Canada – Ontario: Results in reading by gender**

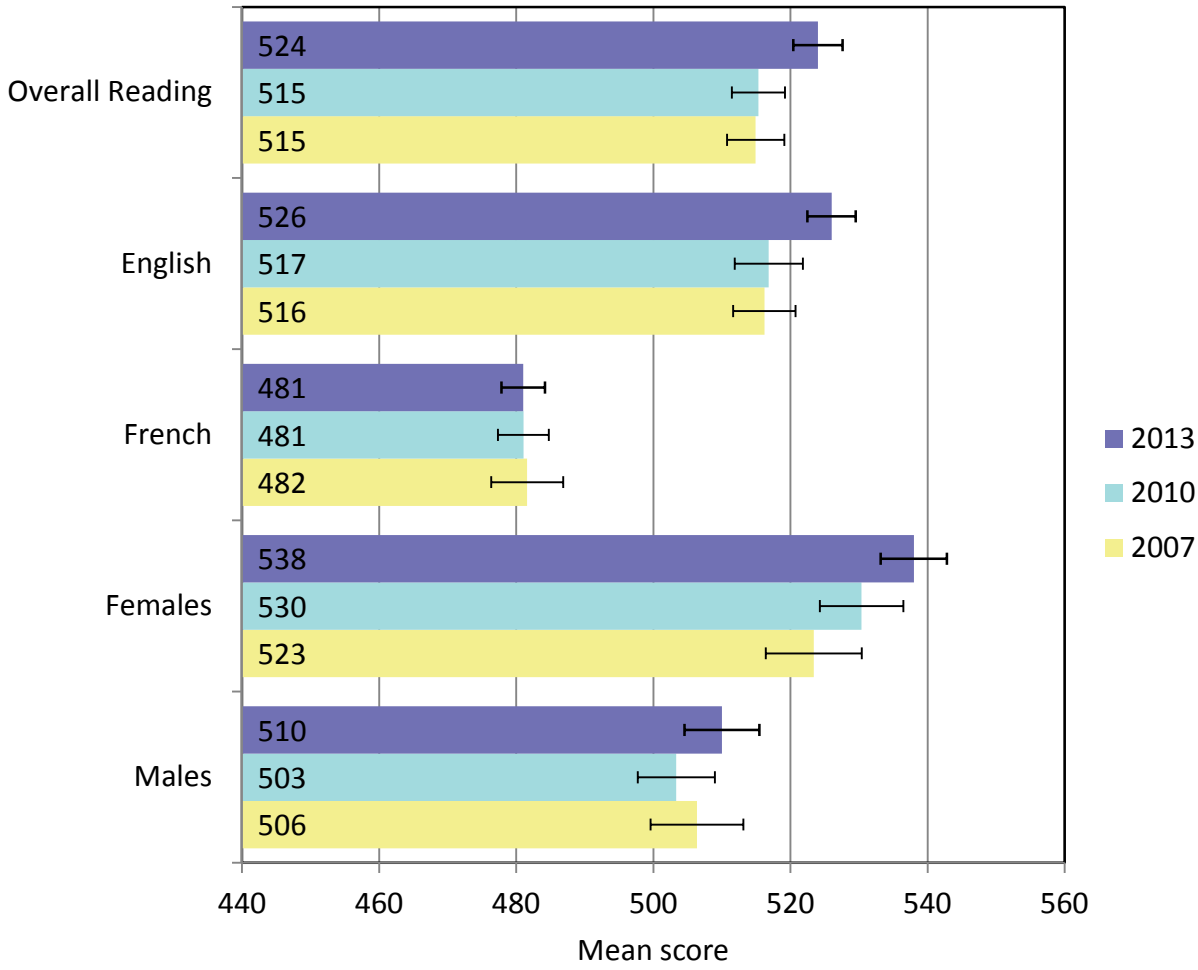


Comparison of reading results: 2007, 2010, and 2013

Reading was a major domain in PCAP 2007. As a minor domain in 2010 and 2013, the assessment comprised fewer reading items; however, common items among the three assessments allow the reporting of changes over time for reading achievement.

As shown in the following chart, reading achievement for Ontario students has undergone a positive change for reading overall, and for English-language students between the 2010 and 2013 PCAP assessment of reading. For girls in Ontario, there has been a positive change between 2007 and 2013, although the change was not significant between the 2010 and 2013 administrations.

CHART ON.12 **Canada – Ontario: Changes over time in reading**

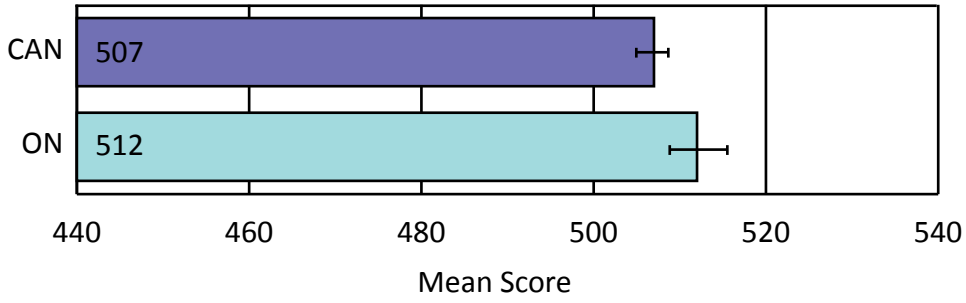


Results in mathematics

The following charts presents student achievement for Canada and Ontario in mathematics overall, by language of the school system, and by gender.

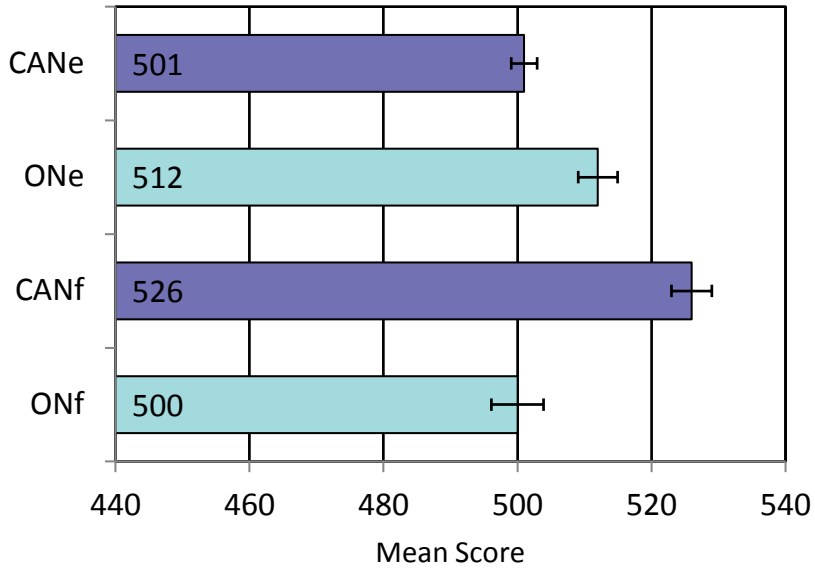
In PCAP 2013, mathematics achievement in Ontario is statistically similar to that in Canada overall, as shown in the chart below.

CHART ON.13 **Canada – Ontario: Mean score in mathematics**



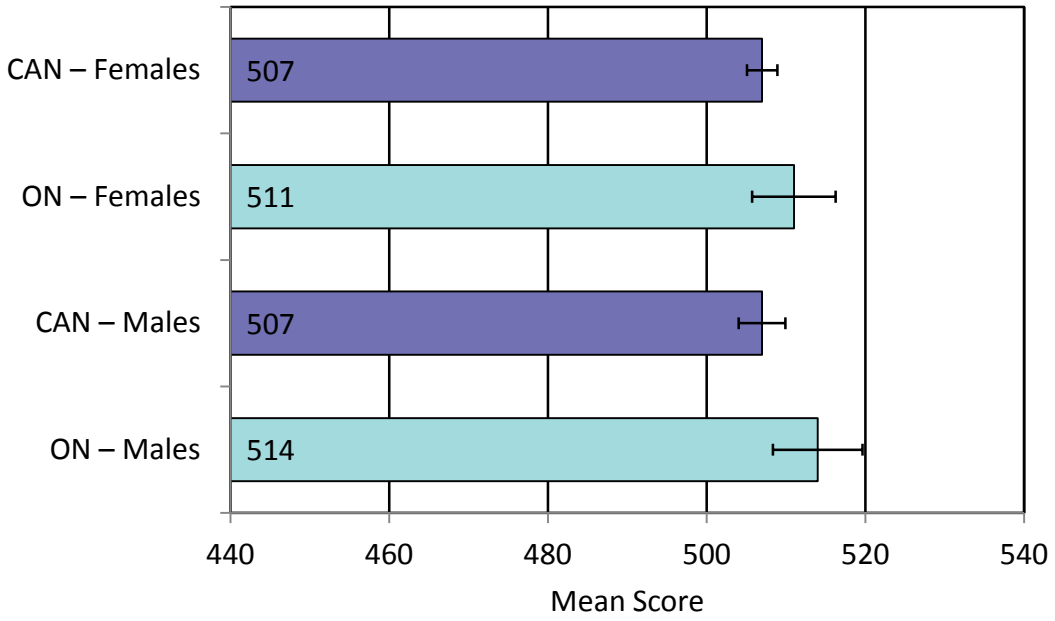
As shown in the following chart, mathematics scores in English-language schools are significantly higher than the Canadian English mean, although in French-language schools achievement results are significantly lower than the Canadian French mean. Within the province, students in English-language schools outperform those in French-language schools in mathematics.

CHART ON.14 **Canada – Ontario: Results in mathematics by language**



In Ontario, as in Canada overall, there is no gender gap in mathematics, and there is no significant difference in mathematics achievement compared to Canadian boys and girls overall.

CHART ON.15 **Canada – Ontario: Results in mathematics by gender**

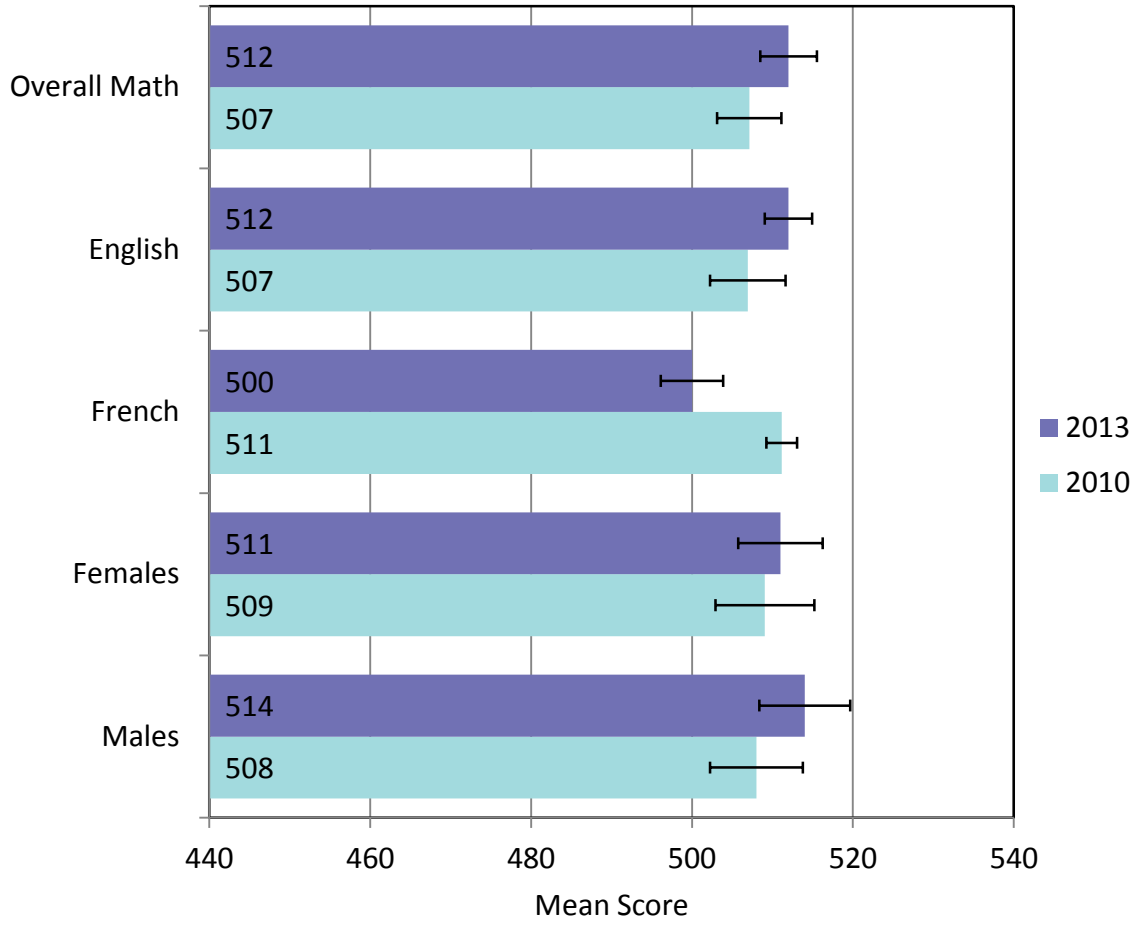


Comparison of mathematics results: 2010 and 2013

Mathematics was a major domain in PCAP 2010, which was the baseline year. As a minor domain in 2013, the assessment comprised fewer mathematics items; however, common items between the two assessments allow the reporting of changes over time for mathematics achievement.

As shown in the PCAP 2013 assessment of mathematics, there has been a negative change over time in achievement in French-language schools in Ontario between PCAP 2010 and 2013. The results between the two administrations have been consistent in Ontario for each of the other categories analyzed, as shown in the following chart.

CHART ON.16 **Canada – Ontario: Changes over time in mathematics**



QUEBEC

Context Statement

Social context

Quebec's population of close to eight million is concentrated in the south of the province, mostly in its largest city, Montreal, and its capital city, Quebec City. The official language of Quebec is French. Francophones account for around 80 per cent of Quebec's total population. Anglophones make up around 9 per cent and have access to a full system of educational institutions, from preschool to university. There are 11 Aboriginal peoples in Quebec, who account for about 1 per cent of the population. Under the *Indian Act*, the Government of Canada is responsible for ensuring that Aboriginal children receive educational services. However, under agreements signed with three First Nations in the 1970s, the government of Quebec determines the legal framework applicable to educational services delivered to Cree, Inuit, and Naskapi communities.

In addition, an increase in immigration, especially in the Greater Montreal area, has resulted in a massive inflow of students whose first language is neither French nor English. These students attend French schools. To meet the needs of this new client group, schools have implemented special measures, including francisation programs and welcoming classes.

Organization of the school system

Quebec has four levels of education: elementary (including preschool), secondary, college, and university. Full- and part-time enrolment is approximately 1.8 million. Elementary, secondary, and college education is free. University students pay tuition fees (relatively low in the North American context). Children are admitted to elementary school at six years of age, and school attendance is compulsory until the age of 16. The official language of instruction at the elementary and secondary levels is French. Education in English is available mainly to students whose father or mother pursued elementary studies in English in Canada. Approximately 10 per cent of Quebec students are educated in English.

Elementary school is usually preceded by one year of full-time Kindergarten for five-year-olds. Almost all five-year-olds attend Kindergarten, even though it is not compulsory. Since September 2013, some children from underprivileged backgrounds may have access to full-day Kindergarten from the age of four.

Elementary school lasts six years. Secondary school lasts five years and is divided into two levels. The first two-year level, or "cycle," is strongly focused on basic education. In the second, three-year cycle, students continue their general education but also take optional courses to explore other avenues of learning before going on to college.

In 2011-2012, a total of 992,740 students were registered in general non-adult classes in Quebec's 2,719 elementary and secondary schools. Of these, 2,337 are public schools run by 72 school boards, and 351 are private schools.

Science teaching

The Ministry of Education, Recreation and Sports determines curriculum content, in close collaboration with specialists in various subjects, curriculum developers, teachers, and school-board guidance counsellors.

The elementary science curriculum focuses on skills development. The new curriculum for the first year of secondary school, implemented in the 2005-2006 academic year, is also skills-based. At the time of this assessment, the target population was the seventh cohort being taught under the new Quebec Education Program.

At the elementary level, students in science and technology learn to:

- propose explanations for or solutions to scientific or technological problems;
- make the most of scientific and technological tools, objects, and procedures;
- communicate in the languages used in science and technology.

Given the broad range of knowledge included in the elementary curriculum, and that teachers can choose which themes to focus on, the ministry has developed additional documents to provide more specific information on the elements of knowledge that should be highlighted.

At the secondary level, students in science and technology learn to:

- seek answers or solutions to scientific or technological problems;
- make the most of their knowledge of science and technology;
- communicate in the languages used in science and technology.

The development of competencies is closely linked with the acquisition of knowledge in six disciplines: chemistry, physics, biology, astronomy, geology, and technology.

Science assessment

At the elementary level, science and technology assessments are carried out by school boards or directly by schools.

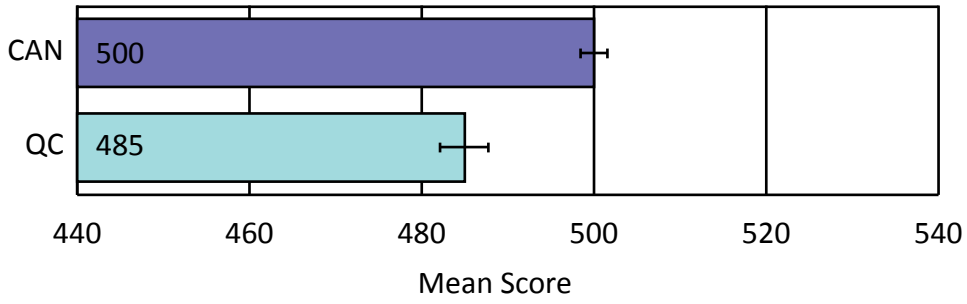
At the secondary level, model tests have been available to schools since the implementation of the new science and technology curriculum in 2005-2006. Since June 2009, additional tests have been available to schools for the two compulsory Secondary Cycle Four programs: science and technology and applied science and technology. Schools could administer these assessments at their discretion. Since June 2012, students in Secondary Cycle Four programs must undergo compulsory ministry tests.

For additional information, please see the following Web sites:
http://www.mels.gouv.qc.ca/references/programmes-detudes/
http://www1.mels.gouv.qc.ca/progressionPrimaire/index_en.asp
https://www7.mels.gouv.qc.ca/dc/evaluation/index_en.php

Results in science

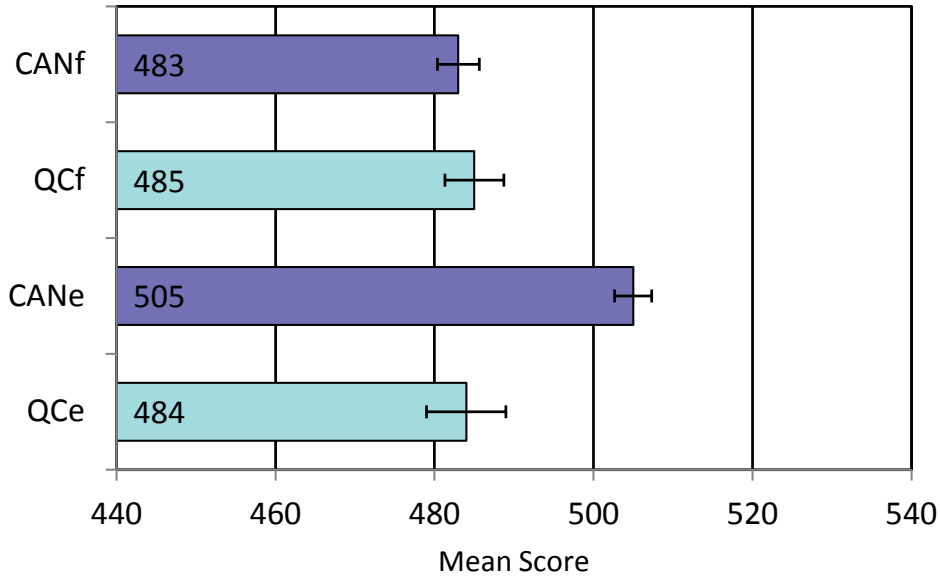
The mean score of Quebec students who completed the PCAP 2013 Science Assessment is significantly lower than that of Canadian students overall, as shown in the chart below.

CHART QC.1 **Canada – Quebec: Mean score in science**



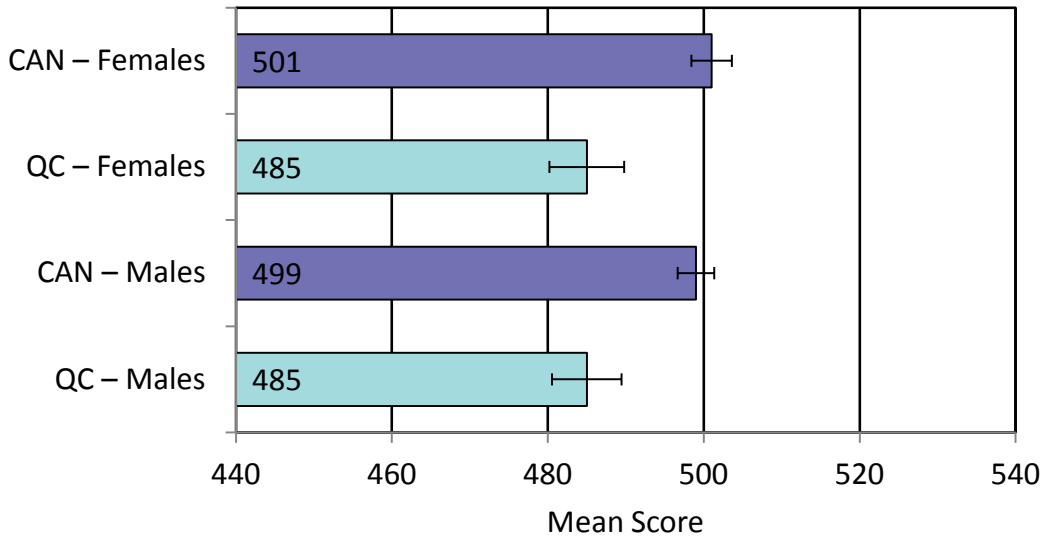
When compared to the Canadian means, the achievement of students in French-language schools is the same as the Canadian French mean, whereas those enrolled in English-language schools have lower achievement than Canadian English students overall. Within the province, there is no significant difference in achievement between the two language systems.

CHART QC.2 **Canada – Quebec: Results in science by language**



There is no significant gender difference in science within Quebec. When compared to the Canadian results, Quebec boys and girls achieve lower scores in science.

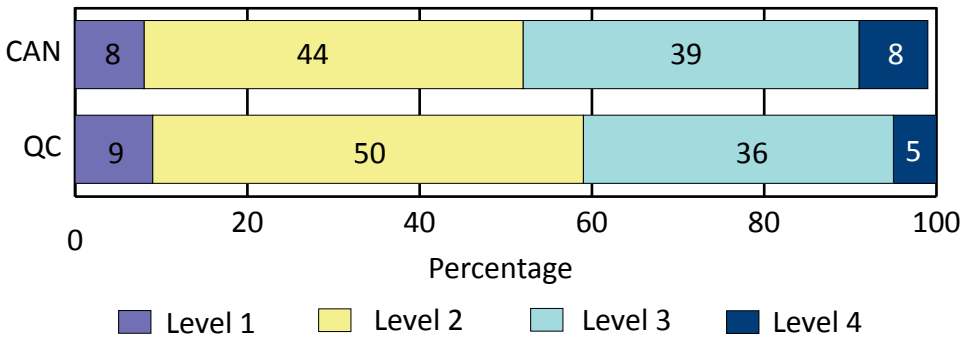
CHART QC.3 **Canada – Quebec: Results in science by gender**



The percentage of students at each of the four performance levels in science is examined by jurisdiction, by language of the school system, and by gender, as presented in the next three charts. Level 2 is the expected level for Grade 8/Secondary II students in Canada.

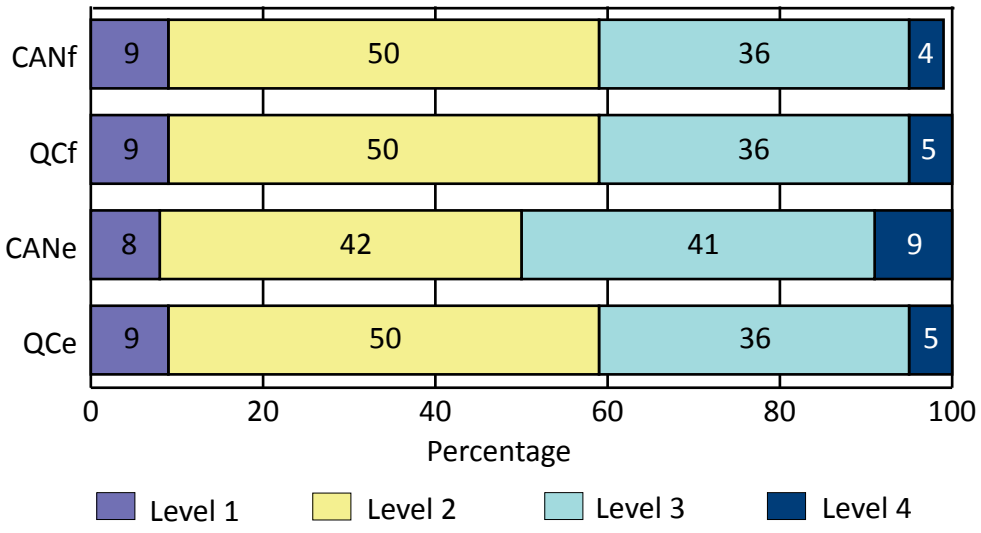
In Quebec, 91 per cent of students achieve at the expected level of performance or above, and the percentage of students at the highest performance levels is lower than that in Canada overall.

CHART QC.4 **Canada – Quebec: Results in science by level of performance**



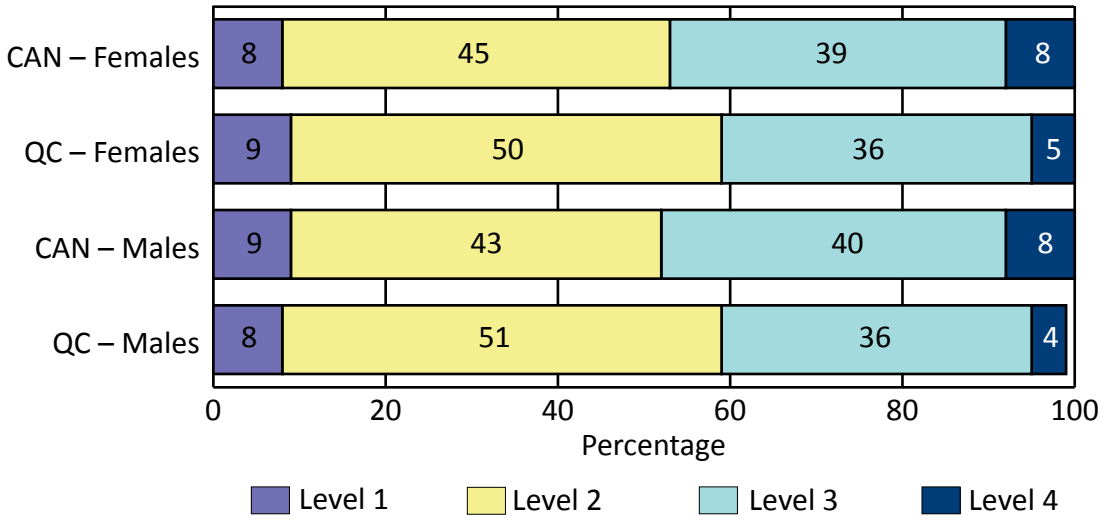
In Quebec, 91 per cent of both French- and English-language students perform at level 2 or above. Compared to the Canadian results, about the same proportion of students in French-language schools achieve at levels 3 and 4. The opposite trend is found in English-language schools as fewer students achieve at the higher levels of performance.

CHART QC.5 **Canada – Quebec: Comparison by level of performance in science by language**



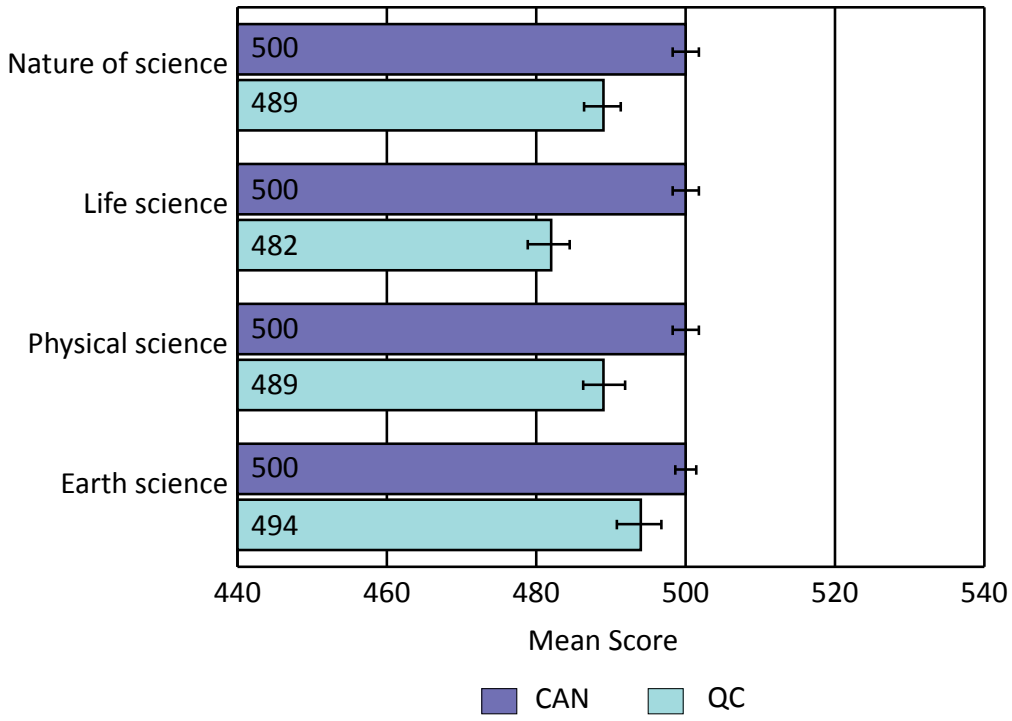
In Quebec, 91 per cent of both girls and boys perform at level 2 and above, and there is no gender difference at the higher levels of performance. Compared to the Canadian results, a lower proportion of girls and boys achieve at the higher levels of performance.

CHART QC.6 **Canada – Quebec: Comparison by level of performance in science by gender**



When the results are examined by sub-domain in science, no significant differences in achievement are found among the four sub-domains. When compared to the Canadian means, achievement scores in Quebec are lower in each of the sub-domains.

CHART QC.7 **Canada – Quebec: Results by sub-domain in science**



In French-language schools in Quebec, achievement is statistically similar to Canadian French students overall. Students enrolled in English-language schools have significantly lower achievement in each of the four sub-domains compared to their Canadian counterparts. Within Quebec, French-language students outperform those in English-language schools only in Earth science.

TABLE QC.1 **Canada – Quebec: Results by sub-domain and language**

	Nature of science		Life science		Physical science		Earth science	
	Mean	**CI**	**Mean**	**CI**	**Mean**	**CI**	**Mean**	**CI**
CANf	487	2.6	481	3.0	488	3.3	492	2.4
QCf	489	3.5	482	3.7	488	3.7	495	3.6
Difference	2		1		0		3	
CANe	504	2.2	506	2.6	504	2.3	502	2.5
QCe	492	6.0	483	5.4	489	4.5	484	5.6
Difference	**12***		**23***		**15***		**18***	
QCf	489	3.5	482	3.7	488	3.7	495	3.6
QCe	492	6.0	483	5.4	489	4.5	484	5.6
Difference	3		1		1		**11***	

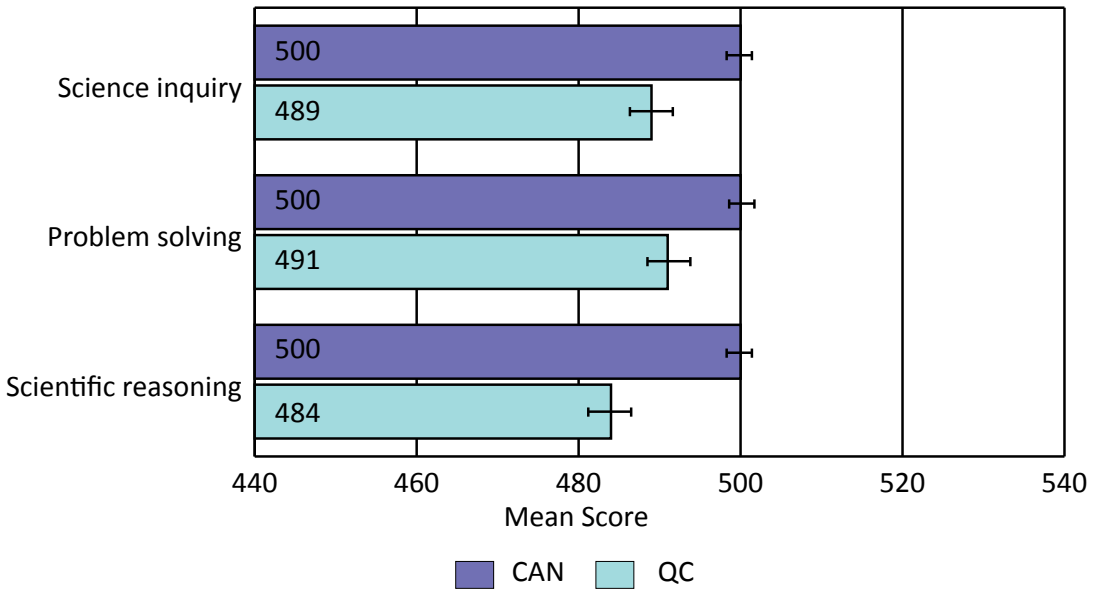
When compared to the Canadian means, Quebec girls have significantly lower achievement in all four sub-domains compared to their Canadian counterparts. Quebec boys achieve lower mean scores in nature of science, life science, and physical science when compared to the Canadian means. No significant gender difference is found among three sub-domains in science within Quebec; however, boys outperform girls in physical science.

TABLE QC.2 **Canada – Quebec: Results by sub-domain and gender**

	Nature of science		Life science		Physical science		Earth science	
	Mean	**CI**	**Mean**	**CI**	**Mean**	**CI**	**Mean**	**CI**
CAN – Females	501	2.7	501	2.5	499	2.5	501	3.3
QC – Females	491	5.1	484	5.3	484	5.4	493	3.8
Difference	**10***		**17***		**15***		**8***	
CAN – Males	499	2.8	499	2.1	501	2.4	500	2.9
QC – Males	488	4.6	481	4.6	493	5.0	495	4.1
Difference	**11***		**18***		**8***		5	
QC – Females	491	5.1	484	5.3	484	5.4	493	3.8
QC – Males	488	4.6	481	4.6	493	5.0	495	4.1
Difference	3		3		**9***		2	

When the results are examined by competency in science, there are no significant differences in achievement among the three competencies within Quebec. Results are lower in each of the competencies compared to the Canadian means.

CHART QC.8 **Canada – Quebec: Results by competency in science**



In French-language schools in Quebec, there are no significant differences among the three competencies compared to the Canadian means. In English-language schools, mean scores for each of the three competencies were lower than the Canadian results. For the three competencies within the province, there is no significant difference between the two language systems.

TABLE QC.3 **Canada – Quebec: Results by competency and language**

	Science inquiry		Problem solving		Scientific reasoning	
	Mean	**CI**	**Mean**	**CI**	**Mean**	**CI**
CANf	487	2.8	490	3.2	482	2.7
QCf	489	4.1	491	3.1	484	4.2
Difference	2		1		2	
CANe	504	2.0	503	2.1	505	1.9
QCe	491	4.9	486	4.7	483	4.4
Difference	**13***		**17***		**22***	
QCf	489	4.1	491	3.1	484	4.2
QCe	491	4.9	486	4.7	483	4.4
Difference	2		5		1	

Achievement is lower for both girls and boys compared to the Canadian mean scores for each of the three competencies. Within the province, girls outperform boys in science inquiry, whereas boys outperform girls in problem solving.

TABLE QC.4 **Canada – Quebec: Results by competency and gender**

	Science inquiry		Problem solving		Scientific reasoning	
	Mean	**CI**	**Mean**	**CI**	**Mean**	**CI**
CAN – Females	503	2.6	499	3.0	499	2.5
QC – Females	493	5.6	488	4.9	482	5.1
Difference	**10***		**11***		**17***	
CAN – Males	497	3.3	501	2.4	501	2.7
QC – Males	486	3.8	494	3.8	485	4.3
Difference	**11***		**7***		**16***	
QC – Females	493	5.6	488	4.9	482	5.1
QC – Males	486	3.8	494	3.8	485	4.3
Difference	**7***		**6***		3	

Reading and mathematics results

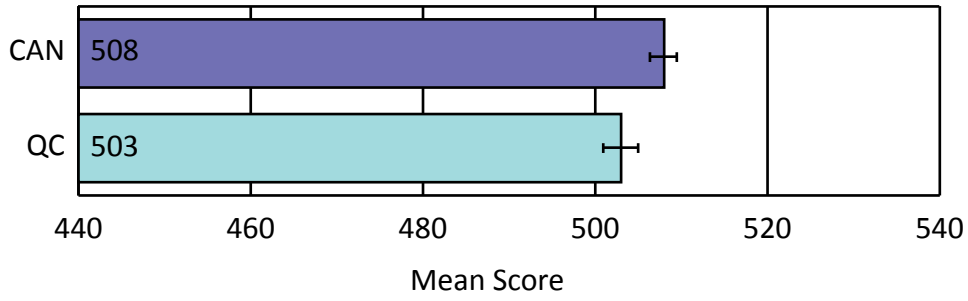
In PCAP 2013, reading and mathematics are both minor domains. Results are reported overall, by language of the school system, and by gender. Finally, multiple comparisons over time between PCAP assessments are reported.

Results in reading

The following charts present student achievement for Canada and Quebec in reading overall, by language of the school system, and by gender.

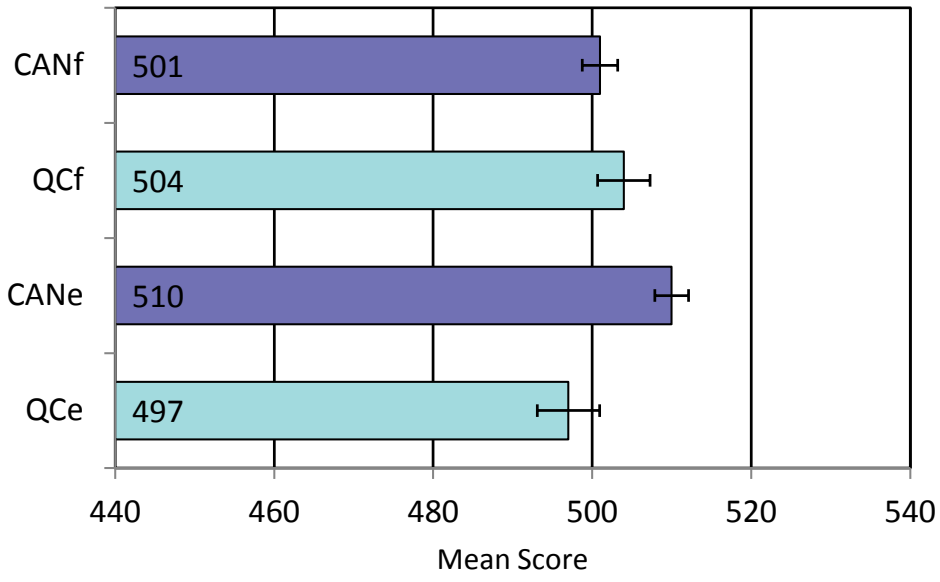
In PCAP 2013, reading achievement in Quebec is significantly lower than the Canadian mean score.

CHART QC.9 **Canada – Quebec: Mean score in reading**



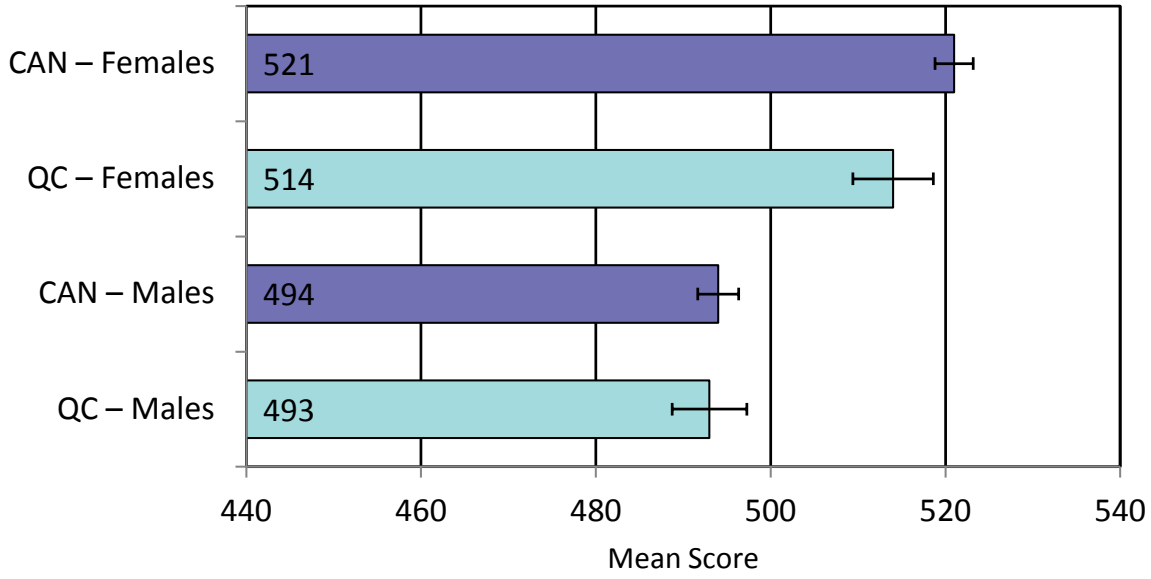
As shown in the following chart, reading scores in French-language schools in Quebec are statistically similar to the Canadian French mean whereas English-language schools have lower achievement than the Canadian English mean. Within the province, achievement results in reading are statistically higher in French-language schools.

CHART QC.10 **Canada – Quebec: Results in reading by language**



Reading achievement for both girls and boys in Quebec is statistically similar to Canadian students overall. Girls outperform boys in reading both within the province (by 21 points) and in Canada overall (by 27 points), as shown in the PCAP 2013 assessment of reading.

CHART QC.11 **Canada – Quebec: Results in reading by gender**

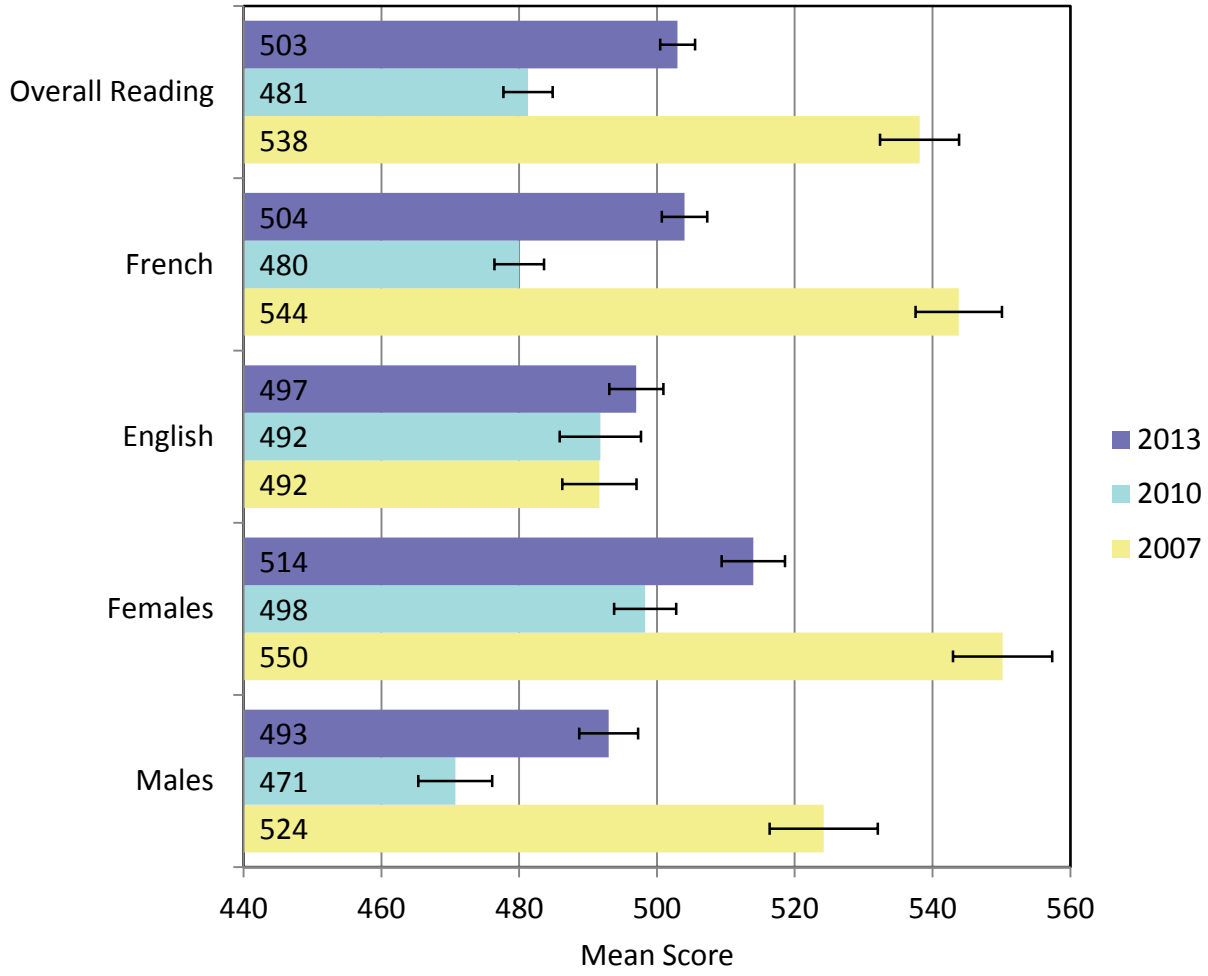


Comparison of reading results: 2007, 2010, and 2013

Reading was a major domain in PCAP 2007. As a minor domain in 2010 and 2013, the assessment comprised fewer reading items; however, common items among the three assessments allow the reporting of changes over time for reading achievement.

As shown in the following chart, positive changes in reading achievement between 2010 and 2013 have occurred for reading overall, for French-language schools, and for both girls and boys in Quebec. When reading results are compared between 2007 and 2013, a negative change is shown in all categories analyzed except for English-language schools.

CHART QC.12 **Canada – Quebec: Changes over time in reading**

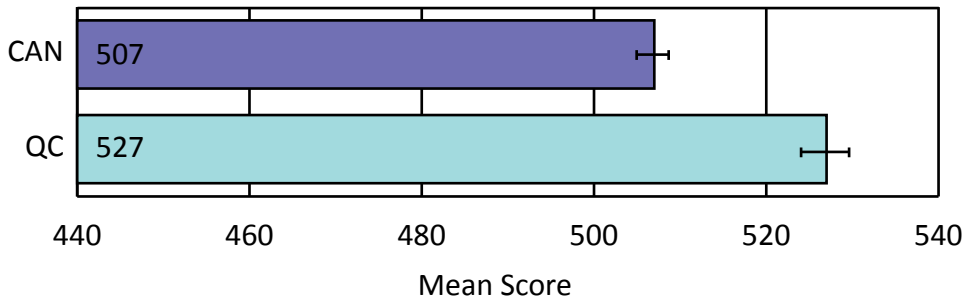


Results in mathematics

The following charts presents student achievement for Canada and Quebec in mathematics overall, by language of the school system, and by gender.

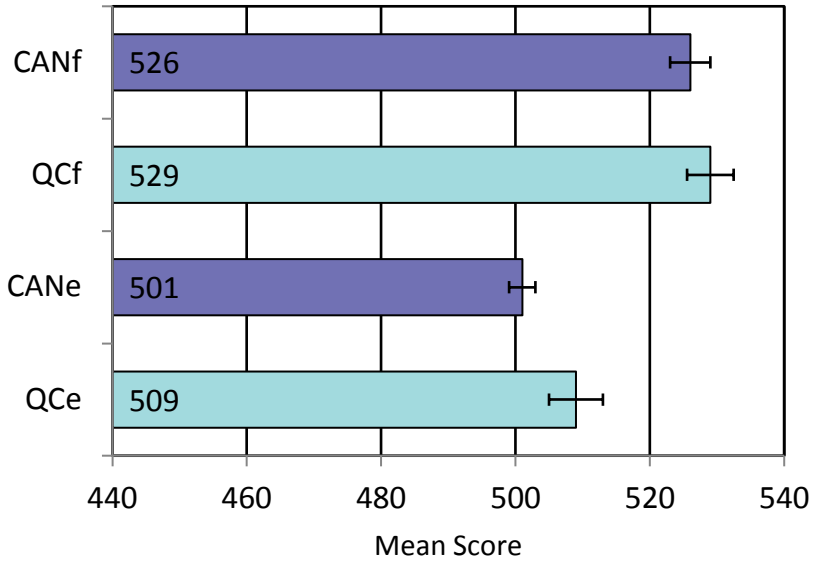
In PCAP 2013, mathematics achievement in Quebec is significantly higher than that in Canada overall.

CHART QC.13 **Canada – Quebec: Mean score in mathematics**



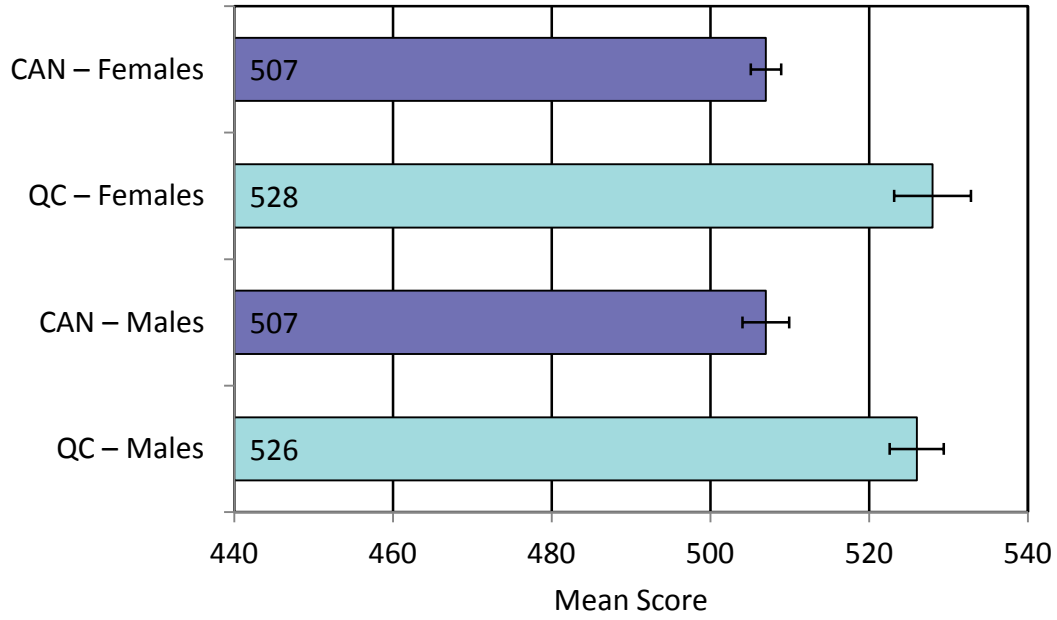
As shown in the following chart, mathematics scores in French-language schools are statistically similar to the Canadian French results, whereas English-language schools are significantly higher than the Canadian English mean. Within the province, students in French-language schools outperform those in English-language schools in mathematics.

CHART QC.14 **Canada – Quebec: Results in mathematics by language**



In Quebec, as in Canada overall, there is no gender gap in mathematics; however, both boys and girls have higher achievement in mathematics compared to Canadian boys and girls overall.

CHART QC.15 **Canada – Quebec: Results in mathematics by gender**

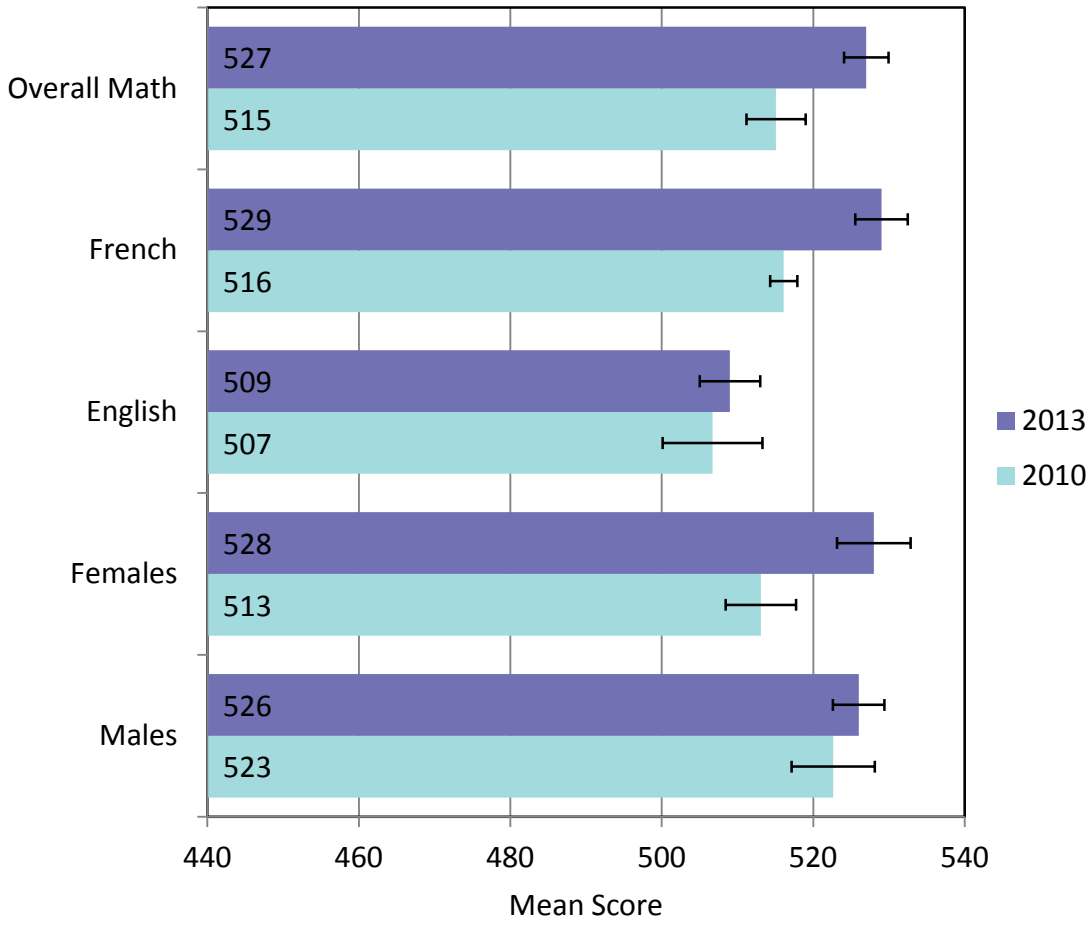


Comparison of mathematics results: 2010 and 2013

Mathematics was a major domain in PCAP 2010, which was the baseline year. As a minor domain in 2013, the assessment comprised fewer mathematics items; however, common items between the two assessments allow the reporting of changes over time for mathematics achievement.

As shown in the PCAP 2013 assessment of mathematics, there have been significant positive changes over time in Quebec in mathematics overall, for French-language schools, and for girls. Between 2010 and 2013, no significant changes were seen for English-language schools or for boys in Quebec.

CHART QC.16 **Canada – Quebec: Changes over time in mathematics**



NEW BRUNSWICK

Context Statement

Social context

As Canada's only officially bilingual province, New Brunswick offers students the opportunity to learn in both English and French. The public education system has seven school districts — four English and three French.

On July 1, 2013, the estimated total population of New Brunswick was 757,500, an increase of 0.37 per cent over July 2012. Although the province's population has continuously grown since the first quarter of 2007, enrolment in francophone and anglophone schools has decreased during the same period. For the 2012-2013 school year, 29,124 students were enrolled in the francophone sector, representing 28.8 per cent of the total enrolment of 101,079 in the province from Kindergarten to Grade 12. Almost half of students enrolled in francophone schools live in a majority anglophone environment. For the 2012-2013 school year, 71,955 students were enrolled in the anglophone sector, representing 71.2 per cent of the total New Brunswick enrolment.

New Brunswick's 1986 inclusive education policies are unique in Canada. The policies affirm the right of all students to learn and develop their full potential in a common, positive learning environment.

Organization of the school system

In 1974, New Brunswick recognized its linguistic duality by establishing two parallel but distinct school systems. The francophone sector of the Department of Education is responsible for francophone curriculum and assessment, and the anglophone sector is responsible for anglophone curriculum and assessment. Management of the education system is shared between the department and district education councils. Each of the seven school districts is governed by a district education council.

The francophone sector has three district boards of education, whose members are locally elected by the public and who are responsible for policy development and decision making regarding school and district operations. Children who will be five years old by December 31 are enrolled in Kindergarten. School attendance is compulsory until the end of secondary school or the age of 18, whichever comes first.

Since 2009, two mandatory curricula, one anglophone and one francophone, have been implemented in all regulated facilities that offer services to preschool-aged children.

Science teaching

Science and technology play a key role in the overall development of the individual. Learning about science and technology involves acquiring the tools needed to understand the world and how to interact with it. Science and technology are the product of human thought and creativity and occupy a fundamental place in education. They help students not only achieve a better understanding of their

universe, but also acquire reasoning skills, refine their problem-solving abilities, and maintain a critical stance. The science curriculum is grounded in students' knowledge, the natural environment and various social, economic, political, and environmental contexts. It allows students to acquire notions and concepts that highlight the interdependency between living beings and their environment, and to develop the insights necessary to understand their responsibilities as humans integrated in nature. Students are also expected to demonstrate their scientific literacy through attitudes showing an understanding of life, the environment, and society in general. From Kindergarten to Grade 8, learning content is related to two major themes, the living universe and the non-living universe. Expectations are progressive over the years of study. As part of the regular program, science makes up at least 4 per cent of teaching time in Grade 1, rising to a minimum of 12 per cent in Grade 8. From Grades 9 to 12, i.e., at the secondary level, science courses are on a semester system, and the minimum teaching time for these subjects is 93.5 hours per semester. Required Grade 9 science courses as well as Grade 10 science courses address the principles governing the structures of the living universe and the non-living universe and explain the mechanisms through which these structures change over time. One other optional credit is required for graduation. Optional credits are also offered in these subjects as well as in environmental science and astronomy.

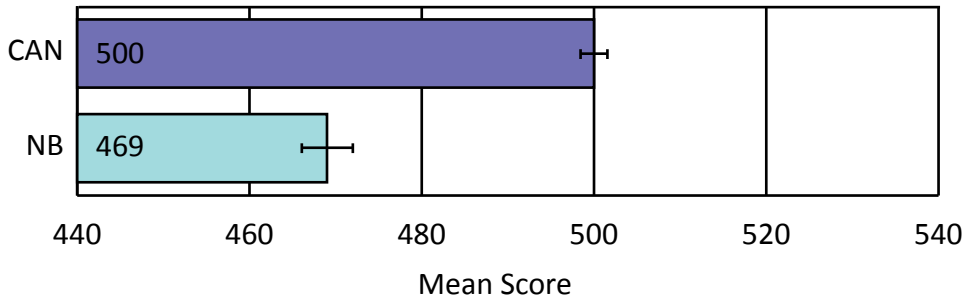
Science assessment

The francophone sector of the Department of Education and Early Childhood Development has administered examinations in science and technology at the Grade 5 level since 2006 and at the Grade 8 level since 2010. The examinations include both multiple-choice and constructed-response questions and cover the key dimensions of the curriculum, including investigative skills, to assess the acquisition of knowledge related to the two major conceptual domains, the living universe, and the non-living universe. These two assessments yield standardized data on progress in learning, which help guide classroom practices. The participation of teachers at every stage of development, administration, and marking of the examinations is very helpful in their own science assessment practices.

Results in science

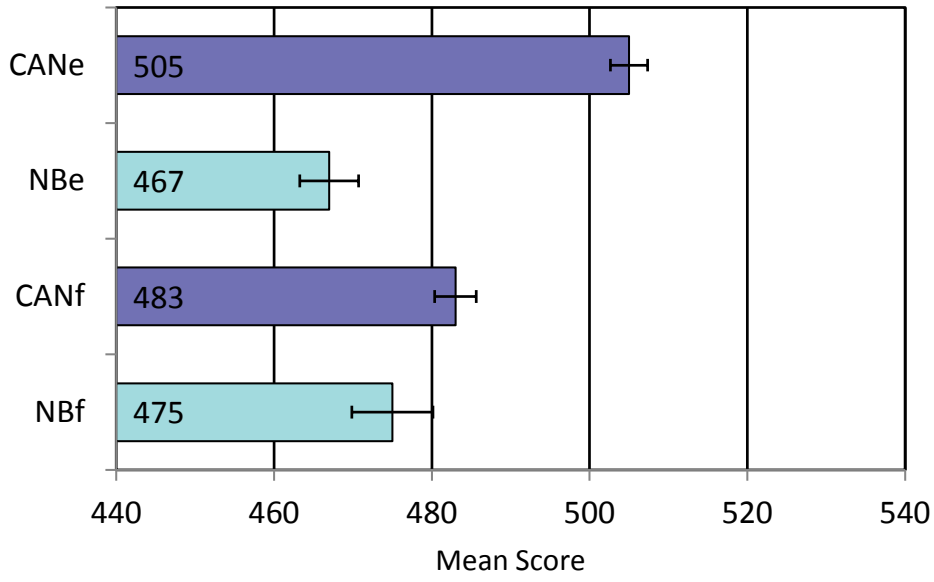
The mean score of New Brunswick students who completed the PCAP 2013 Science Assessment is significantly lower than that of Canadian students overall.

CHART NB.1 **Canada – New Brunswick: Mean score in science**



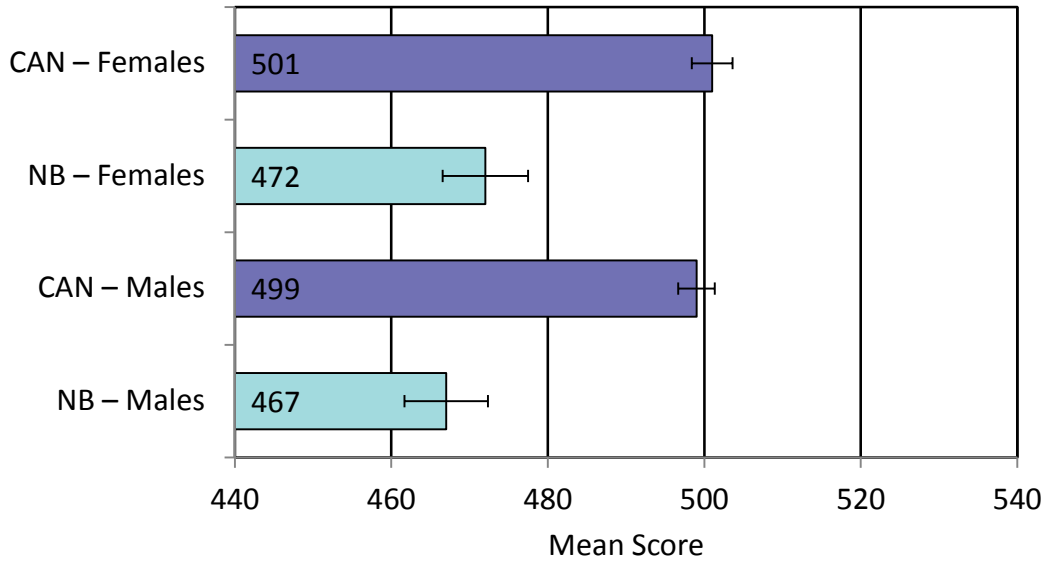
Students enrolled in English- and French-language schools in New Brunswick achieve significantly lower scores than the Canadian means. Within New Brunswick, French-language schools outperform English-language schools in science.

CHART NB.2 **Canada – New Brunswick: Results in science by language**



Within the New Brunswick, there is no gender difference in achievement in science. However, New Brunswick girls and boys perform significantly lower than their Canadian counterparts.

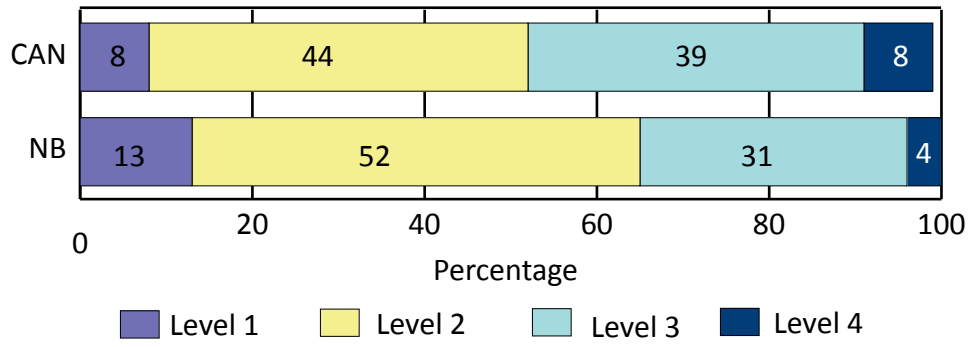
CHART NB.3 **Canada – New Brunswick: Results in science by gender**



The percentage of students at each of the four performance levels in science was examined by jurisdiction, by language of the school system, and by gender, as presented in the next three charts. Level 2 is the expected level for Grade 8/Secondary II students in Canada.

In New Brunswick, 87 per cent of students achieve at the expected level of performance or above. There is a proportionally higher percentage of New Brunswick students at level 2 than in Canada overall; however, a lower proportion of students achieve at the two higher performance levels.

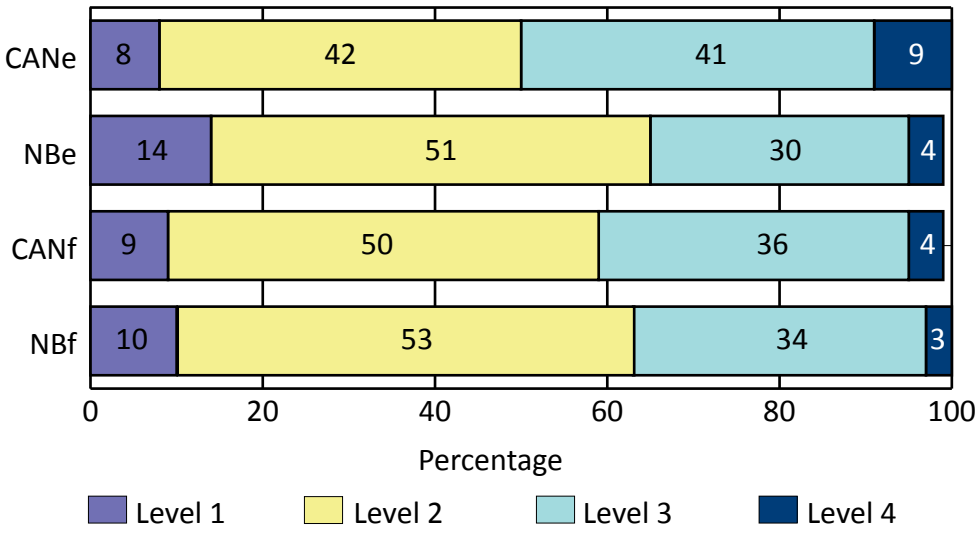
CHART NB.4 **Canada – New Brunswick: Results in science by level of performance**



In English-language schools, 85 per cent of New Brunswick students achieve at or above the expected level of performance in science compared to 92 per cent in Canada overall. Compared to the Canadian results, proportionally fewer students in English-language schools achieve at the higher levels.

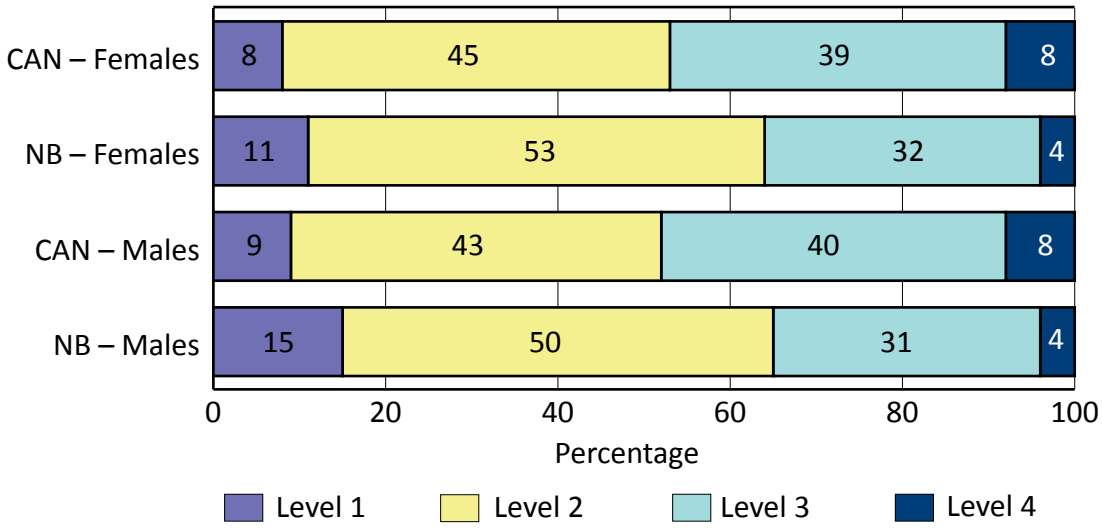
In French-language schools, 90 per cent of New Brunswick students achieve at or above the expected level of performance, which is similar to that in Canadian French-language schools, and a similar percentage of students in French-language schools perform at the higher levels compared to the Canadian results.

CHART NB.5 **Canada – New Brunswick: Comparison by level of performance in science by language**



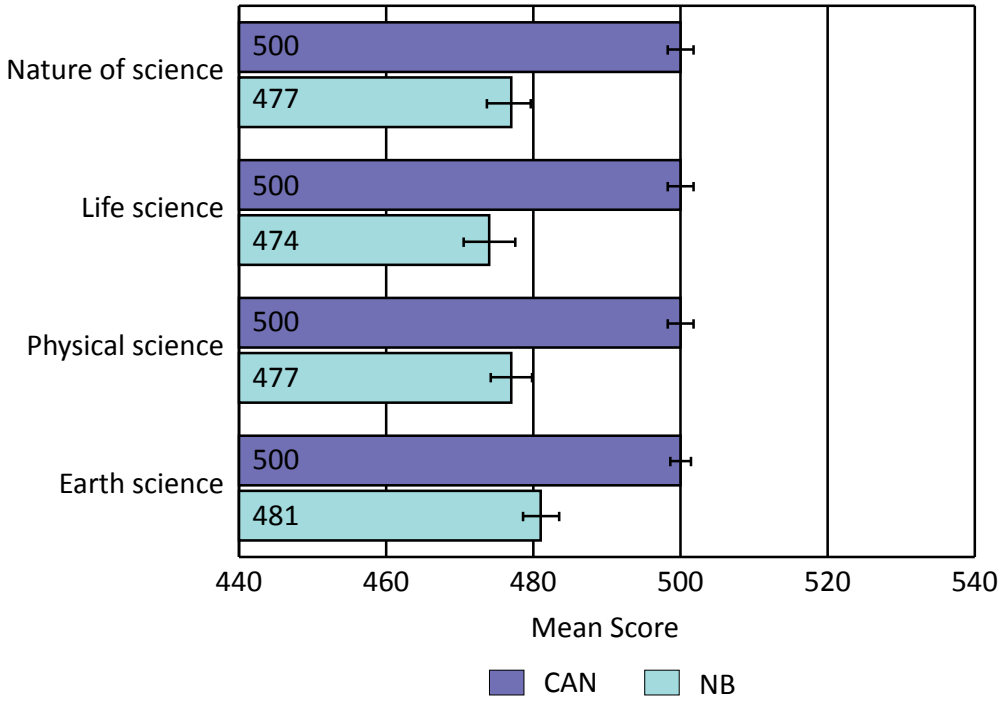
In New Brunswick, 89 per cent of girls and 85 per cent of boys perform at level 2 and above, and proportionally the same percentage of girls and boys achieve the higher levels of performance. Compared to the Canadian results, a lower percentage of both girls and boys achieve at levels 3 and 4.

CHART NB.6 **Canada – New Brunswick: Comparison by level of performance in science by gender**



In each of the four sub-domains in science, New Brunswick students achieve significantly lower mean scores than in Canada overall. Within the province, there is no significant difference in achievement among the four sub-domains.

CHART NB.7 **Canada – New Brunswick: Results by sub-domain in science**



Students enrolled in French-language schools in New Brunswick have similar results to those in French schools in Canada overall, although New Brunswick French students have lower scores in Earth science. In English-language schools, achievement is significantly lower for all four sub-domains compared to the Canadian means. Between the two language systems with the province, higher scores in physical science are found in French-language schools.

TABLE NB.1 **Canada – New Brunswick: Results by sub-domain and language**

	Nature of science		Life science		Physical science		Earth science	
	Mean	CI	Mean	CI	Mean	CI	Mean	CI
CANe	504	2.2	506	2.6	504	2.3	502	2.5
NBe	476	5.0	474	4.9	471	4.4	483	3.7
Difference	**28***		**32***		**33***		**19***	
CANf	487	2.6	481	3.0	488	3.3	492	2.4
NBf	481	5.0	474	5.1	493	4.6	476	4.2
Difference	6		7		5		**16***	
NBe	476	5.0	474	4.9	471	4.4	483	3.7
NBf	481	5.0	474	5.1	493	4.6	476	4.2
Difference	5		0		**22***		7	

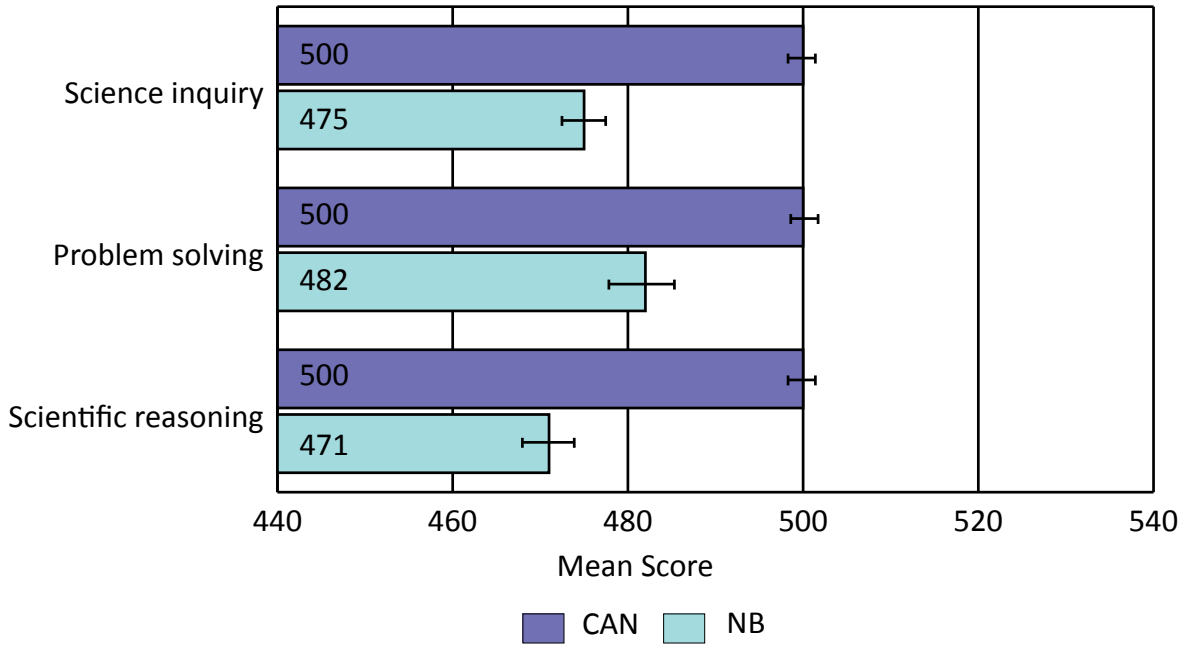
There are no gender differences within New Brunswick among the four sub-domains. When compared to the Canadian means, the achievement in all four sub-domains is significantly lower for both girls and boys.

TABLE NB.2 **Canada – New Brunswick: Results by sub-domain and gender**

	Nature of science		Life science		Physical science		Earth science	
	Mean	CI	Mean	CI	Mean	CI	Mean	CI
CAN – Females	501	2.7	501	2.5	499	2.5	501	3.3
NB – Females	480	4.3	478	5.3	477	4.6	479	4.6
Difference	**21***		**23***		**22***		**22***	
CAN – Males	499	2.8	499	2.1	501	2.4	500	2.9
NB – Males	475	5.8	471	4.8	477	4.5	483	4.4
Difference	**24***		**28***		**24***		**17***	
NB – Females	480	4.3	478	5.3	477	4.6	479	4.6
NB – Males	475	5.8	471	4.8	477	4.5	483	4.4
Difference	5		7		0		4	

When the results are examined by competency in science, New Brunswick students have higher achievement in problem solving than in scientific reasoning. Achievement scores are lower for each competency when compared to the Canadian results.

CHART NB.8 **Canada – New Brunswick: Results by competency in science**



When compared by language of the school system, students in English-language schools achieve significantly lower scores in each of the three competencies compared to the Canadian means, and students enrolled in French-language schools achieve lower scores in science inquiry and scientific reasoning compared to Canada overall. Within the province, students in French-language schools outperform those in English-language schools in problem solving.

TABLE NB.3 **Canada – New Brunswick: Results by competency and language**

	Science inquiry		Problem solving		Scientific reasoning	
	Mean	**CI**	**Mean**	**CI**	**Mean**	**CI**
CANe	504	2.0	503	2.1	505	1.9
NBe	474	5.0	478	4.2	470	4.6
Difference	**30***		**25***		**35***	
CANf	487	2.8	490	3.2	482	2.7
NBf	479	4.5	492	5.8	474	4.9
Difference	**8***		2		**8***	
NBe	474	5.0	478	4.2	470	4.6
NBf	479	4.5	492	5.8	474	4.9
Difference	5		**14***		4	

Compared to the Canadian means, New Brunswick girls and boys have lower achievement for the three competencies. Within the province, girls outperform boys in science inquiry and problem solving.

TABLE NB.4 **Canada – New Brunswick: Results by competency and gender**

	Science inquiry		Problem solving		Scientific reasoning	
	Mean	CI	Mean	CI	Mean	CI
CAN – Females	503	2.6	499	3.0	499	2.5
NB – Females	479	4.5	486	5.1	470	5.1
Difference	**24***		**13***		**29***	
CAN – Males	497	3.3	501	2.4	501	2.7
NB – Males	472	5.2	478	5.1	473	6.3
Difference	**25***		**23***		**28***	
NB – Females	479	4.5	486	5.1	470	5.1
NB – Males	472	5.2	478	5.1	473	6.3
Difference	**7***		**8***		3	

Reading and mathematics results

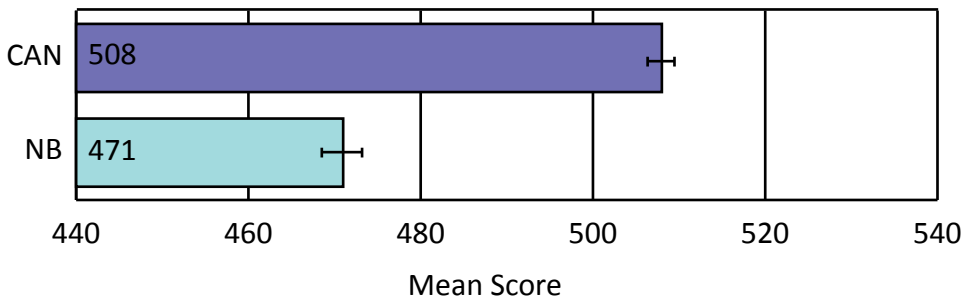
In PCAP 2013, reading and mathematics are both minor domains. Results are reported overall, by language of the school system, and by gender. Finally, multiple comparisons over time between PCAP assessments are reported.

Results in reading

The following charts present student achievement for Canada and New Brunswick in reading overall, by language of the school system, and by gender.

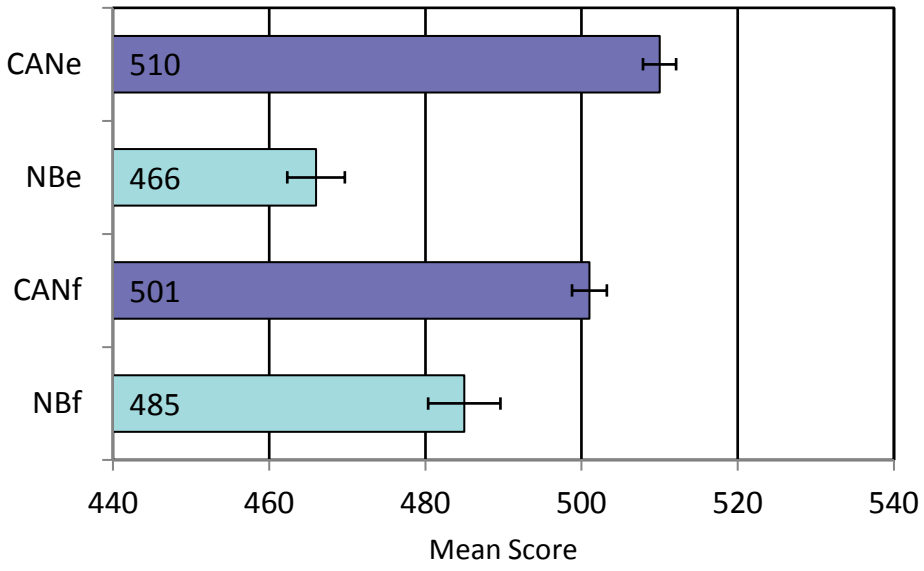
In PCAP 2013, reading achievement in New Brunswick is significantly lower than the Canadian mean score, as shown in the chart below.

CHART NB.9 **Canada – New Brunswick: Mean score in reading**



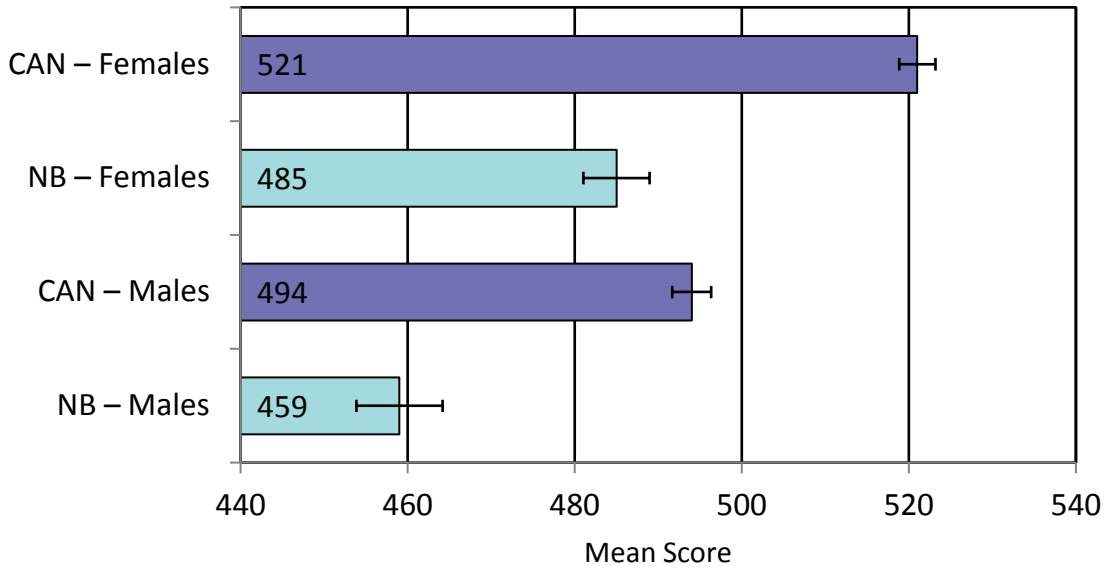
As shown in the following chart, reading scores in both English- and French-language schools in New Brunswick are significantly lower than the Canadian means. Within the province, achievement results are significantly higher for French-language students.

CHART NB.10 **Canada – New Brunswick: Results in reading by language**



Reading achievement for both girls and boys in New Brunswick is significantly lower than Canadian students overall. Girls outperform boys in reading both within the province (by 26 points) and in Canada overall (by 27 points), as shown in the PCAP 2013 assessment of reading.

CHART NB.11 **Canada – New Brunswick: Results in reading by gender**

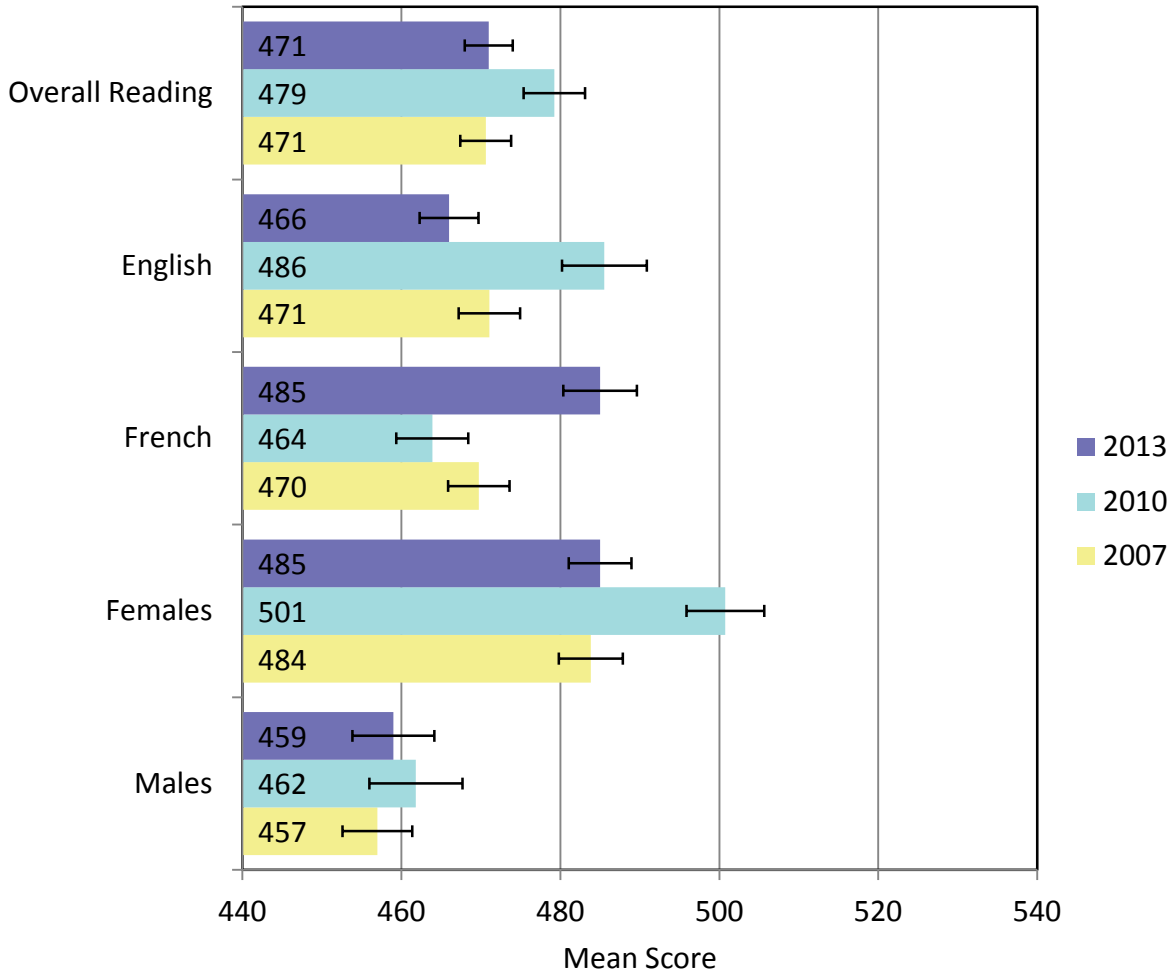


Comparison of reading results: 2007, 2010, and 2013

Reading was a major domain in PCAP 2007. As a minor domain in 2010 and 2013, the assessment comprised fewer reading items; however, common items among the three assessments allow the reporting of changes over time for reading achievement.

As shown in the following chart, there was a positive change in reading achievement in New Brunswick between 2010 and 2013 for French-language students, and a negative change for reading overall, for English-language students, and for girls. Between 2007 and 2013, there was a positive change in reading achievement in French language schools, but no other changes were significant between these PCAP assessments of reading.

CHART NB.12 **Canada – New Brunswick: Changes over time in reading**

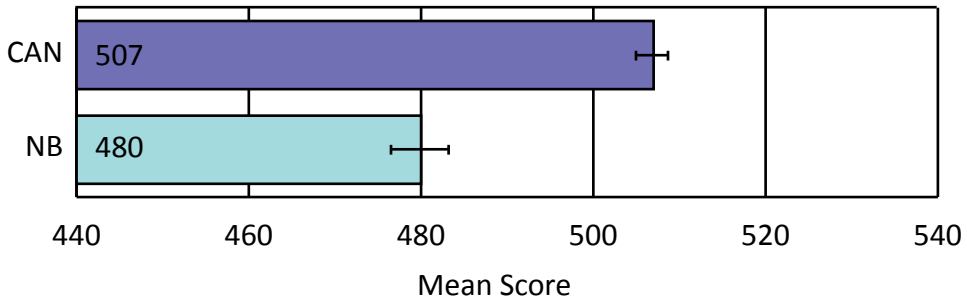


Results in mathematics

The following charts presents student achievement for Canada and New Brunswick in mathematics overall, by language of the school system, and by gender.

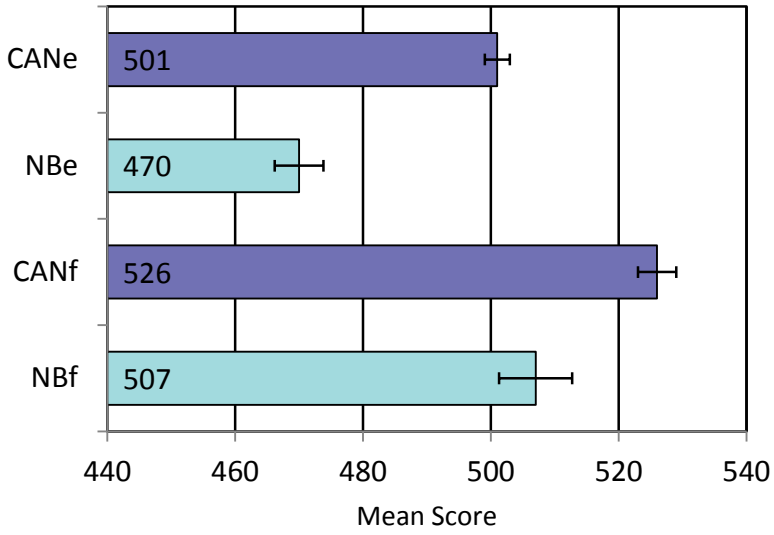
In PCAP 2013, mathematics achievement in New Brunswick is significantly lower than in Canada overall, as shown in the chart below.

CHART NB.13 **Canada – New Brunswick: Mean score in mathematics**



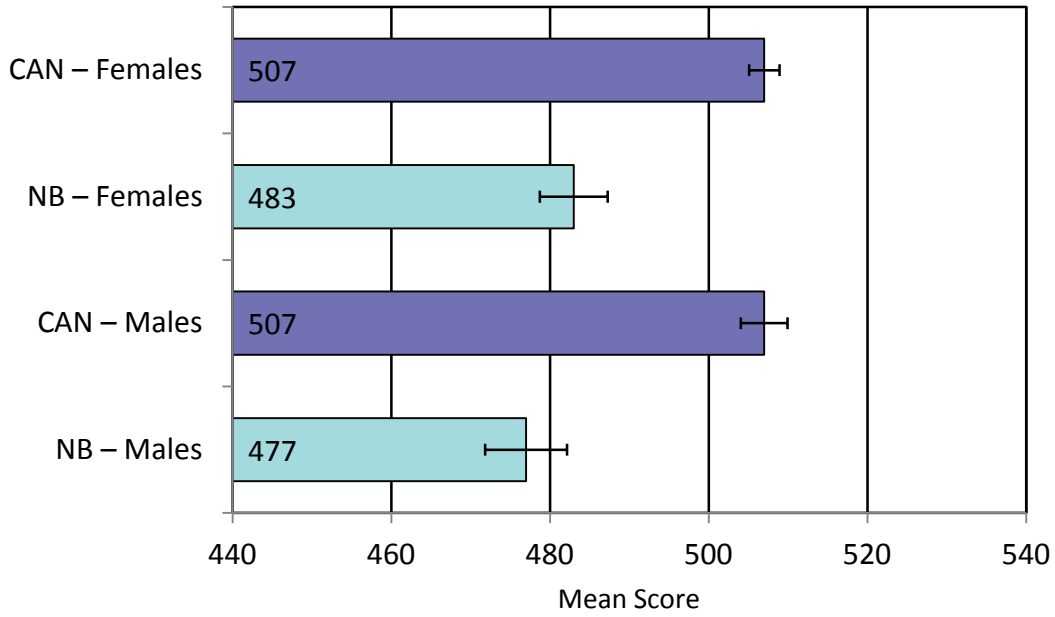
As shown in the following chart, mathematics scores in both English- and French-language schools in New Brunswick are significantly lower than the Canadian means. Within the province, students in French-language schools outperform those in English-language schools in mathematics.

CHART NB.14 **Canada – New Brunswick: Results in mathematics by language**



In New Brunswick, as in Canada overall, there is no gender gap in mathematics; however, both boys and girls have lower achievement in mathematics compared to Canadian boys and girls overall.

CHART NB.15 **Canada – New Brunswick: Results in mathematics by gender**

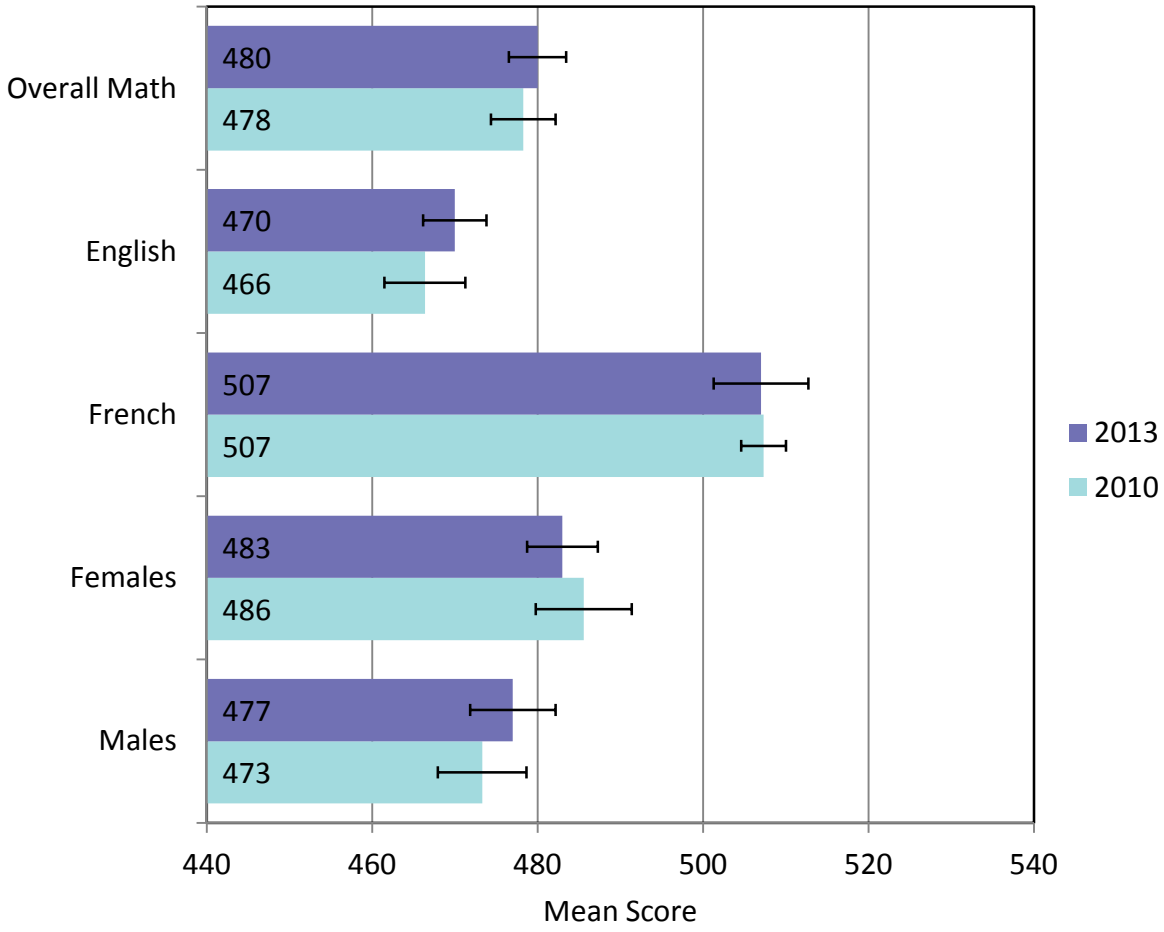


Comparison of mathematics results: 2010 and 2013

Mathematics was a major domain in PCAP 2010, which was the baseline year. As a minor domain in 2013, the assessment comprised fewer mathematics items; however, common items between the two assessments allow the reporting of changes over time for mathematics achievement.

As shown in the PCAP 2013 assessment of mathematics, achievement results have been statistically consistent between 2010 and 2013.

CHART NB.16 **Canada – New Brunswick: Changes over time in mathematics**



NOVA SCOTIA

Context Statement

Social context

Nova Scotia has a population of 938,200, with a higher rural population than the Canadian average. The annual population growth rate is below 1 per cent, and immigration is low compared to the rest of Canada. About 10 per cent of the population is able to conduct a conversation in French only or in both English and French. Visible minorities make up 5 per cent. Unemployment rates in Nova Scotia are typically above the Canadian average.

Organization of the school system

There are seven regional anglophone school boards in Nova Scotia, which enrol 96 per cent of all public school students. The provincial school board for Acadian/francophone students, known as the *Conseil scolaire acadien provincial*, enrols the remaining 4 per cent of students. Nova Scotia's total public school population is slightly more than 122,500 from Primary to Grade 12. Overall, it is anticipated that school enrolment will continue to decrease over the next few years. Children who started school prior to the 2008-2009 school year must have turned five years of age on or before October 1 to be admitted to grade Primary. Beginning in September 2008, students who enter Primary must be five years old on or before December 31. Students must attend school until they are 16 years old.

Science teaching

The Atlantic Canada Science Curriculum was carefully conceived to emphasize a logical, developmental sequence of science from grade to grade to the end of the public school program. Key aspects of this curriculum include the following:

- Students take an active role in their study of science.
- Science classrooms are centres of inquiry where learners investigate science learning.
- Conceptual and procedural fluency in science is developed in a resource-based learning environment.
- The importance of science literacy permeates the breadth and depth of the science curriculum at all instructional levels.
- Students are expected to communicate scientifically, reason scientifically, use problem-solving strategies effectively, and value science.
- Science instruction, and science itself, offers increased opportunities for students to use current and emerging technologies.

The Atlantic Canada Science Curriculum is shaped by a vision that fosters the development of scientifically literate students who can extend and apply their learning and who are effective participants in an increasingly technological society.

Nova Scotia students are required to take science for the first 10 years of school. The elementary science program encourages children to learn by manipulating materials, observing first-hand, and talking and writing about what they are learning. This active, experiential approach promotes the importance of building and expanding on the natural curiosity of children and helps to nurture a lifelong desire to experience, question, and investigate. The junior high science program also provides students with significant hands-on, minds-on experiences relating to science, technology, society, and the environment.

In order to graduate, students are required to earn two science credits during their high school years — Science 10 and a second credit from among biology, chemistry, or physics courses. In addition to the two science credits, students must earn two credits from among other science, mathematics, or technology courses.

Nova Scotia students benefit from opportunities to engage actively in doing science in outdoor and community-based learning environments and from other opportunities afforded by a range of education partners. More information about the Nova Scotia Primary–12 education system can be found on the department Web site at www.ednet.ns.ca/.

Science assessment

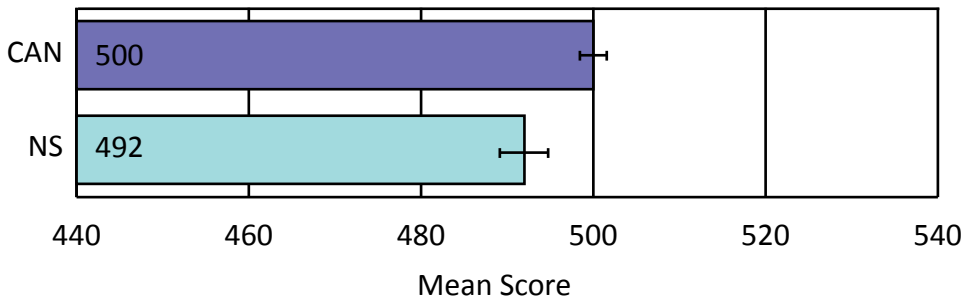
Assessment is integrated with instruction and includes a wide variety of assessment strategies. Students' progress is monitored each year within the school. At this time, the provincial assessment program does not assess science. Nova Scotia students also participate in the Programme for International Student Assessment (PISA) and the Pan-Canadian Assessment Program (PCAP), both of which assess science achievement using a sample of students.

Results in science

The performance of Nova Scotia students in science is compared to that of Canadian students overall. Results are presented both by mean score and by performance level. The following charts present student achievement in science overall, by language of the school system, and by gender.

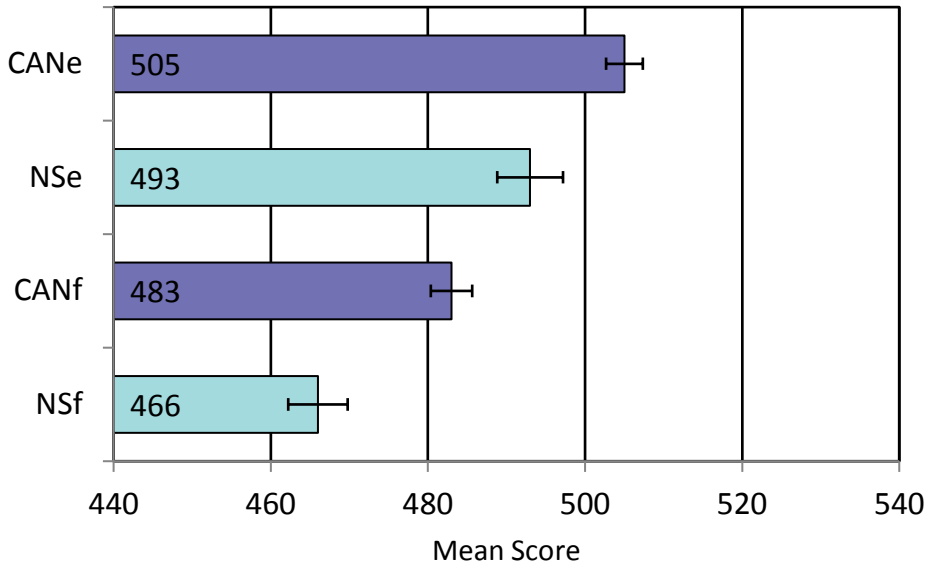
The mean score of Nova Scotia students who completed the PCAP 2013 Science Assessment is significantly lower than that of Canadian students overall.

CHART NS.1 **Canada – Nova Scotia: Mean score in science**



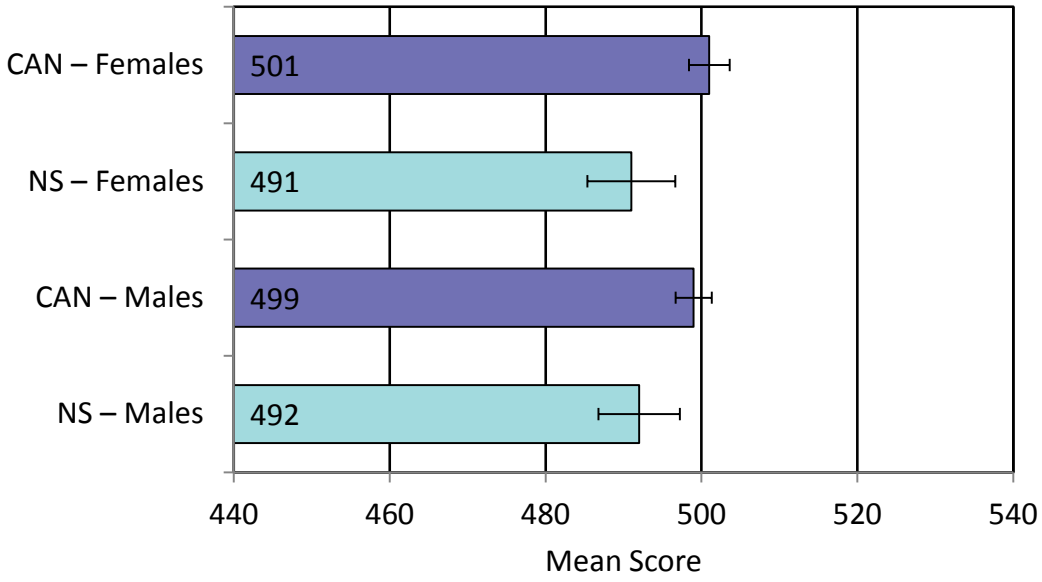
Students enrolled in both English- and French-language schools achieve lower results compared to their Canadian counterparts. Within the province, students in English-language schools achieve significantly higher mean scores than those in French-language schools.

CHART NS.2 **Canada – Nova Scotia: Results in science by language**



Boys in Nova Scotia achieve significantly similar scores in science compared with Canadian boys overall, whereas girls in Nova Scotia have lower achievement compared to their Canadian counterparts. Within the province there is no gender difference in achievement in science.

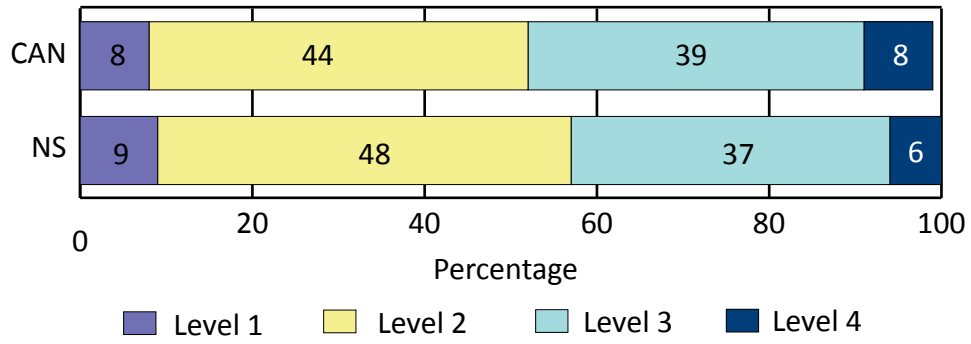
CHART NS.3 **Canada – Nova Scotia: Results in science by gender**



The percentage of students at each of the four performance levels in science was examined by jurisdiction, by language of the school system, and by gender, as presented in the next three charts. Level 2 is the expected level for Grade 8/Secondary II students in Canada.

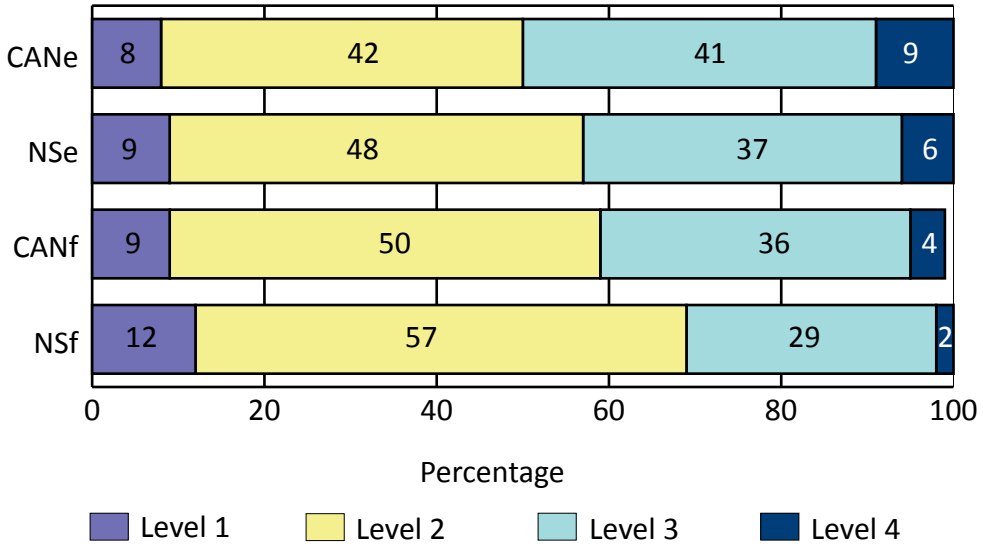
In Nova Scotia, 91 per cent of students achieve level 2 or above, and the percentage of students at the two higher performance levels is about the same as that in Canada overall.

CHART NS.4 **Canada – Nova Scotia: Percentage of students at performance levels in science**



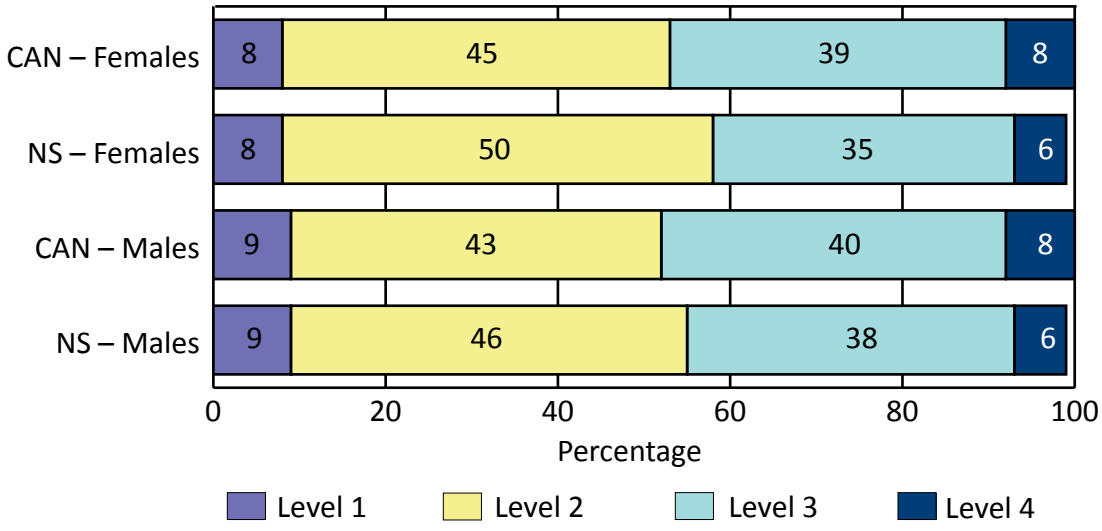
In Nova Scotia, 91 per cent of English-language students and 88 per cent of French-language students perform at level 2 or above. There is a higher proportion of students at the higher levels of students in English-language schools than in French-language schools. Achievement at the higher levels of performance is lower in Nova Scotia than in Canada overall in both English- and French-language schools.

CHART NS.5 **Canada – Nova Scotia: Comparison by level of performance in science by language**



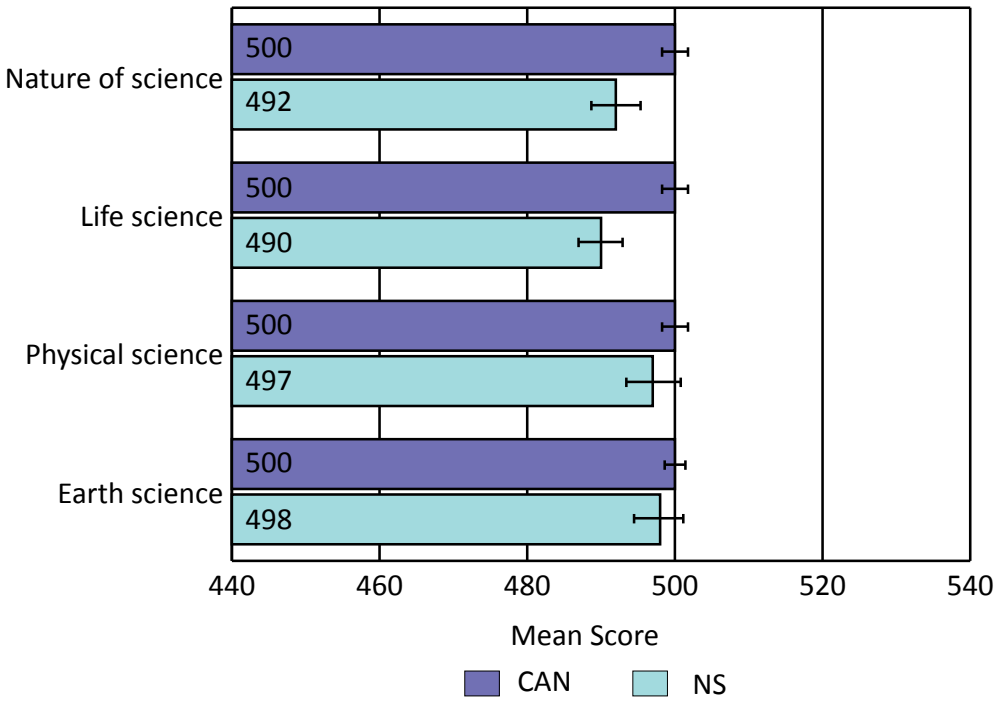
In Nova Scotia, 91 per cent of girls and 90 per cent of boys perform at level 2 and above, and there is a slightly larger percentage of boys who achieve at level 3 of performance. Compared to the Canadian results, about the same percentage of both girls and boys achieve at level 4.

CHART NS.6 **Canada – Nova Scotia: Comparison by level of performance in science by gender**



When the results are examined by sub-domain in science, students in Nova Scotia achieve similar scores in physical science and Earth science compared to the Canadian means; however, achievement results are significantly lower in nature of science and life science. Within the province, there is no significant difference in achievement among the four sub-domains.

CHART NS.7 **Canada – Nova Scotia: Results by sub-domain in science**



Students enrolled in English-language schools in Nova Scotia have lower achievement in nature of science, life science, and physical science compared to the Canadian means. In French-language schools, students achieve lower scores in nature of science, life science, and Earth science compared to their Canadian counterparts. Within the province, students in English-language schools have higher achievement in nature of science, life sciences, and Earth sciences compared to those in French-language schools.

TABLE NS.1 **Canada – Nova Scotia: Results by sub-domain and language**

	Nature of science		Life science		Physical science		Earth science	
	Mean	CI	Mean	CI	Mean	CI	Mean	CI
CANe	504	2.2	506	2.6	504	2.3	502	2.5
NSe	493	3.8	491	4.1	497	4.0	499	4.0
Difference	**11***		**15***		**7***		3	
CANf	487	2.6	481	3.0	488	3.3	492	2.4
NSf	467	3.4	472	4.4	493	4.0	475	4.6
Difference	**20***		**9***		5		**17***	
NSe	493	3.8	491	4.1	497	4.0	499	4.0
NSf	467	3.4	472	4.4	493	4.0	475	4.6
Difference	**26***		**19***		4		**24***	

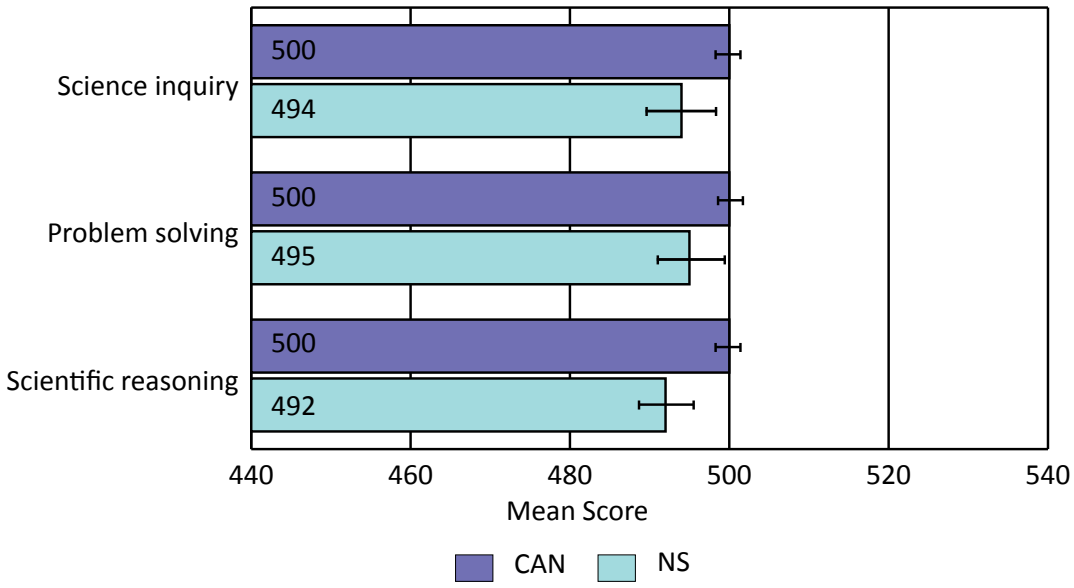
Nova Scotia girls have similar scores to those in Canada overall in nature of science and physical science but lower scores in life science and Earth science. Boys achieve significantly lower results only in life science when compared to the Canadian means. Within the province, boys have higher achievement than girls in Earth science.

TABLE NS.2 **Canada – Nova Scotia: Results by sub-domain and gender**

	Nature of science		Life science		Physical science		Earth science	
	Mean	CI	Mean	CI	Mean	CI	Mean	CI
CAN – Females	501	2.7	501	2.5	499	2.5	501	3.3
NS – Females	494	5.6	491	4.3	494	5.9	493	4.5
Difference	7		**10***		5		**8***	
CAN – Males	499	2.8	499	2.1	501	2.4	500	2.9
NS – Males	491	6.5	489	5.6	500	4.8	503	5.2
Difference	8		**10***		1		3	
NS – Females	494	5.6	491	4.3	494	5.9	493	4.5
NS – Males	491	6.5	489	5.6	500	4.8	503	5.2
Difference	3		2		6		**10***	

Nova Scotia students achieve significantly similar results in science inquiry and problem solving compared to the Canadian means; however, achievement in scientific reasoning was lower than that in Canada overall. Within the province, there is no significant difference in achievement among the three competencies.

CHART NS.8 **Canada – Nova Scotia: Results by competency in science**



When compared to the Canadian means, students in English-language schools have lower achievement in the three competencies; however, in French-language schools student achievement is similar to the Canadian results in problem solving but lower in science inquiry and scientific reasoning. Within Nova Scotia, students in English-language schools have higher achievement in each of the three competencies compared to those in French-language schools.

TABLE NS.3 **Canada – Nova Scotia: Results by competency and language**

	Science inquiry		Problem solving		Scientific reasoning	
	Mean	**CI**	**Mean**	**CI**	**Mean**	**CI**
CANe	504	2.0	503	2.1	505	1.9
NSe	495	3.8	495	3.5	492	3.4
Difference	**9***		**8***		**13***	
CANf	487	2.8	490	3.2	482	2.7
NSf	466	4.1	484	4.7	474	4.8
Difference	**21***		6		**8***	
NSe	495	3.8	495	3.5	492	3.4
NSf	466	4.1	484	4.7	474	4.8
Difference	**29***		**11***		**18***	

Within Nova Scotia, girls outperform boys in science inquiry. Compared to the Canadian means, boys are statistically similar to their Canadian counterparts in all three competencies, whereas girls have similar results in science inquiry and problem solving but lower achievement in scientific reasoning.

TABLE NS.4 **Canada – Nova Scotia: Results by competency and gender**

	Science inquiry		Problem solving		Scientific reasoning	
	Mean	CI	Mean	CI	Mean	CI
CAN – Females	503	2.6	499	3.0	499	2.5
NS – Females	498	5.0	493	5.8	488	4.5
Difference	5		6		**11***	
CAN – Males	497	3.3	501	2.4	501	2.7
NS – Males	490	5.6	497	5.8	495	4.9
Difference	7		4		6	
NS – Females	498	5.0	493	5.8	488	4.5
NS – Males	490	5.6	497	5.8	495	4.9
Difference	**8***		4		7	

Reading and mathematics results

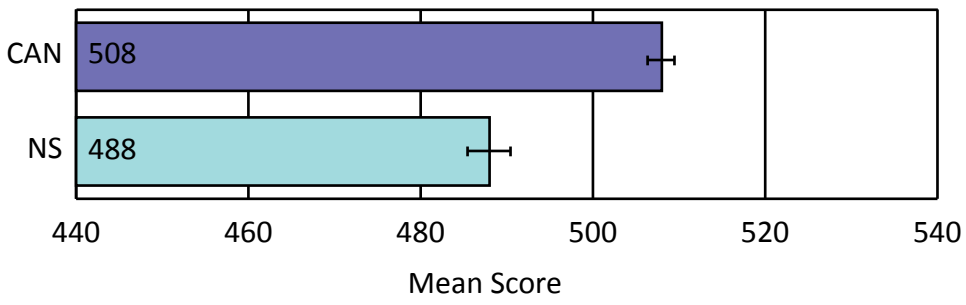
In PCAP 2013, reading and mathematics are both minor domains. Results are reported overall, by language of the school system, and by gender. Finally, multiple comparisons over time between PCAP assessments are reported.

Results in reading

The following charts present student achievement for Canada and Nova Scotia in reading overall, by language of the school system, and by gender.

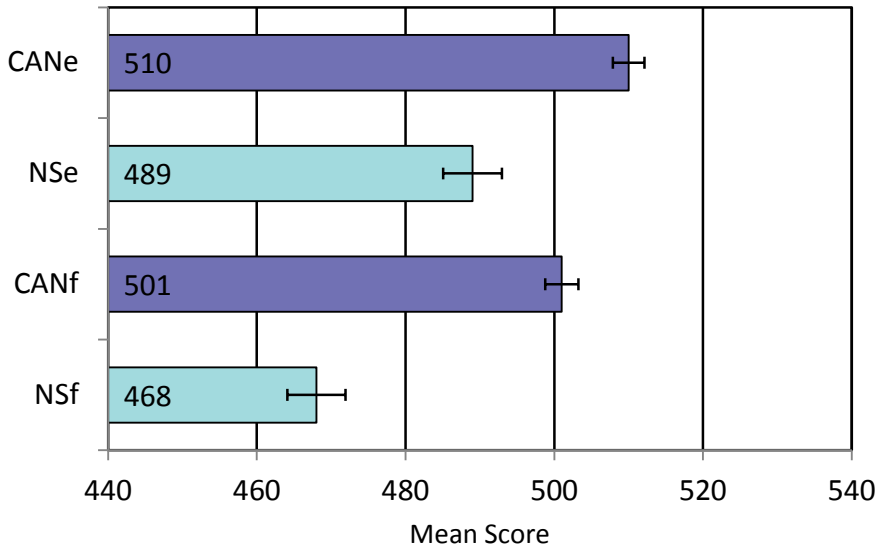
In PCAP 2013, reading achievement in Nova Scotia is significantly lower than the Canadian mean score.

CHART NS.9 **Canada – Nova Scotia: Mean score in reading**



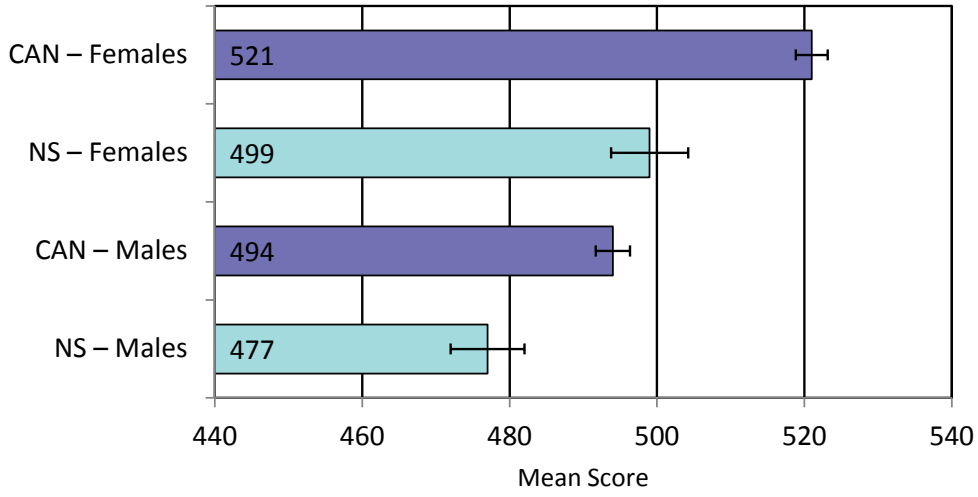
As shown in the following chart, reading scores in both English- and French-language schools in Nova Scotia are significantly lower than the Canadian means. Within the province, achievement results for English-language students are higher than those in French-language schools.

CHART NS.10 **Canada – Nova Scotia: Results in reading by language**



Reading achievement for both girls and boys in Nova Scotia is significantly lower than Canadian students overall. Girls outperform boys in reading both within the province (by 22 points) and in Canada overall (by 27 points) as shown in the PCAP 2013 assessment of reading.

CHART NS.11 **Canada – Nova Scotia: Results in reading by gender**

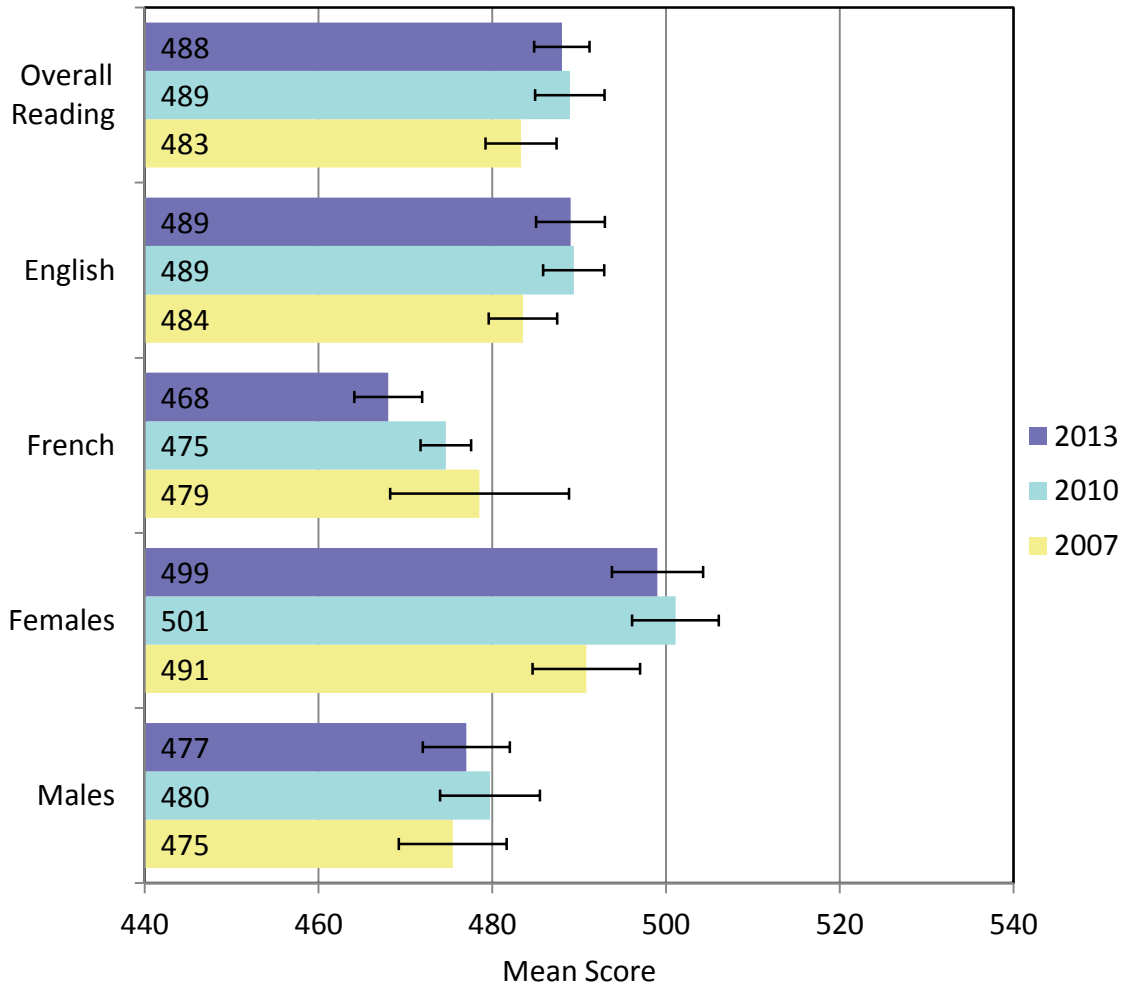


Comparison of reading results: 2007, 2010, and 2013

Reading was a major domain in PCAP 2007. As a minor domain in 2010 and 2013, the assessment comprised fewer reading items; however, common items among the three assessments allow the reporting of changes over time for reading achievement.

As shown in the PCAP 2013 assessment of readings, achievement results have been statistically consistent over time in Nova Scotia.

CHART NS.12 **Canada – Nova Scotia: Changes over time in reading**

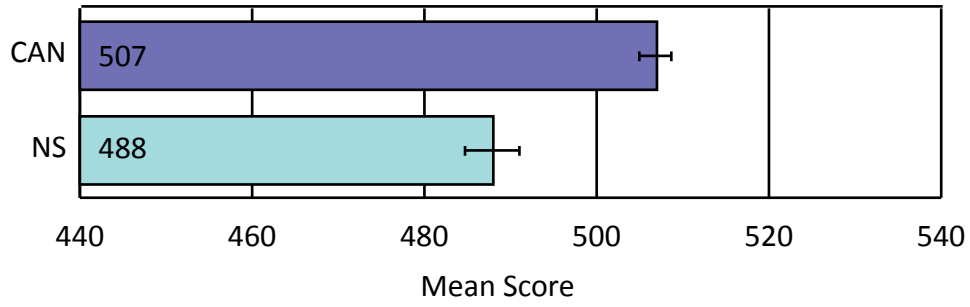


Results in mathematics

The following charts present student achievement for Canada and Nova Scotia in mathematics overall, by language of the school system, and by gender.

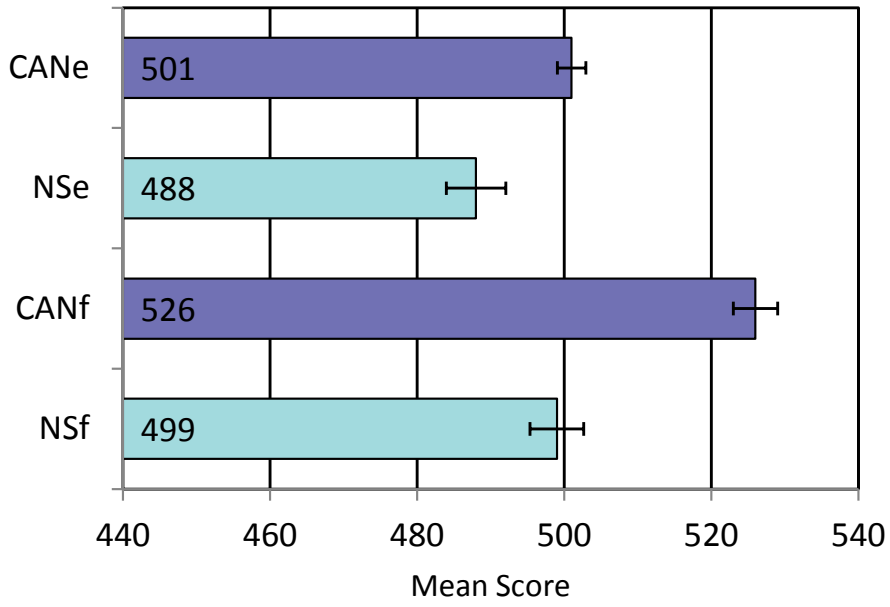
In PCAP 2013, mathematics achievement in Nova Scotia is significantly lower than in Canada overall.

CHART NS.13 **Canada – Nova Scotia: Mean score in mathematics**



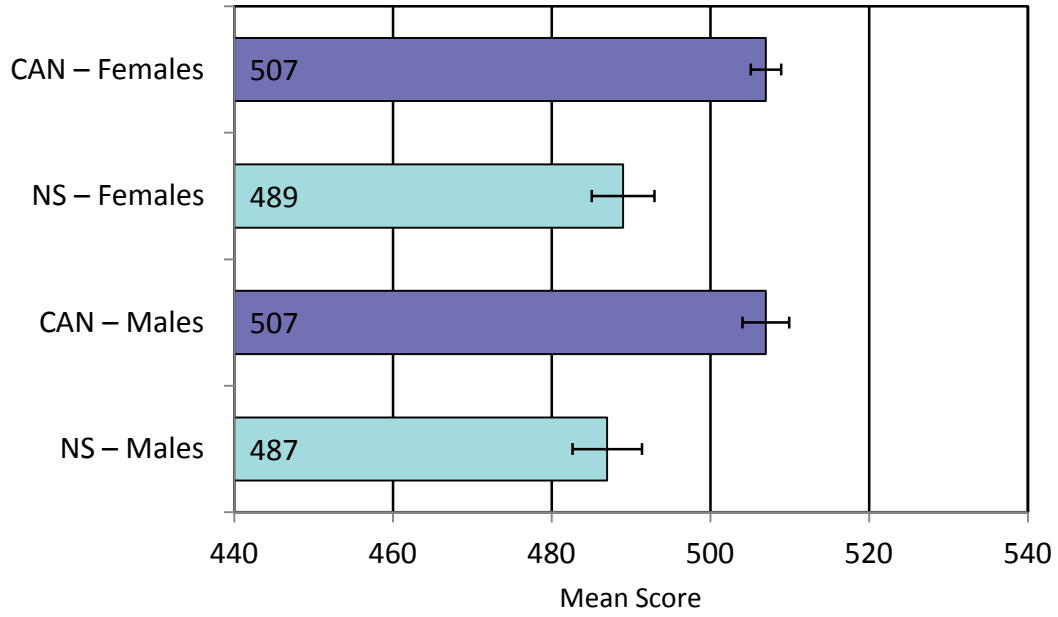
As shown in the following chart, mathematics scores in both English- and French-language schools are significantly lower than the Canadian means. Within the province, students in French-language schools outperform those in English-language schools in mathematics.

CHART NS.14 **Canada – Nova Scotia: Results in mathematics by language**



In Nova Scotia, as in Canada overall, there is no gender gap in mathematics; however, both boys and girls have lower achievement in mathematics compared to Canadian boys and girls overall.

CHART NS.15 **Canada – Nova Scotia: Results in mathematics by gender**

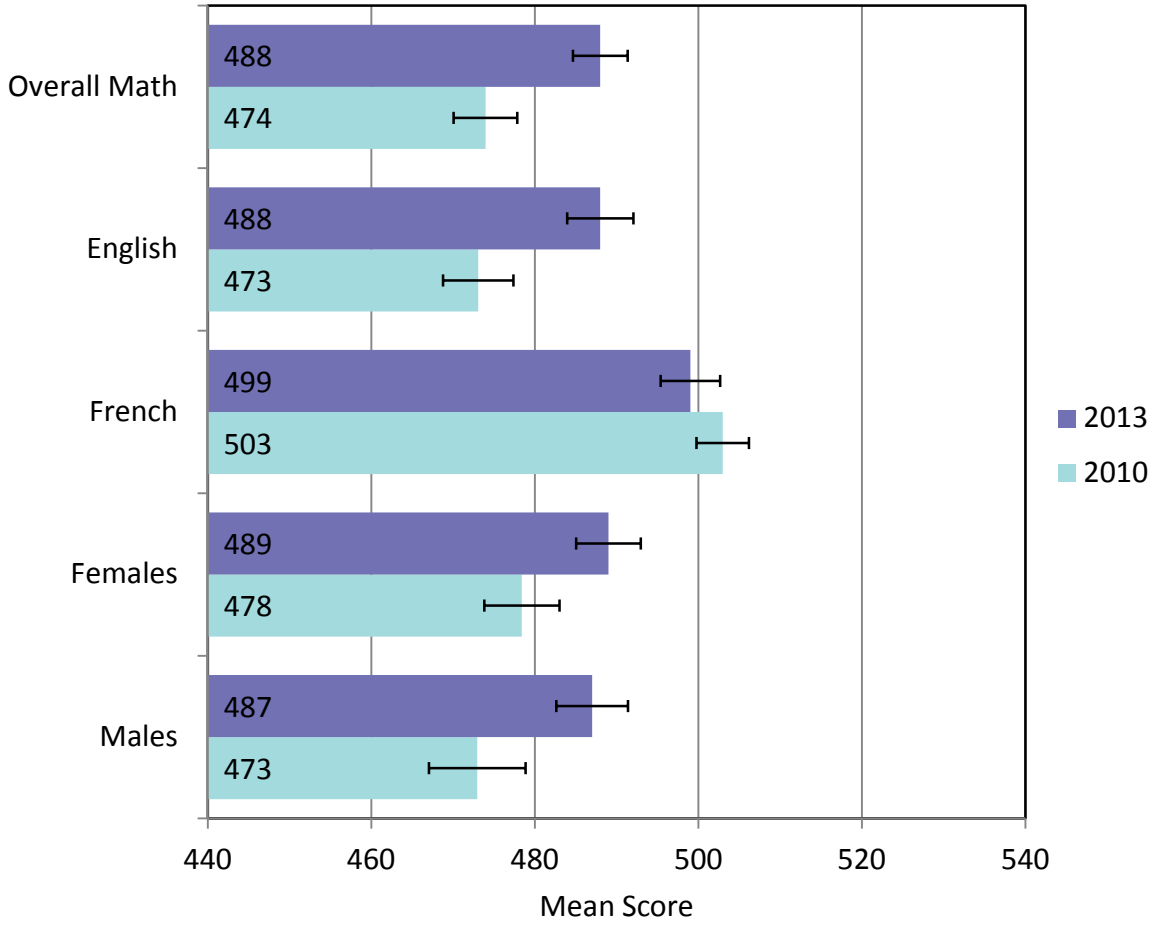


Comparison of mathematics results: 2010 and 2013

Mathematics was a major domain in PCAP 2010, which was the baseline year. As a minor domain in 2013, the assessment comprised fewer mathematics items; however, common items between the two assessments allow the reporting of changes over time for mathematics achievement.

As shown in the PCAP 2013 assessment of mathematics, significant positive changes in achievement over time can be seen in mathematics overall, in English-language schools, and for both girls and boys in Nova Scotia.

CHART NS.16 **Canada – Nova Scotia: Changes over time in mathematics**



PRINCE EDWARD ISLAND

Context Statement

Social context

Prince Edward Island (PE) is the smallest province in Canada, in terms of both land (5,684 square kilometres) and population (145,855). Ninety-nine per cent of the population speaks English. Prince Edward Island has the third highest rate of bilingualism in Canada by percentage of population, with 12.7 per cent of the population self-identifying as speaking both English and French. Approximately 6,000 francophone residents live in Prince Edward Island. Fifty-six per cent of the population is rural, with approximately seven per cent living on farms. The environment is predominately rural, with agriculture, tourism, fishing, and manufacturing constituting the major industries. However, the Island economy is diversifying with support for growth industries such as aerospace, bioscience (including agriculture and fisheries), information technology, and renewable energy. The Confederation Bridge, the world's longest continuous multi-span bridge, opened in 1997, connecting Prince Edward Island to mainland New Brunswick (www.gov.pe.ca).

Organization of the school system

During the 2012-2013 school year, Prince Edward Island's public school system was composed of two school boards, with an enrolment of 20,406 students in 63 public schools. Approximately 829 students were enrolled in six French schools, and 22 per cent were enrolled in French Immersion courses. In addition, there were two private schools, with an enrolment of 211 students, along with one First Nations–operated school. Prince Edward Island has a teaching force of approximately 1,634 teachers employed by the school boards.

The school system consists of Grades K-12. Students entering Kindergarten must be five years of age by the end of December of their first school year. Prince Edward Island's students are accommodated within facilities that contain a number of grade configurations, including Grades K-3, K-4, K-6, 4-6, 5-8, K-8, 7-9, 9-12, and 10-12. This diversity results from demands placed on the schools by local communities, enrolment, and existing facilities. In this province, high school consists of Grades 10–12.

Science teaching

The PE science curriculum articulates the vision for science instruction in Prince Edward Island as the vehicle that enables and encourages students to become lifelong learners of science. The goal of science education is to develop scientific literacy, which strives to empower students in asking and answering meaningful questions, making the connections between inquiry, problem solving, and decision making in real world contexts. The PE science program is structured around four general curriculum outcomes:

- (STSE) science, technology, society, and environment
- Skills
- Knowledge, and
- Attitudes.

Instruction is designed around the traditional strands of life sciences, physical sciences, and Earth and space sciences. The objective is to engage students in a range of purposeful experiences to help them better understand and appreciate science and to apply it to the world around them.

Science assessment

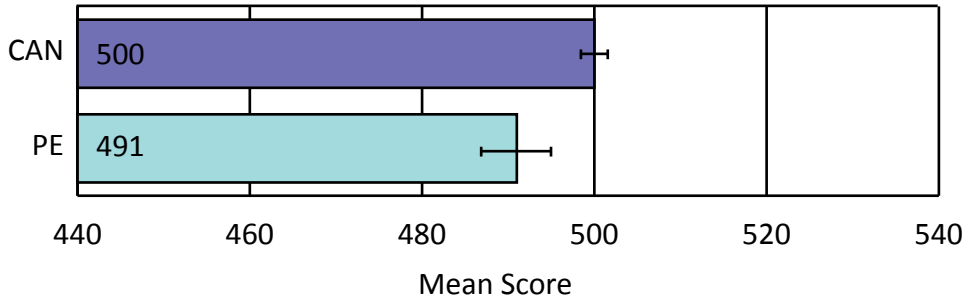
Teachers are encouraged to use a multi-faceted approach in their classrooms to integrate authentic assessment with instruction and to use the collected information to inform students, parents, and other school personnel about student progress. For more information, please visit www.edu.pe.ca.

Results in science

The performance of Prince Edward Island students in science is compared to that of Canadian students overall. Results are presented both by mean score and by performance level. The following charts present student achievement in science overall and by gender.

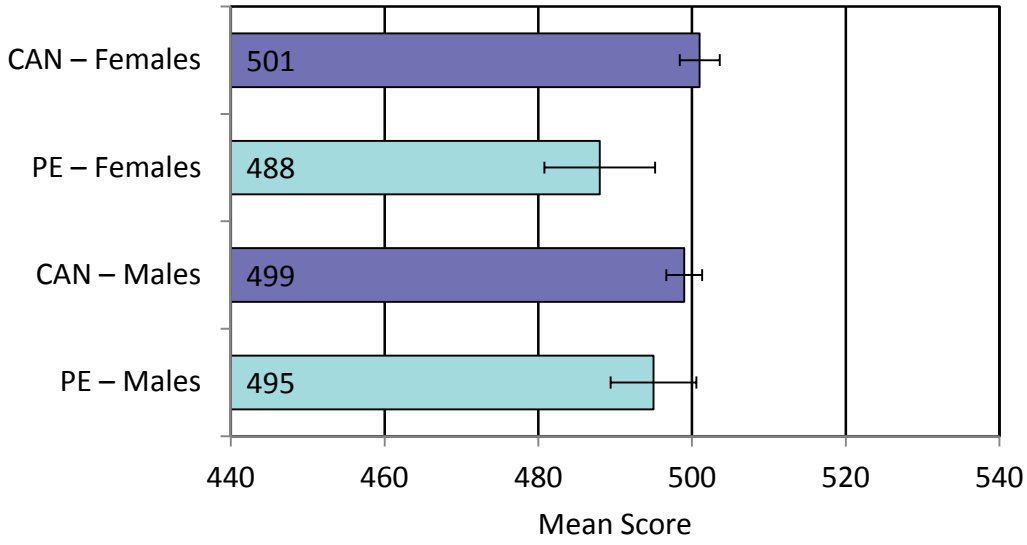
The mean score of Prince Edward Island students who completed the PCAP 2013 Science Assessment is significantly lower than that of Canadian students overall, as shown in the chart below.

CHART PE.1 **Canada – Prince Edward Island: Mean score in science**



There is no significant difference in achievement between girls and boys in science within Prince Edward Island. When compared to Canada overall, boys have statistically similar achievement; however, girls have significantly lower achievement than Canadian girls overall.

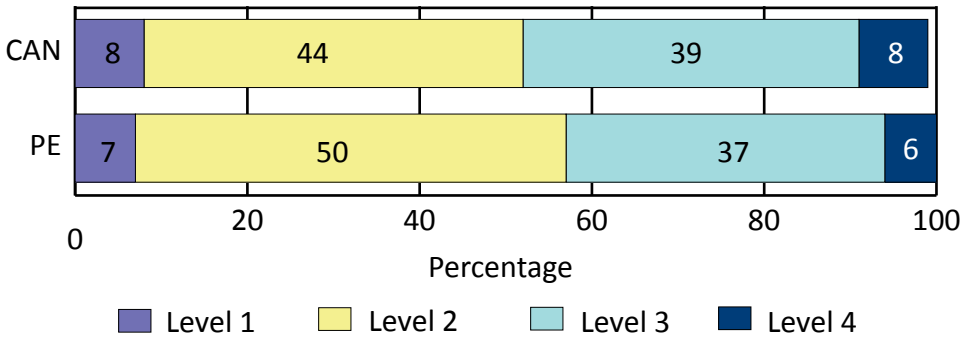
CHART PE.2 **Canada – Prince Edward Island: Results in science by gender**



The percentage of students at each of the four performance levels in science was examined by jurisdiction and by gender, as presented in the next two charts. Level 2 is the expected level for Grade 8/Secondary II students in Canada.

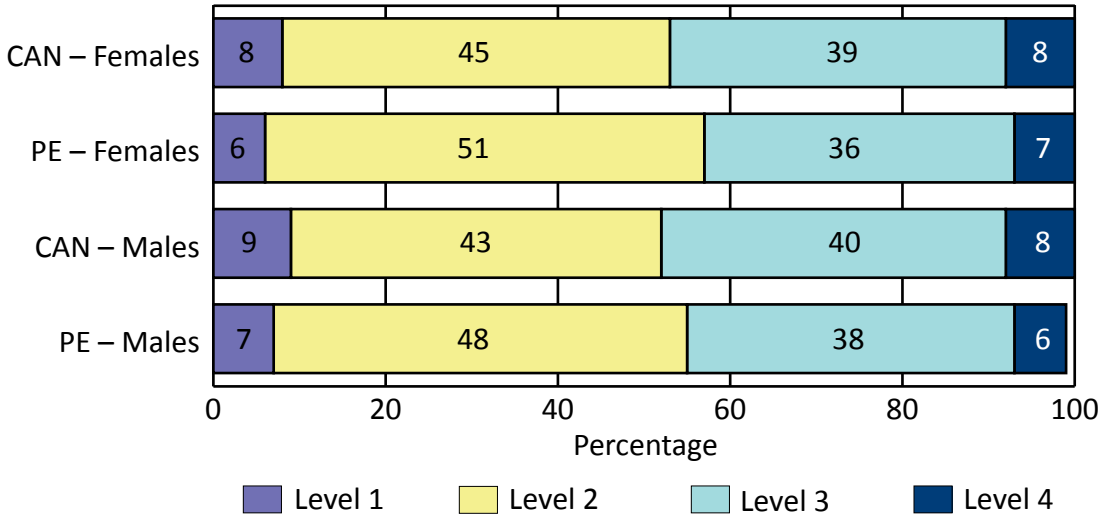
In Prince Edward Island, 93 per cent of students achieve at the expected level of performance or above, and the percentage of students at the two higher performance levels is about the same as that in Canada overall.

CHART PE.3 **Canada – Prince Edward Island: Percentage of students by performance level in science**



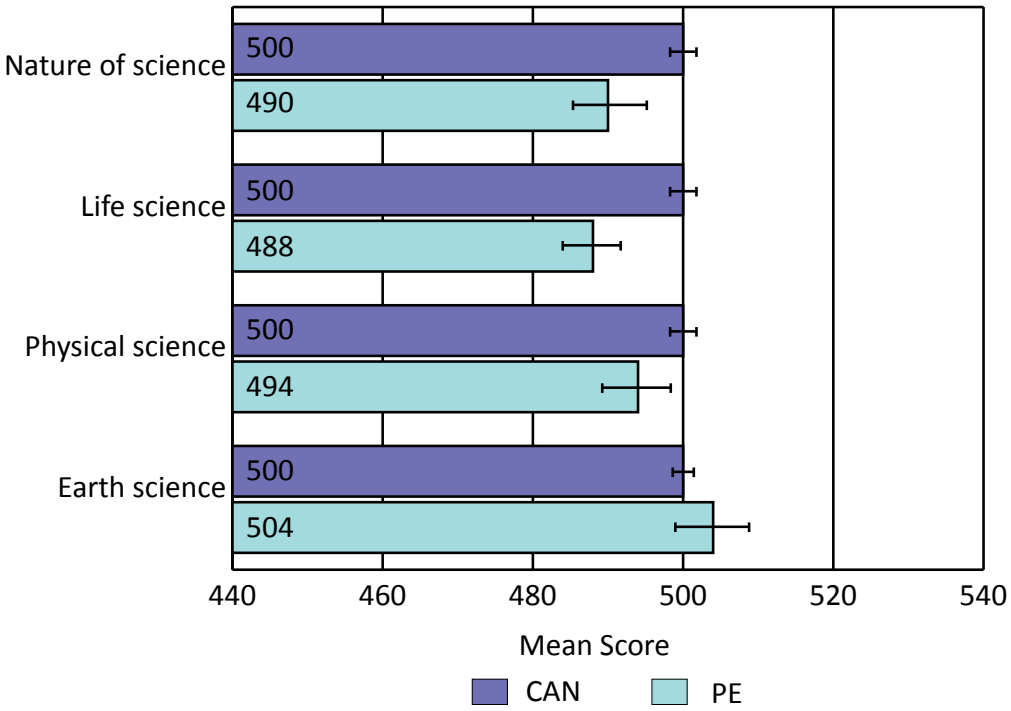
In Prince Edward Island, 94 per cent of girls and 92 per cent of boys perform at level 2 and above. There is no gender gap at the higher levels of performance, and compared to the Canadian results, about the same percentage of both girls and boys achieve at levels 3 and 4.

CHART PE.4 **Canada – Prince Edward Island: Comparison by level of performance in science by gender**



When the results are examined by sub-domain in science, students in Prince Edward Island achieve significantly lower scores in nature of science and life science and similar scores in physical sciences and Earth sciences compared to the Canadian means. Within the province, student achievement is higher in Earth science compared to the other three sub-domains.

CHART PE.5 **Canada – Prince Edward Island: Results by sub-domain in science**



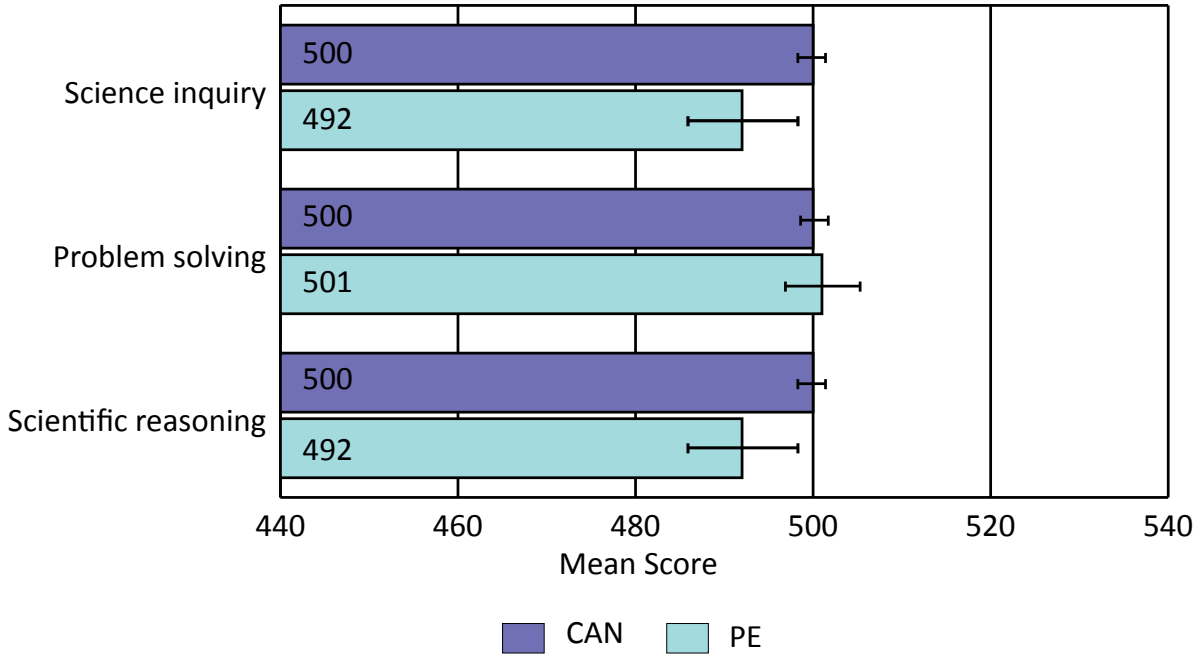
When compared to the Canadian means, Prince Edward Island girls achieve lower scores in nature of science, whereas boys achieve lower scores in life science and higher scores in Earth science. There is no gender difference in achievement among the four sub-domains within the province.

TABLE PE.1 **Canada – Prince Edward Island: Results by sub-domain and gender**

	Nature of science		Life science		Physical science		Earth science	
	Mean	**CI**	**Mean**	**CI**	**Mean**	**CI**	**Mean**	**CI**
CAN – Females	501	2.7	501	2.5	499	2.5	501	3.3
PE – Females	486	7.2	491	7.8	489	6.9	497	6.5
Difference	**15***		10		10		4	
CAN – Males	499	2.8	499	2.1	501	2.4	500	2.9
PE – Males	494	7.7	486	8.0	499	6.5	511	6.7
Difference	5		**13***		2		**11***	
PE – Females	486	7.2	491	7.8	489	6.9	497	6.5
PE – Males	494	7.7	486	8.0	499	6.5	511	6.7
Difference	8		5		10		14	

Students in Prince Edward Island achieve significantly similar scores in the three competencies compared to the Canadian means. Within the province, no significant differences in achievement are found among the three competencies.

CHART PE.6 **Canada – Prince Edward Island: Results by competency in science**



Girls in Prince Edward Island have significantly lower achievement in science inquiry and scientific reasoning compared with their Canadian counterparts; however, boys are statistically similar when

compared to the Canadian means. No significant gender differences are found among the three competencies within Prince Edward Island.

TABLE PE.2 **Canada – Prince Edward Island: Results by competency and gender**

	Science inquiry		Problem solving		Scientific reasoning	
	Mean	CI	Mean	CI	Mean	CI
CAN – Females	503	2.6	499	3.0	499	2.5
PE – Females	489	7.6	500	6.5	486	6.7
Difference	**14***		1		**13***	
CAN – Males	497	3.3	501	2.4	501	2.7
PE – Males	494	6.9	501	8.1	497	7.1
Difference	3		0		4	
PE – Females	489	7.6	500	6.5	486	6.7
PE – Males	494	6.9	501	8.1	497	7.1
Difference	5		1		11	

Reading and mathematics results

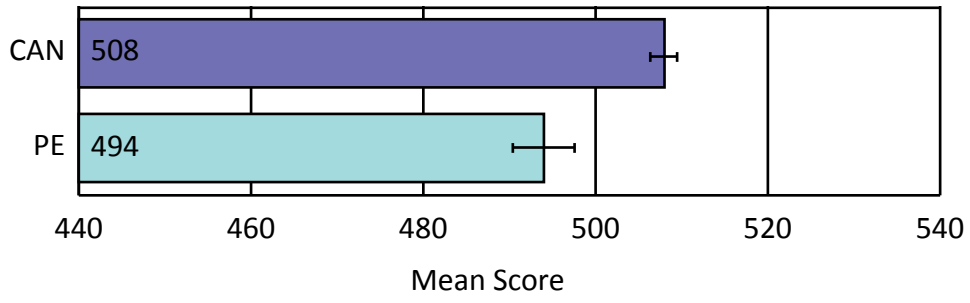
In PCAP 2013, reading and mathematics are both minor domains. Results are reported overall and by gender. Finally, multiple comparisons over time between PCAP assessments are reported.

Results in reading

The following charts present student achievement for Canada and Prince Edward Island in reading overall and by gender.

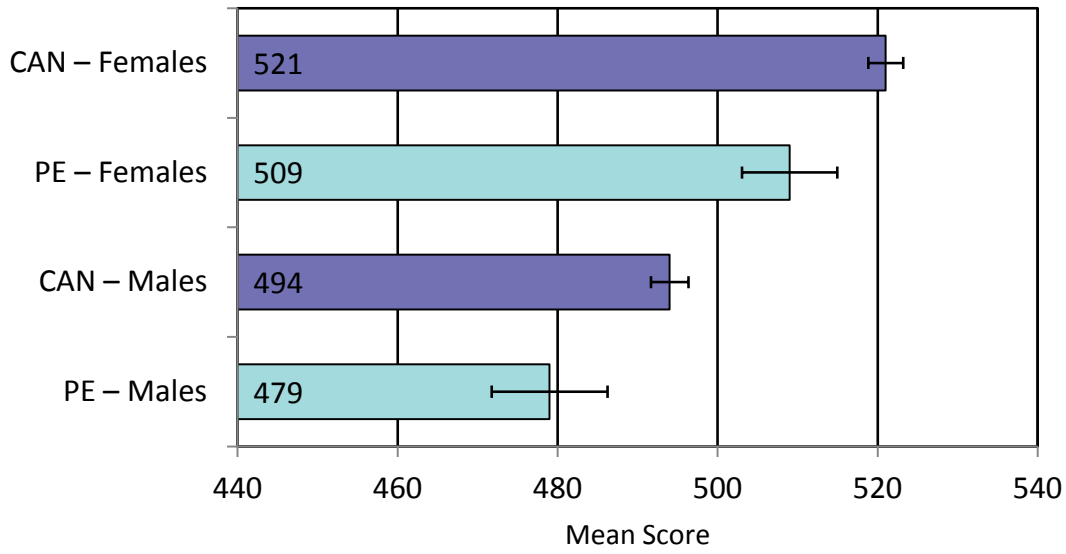
In PCAP 2013, reading achievement in Prince Edward Island is significantly lower than the Canadian mean score, as shown in the chart below.

CHART PE.7 **Canada – Prince Edward Island: Mean score in reading**



Reading achievement for both girls and boys in Prince Edward Island is significantly lower than for Canadian students overall. Girls outperform boys in reading both within the province (by 30 points) and in Canada overall (by 27 points) as shown in the PCAP 2013 assessment of reading.

CHART PE.8 **Canada – Prince Edward Island: Results in reading by gender**

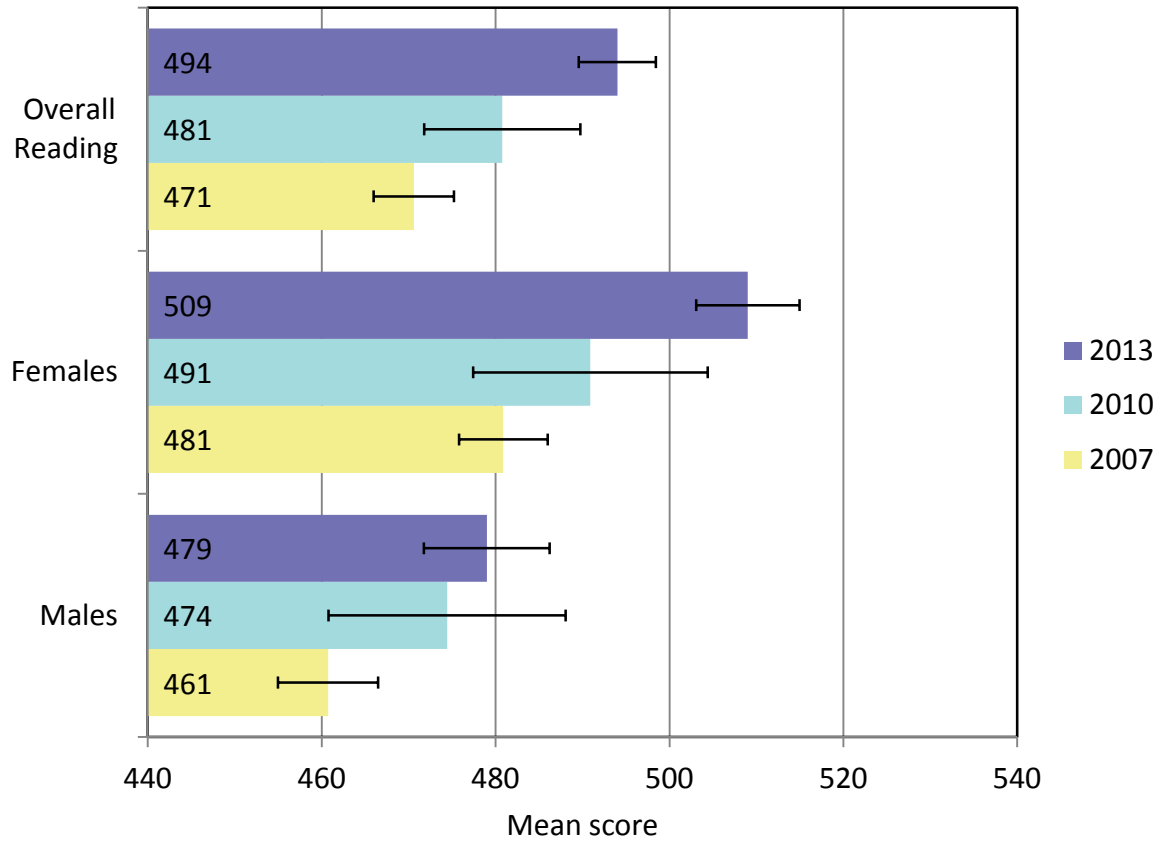


Comparison of reading results: 2007, 2010, and 2013

Reading was a major domain in PCAP 2007. As a minor domain in 2010 and 2013, the assessment comprised fewer reading items; however, common items among the three assessments allow the reporting of changes over time for reading achievement.

As shown in the following chart, reading achievement in Prince Edward Island has been statistically consistent between 2010 and 2013. Between 2007 and 2013, positive changes in reading achievement can be seen in reading overall, and for both girls and boys in Prince Edward Island.

CHART PE.9 **Canada – Prince Edward Island: Comparison over time in reading**

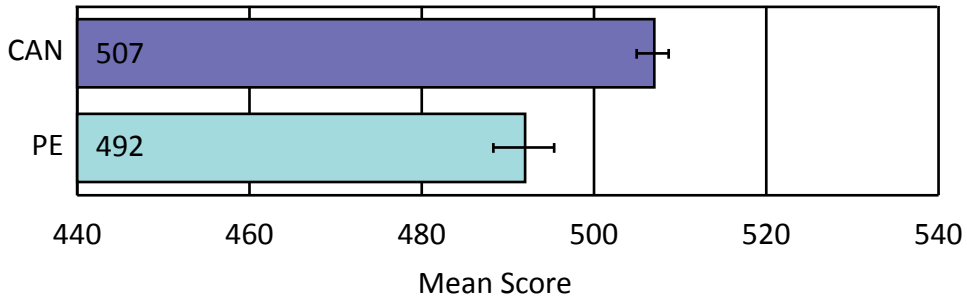


Results in mathematics

The following charts presents student achievement for Canada and Prince Edward Island in mathematics overall and by gender.

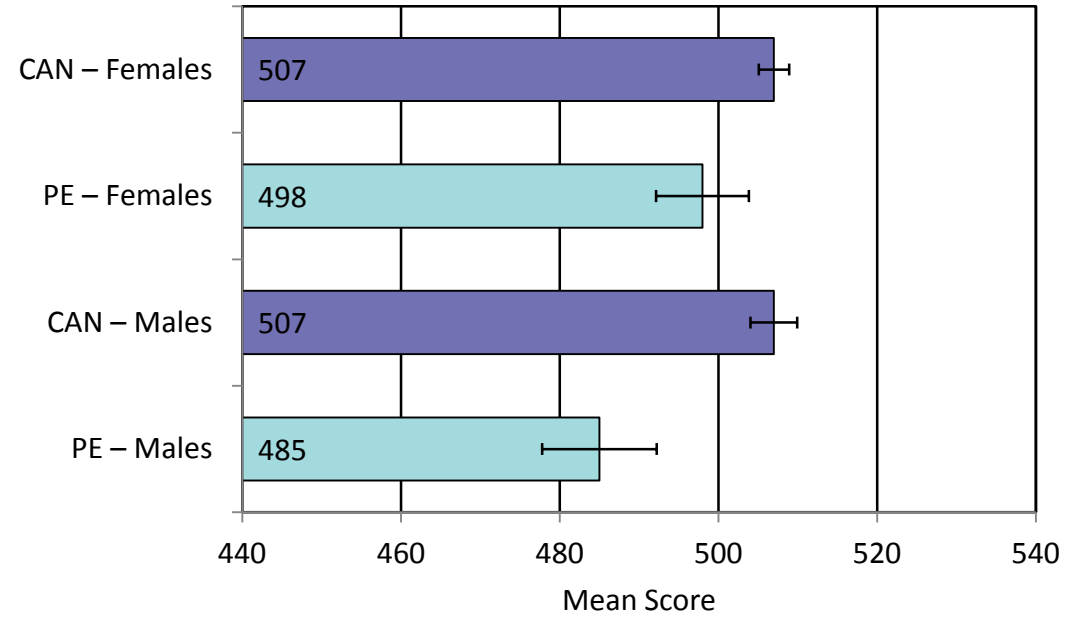
In PCAP 2013, mathematics achievement in Prince Edward Island is significantly lower than in Canada overall, as shown in the chart below.

CHART PE.10 **Canada – Prince Edward Island: Mean score in mathematics**



In Prince Edward Island, girls outperform boys in mathematics; however, both boys and girls have lower achievement in mathematics compared to Canadian boys and girls overall.

CHART PE.11 **Canada – Prince Edward Island: Results in mathematics by gender**

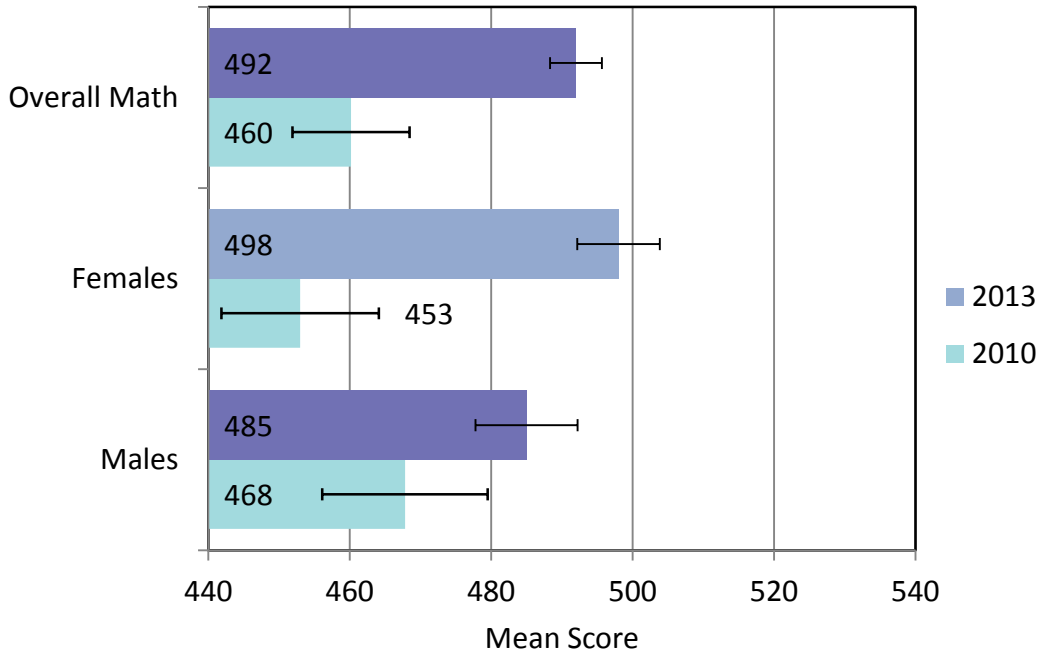


Comparison of mathematics results: 2010 and 2013

Mathematics was a major domain in PCAP 2010, which was the baseline year. As a minor domain in 2013, the assessment comprised fewer mathematics items; however, common items between the two assessments allow the reporting of changes over time for mathematics achievement.

As shown in the PCAP 2013 assessment of mathematics, there have been significant positive changes over time in Prince Edward Island in mathematics overall and for girls.

CHART PE.12 **Canada – Prince Edward Island: Changes over time in mathematics**



NEWFOUNDLAND AND LABRADOR

Context Statement

Social context

In Newfoundland and Labrador, there are approximately 512,000 people spread over a large geographical area. The population of rural areas has been declining, while the population of urban areas, such as the capital city of St. John's, has been rising to a point where it currently makes up 37 per cent of the total population of the province. The declining population in the rural communities, along with the large size of the province, presents many challenges for the delivery of educational programs and services. However, thanks to increased activity in oil exploration, mining, and tourism, the economy is expected to grow significantly, with a predicted increase in the GDP of 7 per cent by the end of 2013. In addition, employment is expected to increase by 2.8 per cent in the same period.

Organization of the school system

The province's education system is made up of two public school districts and four private schools. One of these school districts is francophone. The districts contain 268 schools with a total student enrolment of approximately 67,000, and 5,520 school based educators. The Avalon Peninsula, in the eastern part of the province, comprises 60 per cent of the provincial student enrolment. Early French Immersion (Grades K–12) and late French Immersion (Grades 7–12) are offered in the anglophone public school district. Approximately 13 per cent of the total student population is enrolled in either early or late French Immersion. School entry is compulsory for children who are six years of age by December 31; however, most enter Kindergarten if they are five by that date. Typically, 13-year-olds are in Grade 8.

Science teaching

Science curriculum in Newfoundland and Labrador from Kindergarten to Level III (Grade 12) is based on the *Common Framework of Science Learning Outcomes, K to 12* (CMEC, 1997). The framework is guided by the vision that all students will have an opportunity to develop scientific literacy.

Curriculum is organized around four foundation statements, which delineate four critical aspects of students' scientific literacy: science, technology, society, and the environment (STSE); skills; knowledge; and attitudes. Specific curriculum outcomes, linked to the four foundation statements, are identified for each grade from Kindergarten to Grade 9, and for each high school science course.

Generally, there is a common curriculum for all students in Grades K–Level I (Grade 10). At the senior high school level, students have the option to complete a general or an academic-level program. High school science courses are offered in the areas of biology, chemistry, Earth systems, environmental science, and physics.

Science assessment

Newfoundland and Labrador administers provincial examinations to students who complete the academic science program in high school. Provincial examinations are administered in biology, chemistry, Earth systems, and physics. These examinations are worth 50 per cent of a student's final grade and are marked by a panel of teachers at the end of the school year.

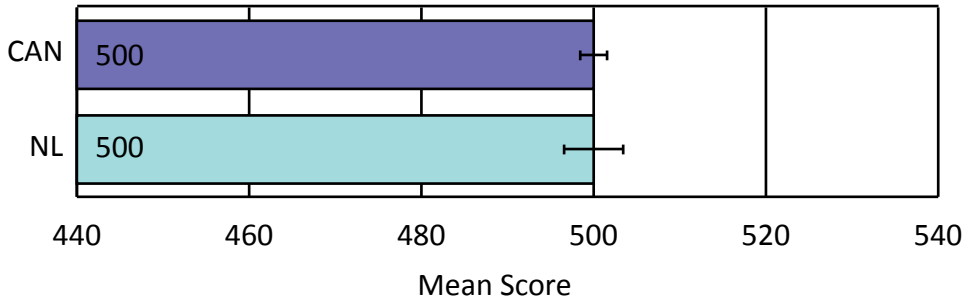
More information about the Newfoundland and Labrador K–12 education system can be found on the Department of Education Web site at www.gov.nl.ca/edu.

Results in science

The performance of Newfoundland and Labrador students in science is compared to that of Canadian students overall. Results are presented both by mean score and by performance level. The following charts present student achievement in science overall and by gender.

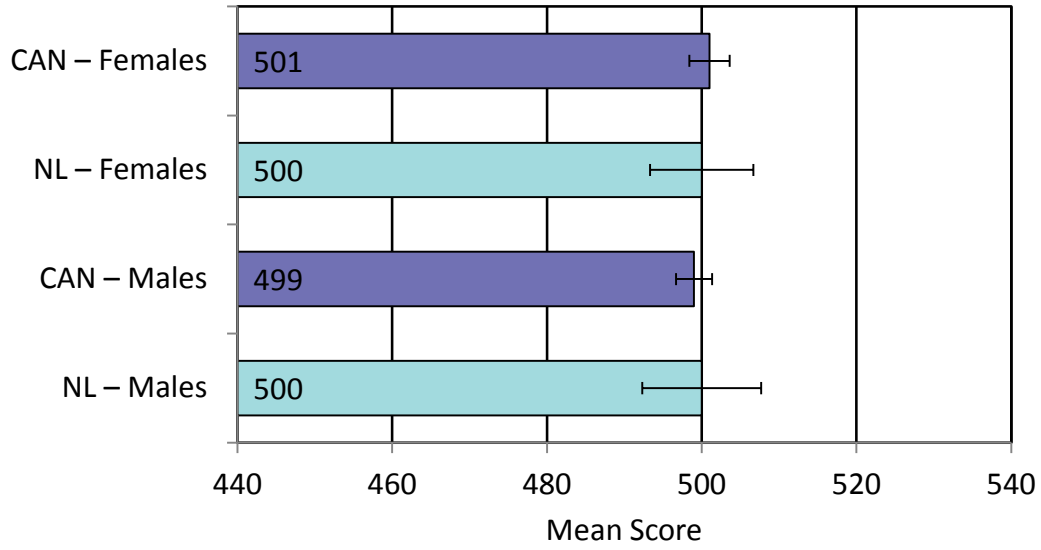
The mean score of Newfoundland and Labrador students who completed the PCAP 2013 Science Assessment is statistically the same as that of Canadian students overall, as shown in the chart below.

CHART NL.1 **Canada – Newfoundland and Labrador: Mean score in science**



There is no significant difference in achievement between girls and boys in science either within Newfoundland and Labrador or when compared to students in Canada overall.

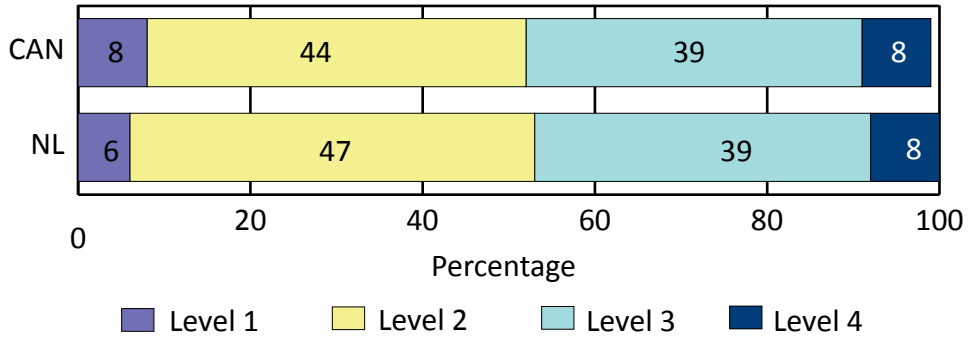
CHART NL.2 **Canada – Newfoundland and Labrador: Results in science by gender**



The percentage of students at each of the four performance levels in science was examined by jurisdiction and by gender, as presented in the next two charts. Level 2 is the expected level for Grade 8/Secondary II students in Canada.

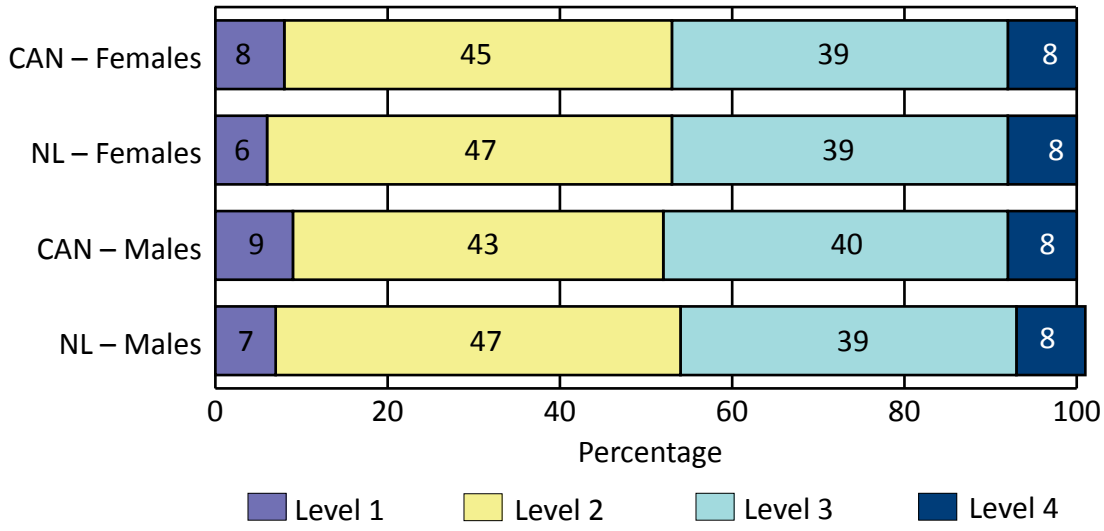
In Newfoundland and Labrador, 94 per cent of students achieve level 2 or above, and the percentage of students at the higher performance levels is the same as that in Canada overall.

CHART NL.3 **Canada – Newfoundland and Labrador: Percentage of students by performance level in science**



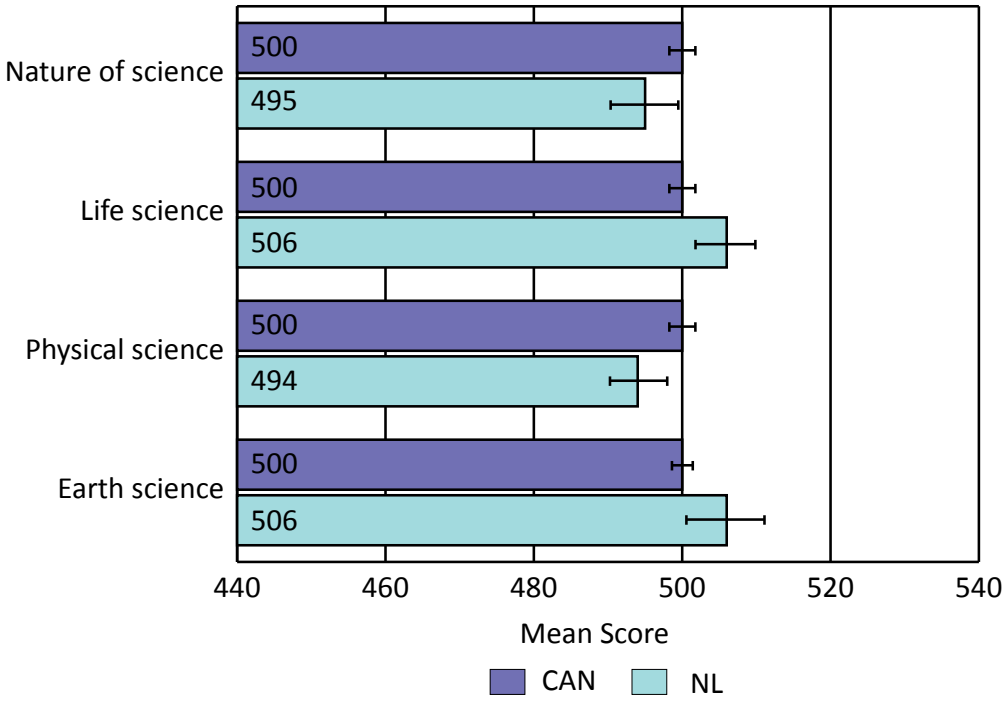
In Newfoundland and Labrador, 94 per cent of both girls and boys perform at level 2 and above, which is about the same as Canadian students overall. Within the province, there is no gender difference for those who achieve the higher levels of performance. Compared to the Canadian results, about the same percentage of both girls and boys achieve at levels 3 and 4.

CHART NL.4 **Canada – Newfoundland and Labrador: Comparison by level of performance in science by gender**



When the results are examined by sub-domain in science, students in Newfoundland and Labrador achieve statistically similar scores in the four sub-domains, both within the province and when compared to the Canadian means.

CHART NL.5 **Canada – Newfoundland and Labrador: Results by sub-domain in science**



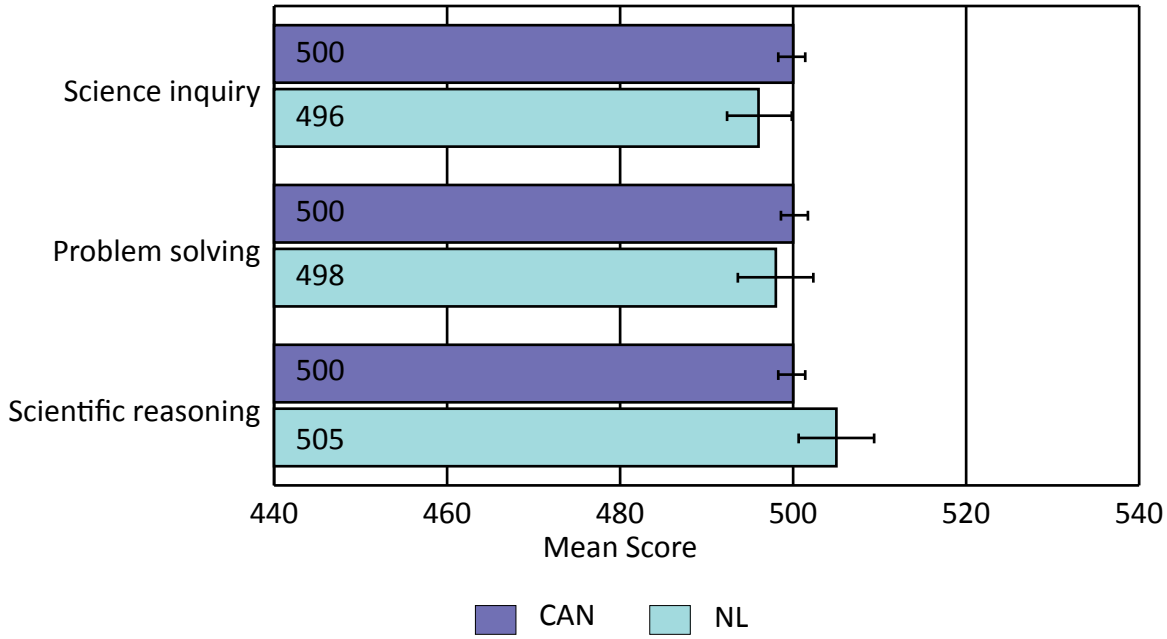
Within Newfoundland and Labrador, girls outperform boys in Earth science. When compared to the Canadian means, girls in Newfoundland and Labrador have lower achievement in physical science and higher achievement in Earth science compared to their Canadian counterparts.

TABLE NL.1 **Canada – Newfoundland and Labrador: Results by sub-domain and gender**

	Nature of science		Life science		Physical science		Earth science	
	Mean	CI	Mean	CI	Mean	CI	Mean	CI
CAN – Females	501	2.7	501	2.5	499	2.5	501	3.3
NL – Females	493	7.2	506	7.8	490	5.5	512	6.9
Difference	8		5		**9***		**11***	
CAN – Males	499	2.8	499	2.1	501	2.4	500	2.9
NL – Males	496	6.5	507	7.6	499	7.2	500	6.8
Difference	3		8		2		0	
NL – Females	493	7.2	506	7.8	490	5.5	512	6.9
NL – Males	496	6.5	507	7.6	499	7.2	500	6.8
Difference	3		1		9		**12***	

When the results are examined by competency in science, students in Newfoundland and Labrador achieve statistically similar scores compared to Canadian students overall. No significant differences are found within the province among the three competencies.

CHART NL.6 **Canada – Newfoundland and Labrador: Results by competency in science**



No significant gender differences are found among the three competencies within Newfoundland and Labrador or when compared to their Canadian counterparts.

TABLE NL.2 **Canada – Newfoundland and Labrador: Results by competency and gender**

	Science inquiry		Problem solving		Scientific reasoning	
	Mean	CI	Mean	CI	Mean	CI
CAN – Females	503	2.6	499	3.0	499	2.5
NL – Females	498	6.8	497	6.9	504	8.3
Difference	5		2		5	
CAN – Males	497	3.3	501	2.4	501	2.7
NL – Males	494	7.3	499	5.5	506	6.9
Difference	3		2		5	
NL – Females	498	6.8	497	6.9	504	8.3
NL – Males	494	7.3	499	5.5	506	6.9
Difference	4		2		2	

Reading and mathematics results

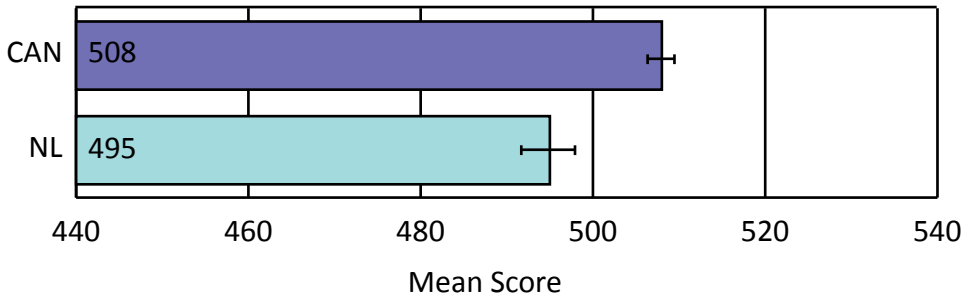
In PCAP 2013, reading and mathematics are both minor domains. Results are reported overall and by gender. Finally, multiple comparisons over time between PCAP assessments are reported.

Results in reading

The following charts present student achievement for Canada and Newfoundland and Labrador in reading overall and by gender.

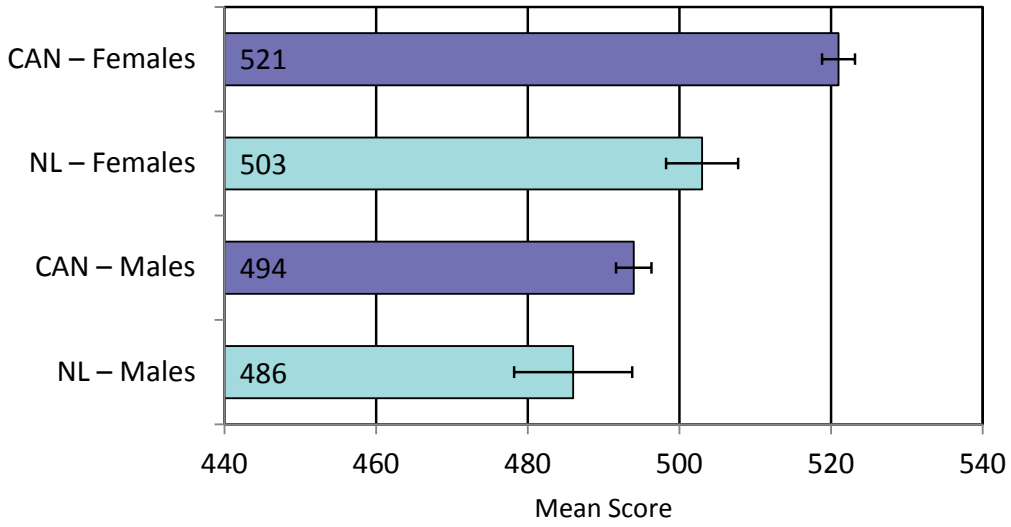
In PCAP 2013, reading achievement in Newfoundland and Labrador is significantly lower than the Canadian mean score, as shown in the chart below.

CHART NL.7 **Canada – Newfoundland and Labrador: Mean score in reading**



Reading achievement for girls in Newfoundland and Labrador is significantly lower than Canadian students overall; boys are statistically similar to Canadian boys in reading. Girls outperform boys in reading, both within the province (by 17 points) and in Canada overall (by 27 points), as shown in the PCAP 2013 assessment of reading.

CHART NL.8 **Canada – Newfoundland and Labrador: Results in reading by gender**

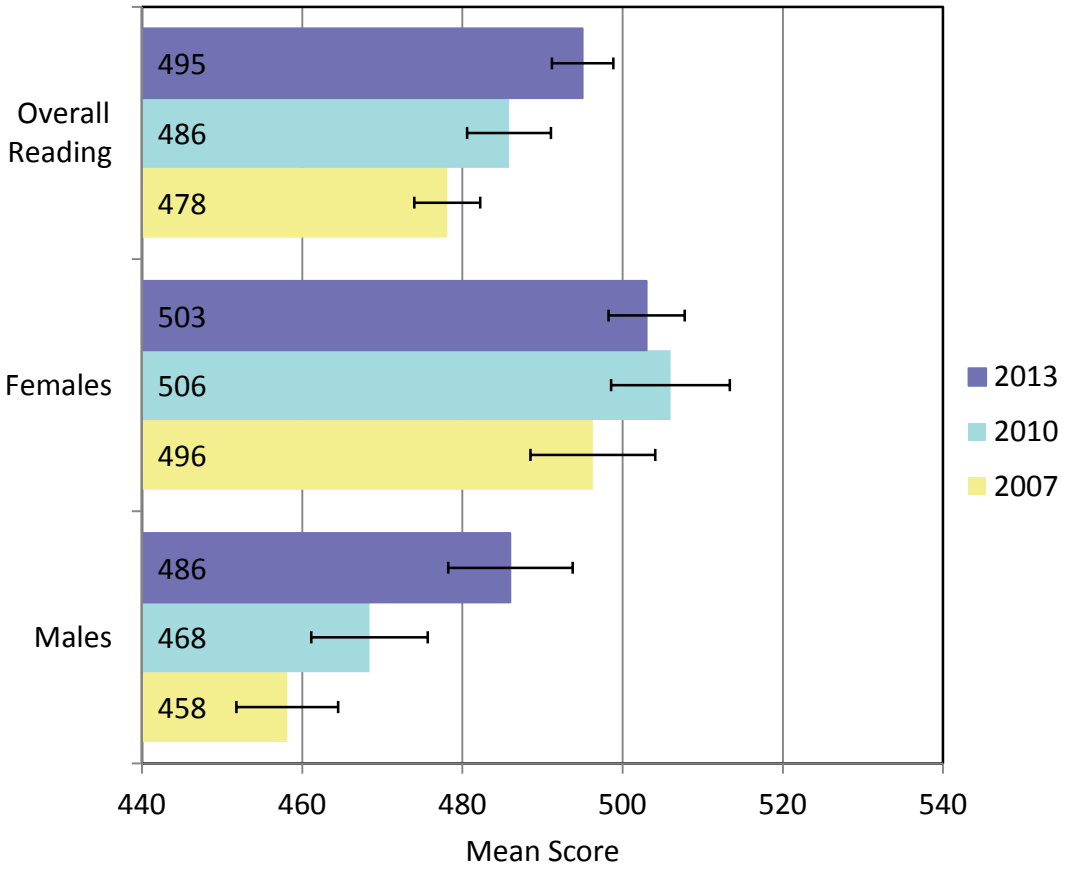


Comparison of reading results: 2007, 2010, 2013

Reading was a major domain in PCAP 2007. As a minor domain in 2010 and 2013, the assessment comprised fewer reading items; however, common items among the three assessments allow the reporting of changes over time for reading achievement.

As shown in the following chart, between 2007 and 2013 and between 2010 and 2013 there was a positive change for reading overall and for boys in the province. There has been no significant change for girls.

CHART NL.9 **Canada – Newfoundland and Labrador: Changes over time in reading**

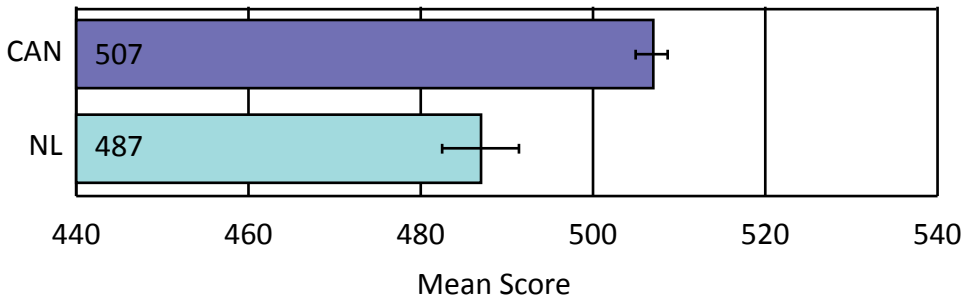


Results in mathematics

The following charts presents student achievement for Canada and Newfoundland and Labrador in mathematics overall and by gender.

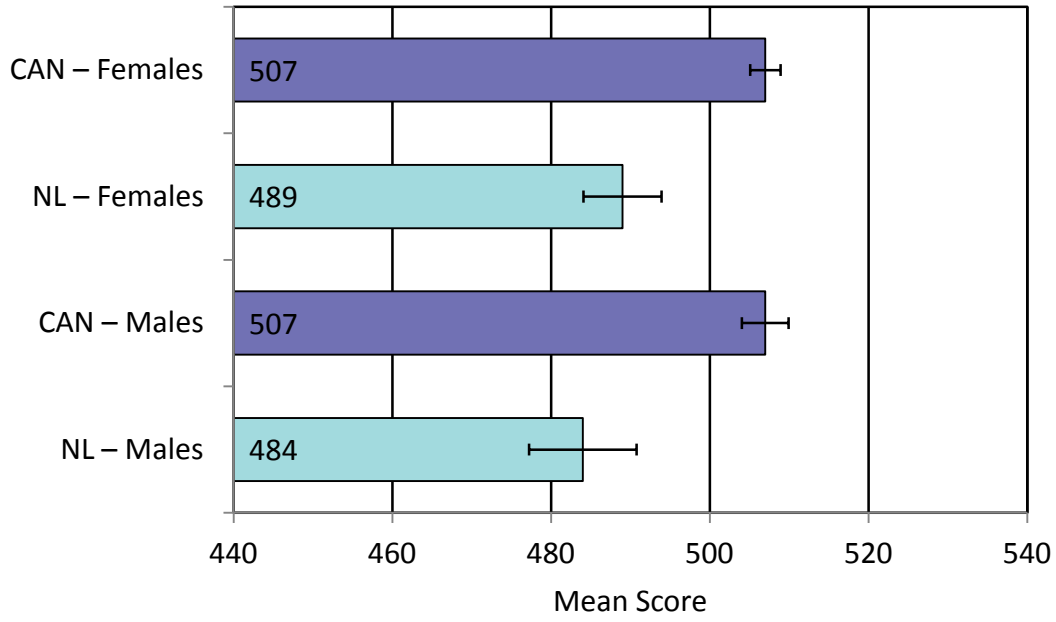
In PCAP 2013, mathematics achievement in Newfoundland and Labrador is significantly lower than in Canada overall, as shown in the chart below.

CHART NL.10 **Canada – Newfoundland and Labrador: Mean score in mathematics**



In Newfoundland and Labrador, as in Canada overall, there is no gender gap in mathematics; however, both girls and boys have lower achievement in mathematics compared to Canadian girls and boys overall.

CHART NL.11 **Canada – Newfoundland and Labrador: Results in mathematics by gender**

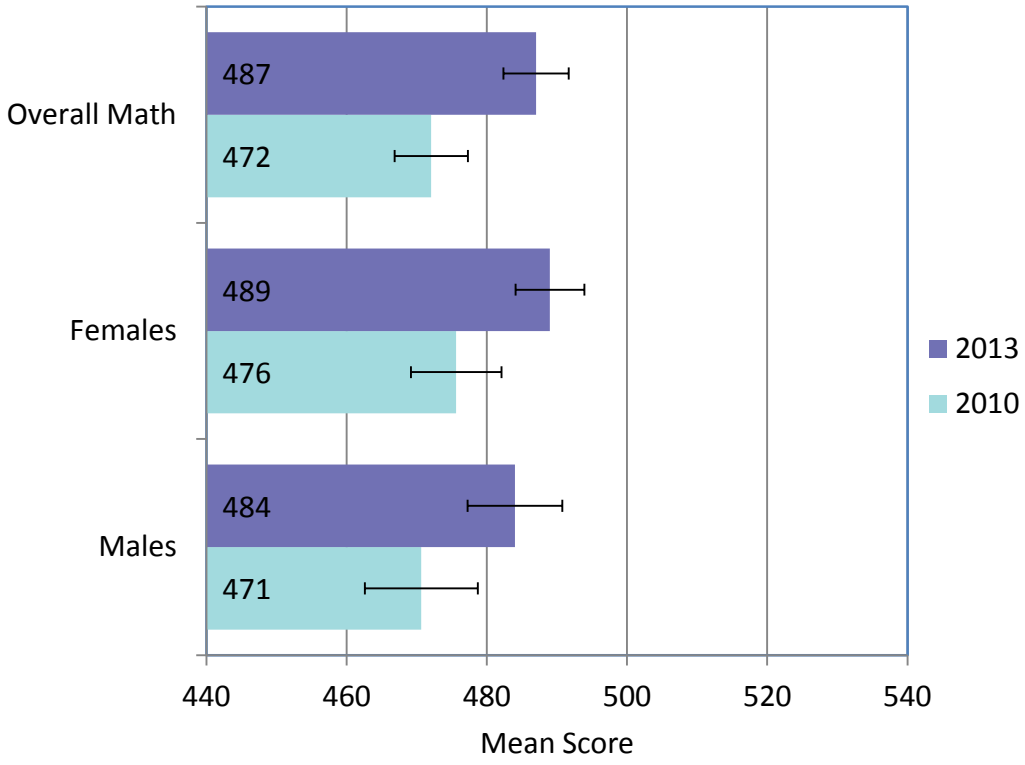


Comparison of mathematics results: 2010 and 2013

Mathematics was a major domain in PCAP 2010, which was the baseline year. As a minor domain in 2013, the assessment comprised fewer mathematics items; however, common items between the two assessments allow the reporting of changes over time for mathematics achievement.

As shown in the PCAP 2013 assessment of mathematics, significant positive changes over time can be seen in mathematics overall and in the achievement of both girls and boys in Newfoundland and Labrador.

CHART NL.12 **Canada – Newfoundland and Labrador: Changes over time in mathematics**



8 CONCLUSIONS

The Pan-Canadian Assessment Program (PCAP) is the continuation of CMEC's commitment to inform Canadians about how well their education systems are meeting the needs of students and society. The information gained from this pan-Canadian assessment provides ministers of education with a basis for examining the curriculum and other aspects of their school systems.

This report describes the performance of Grade 8/Secondary II students in the third administration of PCAP, in which the major domain is science and the secondary or minor domains are reading and mathematics. The science component encompasses more of the actual curricula of all Canadian jurisdictions, while the reading and mathematics components maintain a focus on the same sub-domains as in 2007 and 2010, but with fewer items.

Participation in the testing process can be a demanding exercise. PCAP does not provide student results on an individual or a school basis, which means that it can appear to be of no immediate consequence to them. Therefore, it is a tribute to the students, the teachers, and the school principals who participated in the administration process that they so readily and clearly applied themselves to the tasks demanded of them.

Overview of results

Test design

Based on a review of contemporary research and the curricula from all jurisdictions in each subject area for the grade level, the development process for the test included a bilingual framework-writing team, a bilingual item-development team, a validation process, and field testing, all under the constant review of and feedback from the jurisdictions and their particular subject experts. The data in this case indicate that the design and content of the instruments are sound, engaging students effectively. The instruments provide reliable and valid data on specific pan-Canadian curriculum-based objectives. The range of scenarios and item designs appears to have engaged students to allow them to demonstrate their proficiency in science, reading, and mathematics.

Performance in science, reading, and mathematics

Highest achievement per domain is found in Alberta and Ontario for science, Ontario for reading, and Quebec for mathematics. Ontario is the only province in which students achieve at or above the Canadian mean in each of science, reading, and mathematics. Achievement that is the same as the Canadian mean is found in British Columbia and Newfoundland and Labrador for science and in Alberta and Ontario for mathematics. Saskatchewan, Manitoba, New Brunswick, Nova Scotia, and Prince Edward Island have scores below the Canadian mean in each of the three domains.

Performance by language

In science and reading, students attending English-language school systems outperform students who attend French-language school systems. In mathematics, French-language students have higher achievement than English-language students in PCAP 2013.

In English-school systems, British Columbia, Alberta, Ontario, and Newfoundland and Labrador students obtain mean scores in science that are at or above that obtained by Canadian students enrolled in English schools. In French-school systems, British Columbia, Alberta, and Quebec students obtain mean scores in science that are at or above those obtained by their Canadian counterparts in French-language schools.

In reading, English-language students in Ontario and French-language students in British Columbia and Quebec achieve scores that are at or above the Canadian English and French means respectively. In mathematics, Alberta, Ontario, and Quebec students enrolled in English-language schools and Quebec students enrolled in French-language schools achieve at or above the respective Canadian English and French means.

For those provinces in which there is a significant difference in achievement between the English- and French-language systems in science and reading, students in majority-language systems outperform those in minority-language systems, except in New Brunswick, where francophone students have higher achievement in reading. In mathematics, students in the French-language system outperform those in the English-language systems in all jurisdictions in which there is a significant difference except in Ontario, where anglophone students achieve results that are higher than francophone students.

Performance by gender

In Canada overall, there is no gender difference in achievement in either science or mathematics at Grade 8/Secondary II as shown in PCAP 2013. This is consistent with the PISA 2012 Science results; however, it differs from the mathematics results in which boys outperformed girls at age 15. In reading, girls continue to outperform boys in Canada, which is consistent with results reported in international studies such as PIRLS 2011 for Grade 4 students and PISA 2012 for 15-year-olds.

Achievement in science by performance level

In Canada, 91 per cent of students in Grade 8/Secondary II achieve the expected level of performance (level 2) in science and 47 per cent of Canadian students are achieving above their expected level (levels 3 and 4). Across jurisdictions, the majority of students (86 per cent to 94 per cent) achieve at or above the expected level of performance. Highest levels of performance at levels 3 and 4 are found in Alberta and Ontario (over 50 per cent of students). The same provinces have the highest proportion of students (10 per cent or higher) who achieve at the top level of performance, level 4. Finally, Alberta, Ontario, Prince Edward Island, and Newfoundland and Labrador have proportionally fewer students (less than the Canadian mean of 8 per cent) achieving below the expected level for Grade 8/ Secondary II students in science.

Pan-Canadian results by sub-domain and competency in science

PCAP 2013 assesses four sub-domains in science (nature of science, life science, physical science, and Earth science) and three competencies (science inquiry, problem solving, and scientific reasoning). Within jurisdictions, results are similar among the four sub-domains and three competencies. Although most jurisdictions tend to show stronger results in one or two areas, there is no overall nationwide pattern of achievement for specific areas in science. Overall in Canada, the English-language school systems outperform the French-language schools systems for each of the sub-domains and competencies. Although there is no difference between boys and girls identified in PCAP 2013 across the four sub-domains, the achievement of girls is higher than boys in the competency of scientific inquiry. As PCAP is designed to test the common elements of the various curricula across Canada, jurisdictions can look to their programs of study to identify strengths and weaknesses in their programs.

Performance comparisons in reading and mathematics over time

This third administration of PCAP allows for comparisons of results of Grade 8/Secondary II students in reading from 2007, 2010, and 2013 and in mathematics from 2010 and 2013. Using anchor items to link the tests to the 2010 administration, comparisons can be made with respect to changes over time in achievement for the two domains.

In reading, although there was a negative change in achievement between 2007 and 2010, an improvement in reading scores in PCAP 2013 suggests that, overall, Grade 8/Secondary II students are achieving at the same level as they were in 2007. Reading achievement in English-language schools improved from 2007 to 2013. In French-language schools, there has been a positive change in reading scores between 2010 and 2013; however, student achievement remains significantly lower than that attained in 2007. Canadian girls are achieving at the same level as 2007, although this represents an increase compared to the 2010 reading results. The achievement of boys is slightly less than it was in 2007, but it is comparable to the results obtained by boys in 2010.

In mathematics, there has been a significant improvement in achievement between 2010 and 2013, and this positive change is found in both English- and French-language schools. There has been a significant positive change in scores for girls in mathematics, while the achievement for boys has not significantly changed over time. This differs from the results reported in PISA 2012 in which there was a clear trend showing a decrease in average score in most provinces for 15-year-olds; however, TIMSS 2011, which assesses the same grade level as PCAP (Grade 8/Secondary II), shows a less clear trend with an increasing achievement for some topics and a decreasing achievement for others.

Final statement

The results of this assessment suggest that Canadian jurisdictions are addressing the demands and practices in science, and that the majority of students have attained a level of scientific literacy that enables them to use their knowledge and skills in practical day-to-day activities.

The PCAP 2013 results provide both affirmation and direction for Canadian jurisdictions and classrooms. While students appear to understand what is expected of them in science and appear to practise the key aspects when completing science tasks, there is room for improvement. As well, there are numerous students at level 1, for whom science remains a challenging subject.

There are differences in achievement among provinces. The comparative approach taken in this report does not lend itself to developing explanations for these differences. Secondary analysis undertaken as part of the forthcoming report, *PCAP 2013 Contextual Report on Student Achievement in Science*, will explore how resources and school and classroom conditions, as well as student characteristics and family circumstances, may impact achievement in Grade 8/Secondary II students.

PCAP is designed to determine whether students across Canada reach similar levels of performance in the core disciplines of science, reading, and mathematics at about the same age. It complements existing assessments in each jurisdiction so that they have comparative Canada-wide data on the achievement levels attained by Grade 8/Secondary II students across the county. Further comparative evidence can also be obtained from international assessments such as TIMSS 2015, which will test at the same grade level, and the upcoming PISA, which will test the same cohort of students but two years later.

Overall, the PCAP testing reaffirms that CMEC's large-scale assessment projects offer innovative and contemporary direction on education policy, curriculum, and classroom practices in Canada.

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APPENDIX I

PCAP 2013 Participation, Exemption, and Response Rates

TABLE I-1 **Students' participation rate by jurisdiction and language**

Jurisdiction	Language	Number of eligible students* (participating and non-participating)	Number of non-participating students					Participation rate**	
			Non-participating students	Absent		Other			
				n	%	n	%	n†	%
British Columbia	English	3580	258	182	5	76	2	3322	93
	French	203	15	7	3	8	4	188	93
Alberta	English	2968	248	179	6	69	2	2720	92
	French	370	28	25	7	3	1	342	92
Saskatchewan	English	3602	269	150	4	119	3	3333	93
	French	100	3	2	2	1	1	97	97
Manitoba	English	3592	197	96	3	101	3	3543	99
	French	386	17	10	3	7	2	366	95
Ontario	English	3527	319	146	4	173	5	3208	91
	French	2411	231	86	4	145	6	2180	90
Quebec	English	2100	350	122	6	228	11	1750	83
	French	4144	463	211	5	252	6	3681	89
New Brunswick	English	2117	349	78	4	271	13	1768	84
	French	1265	266	55	4	211	17	999	79
Nova Scotia	English	2930	528	162	6	366	12	2402	82
	French	344	30	15	4	15	4	314	91
Prince Edward Island	English	832	128	46	6	82	10	704	85
	French	46	7	4	9	3	7	39	85
Newfoundland and Labrador	English	1924	283	128	7	155	8	1641	85
	French	8	1	0	0	1	13	7	88
Canada		**36449**	**3990**	**1704**	**5**	**2286**	**6**	**32604**	**89**

* The number of eligible students does not include exempted students (see Table I-2 in Appendix I).
** The students' participation rate was calculated the following way: number of participating students/number of eligible students (participating students + non-participating students).
† This number may differ from the final data set because it does not reflect invalid data which is removed before analysis.

TABLE I-2 **Student exemption rates**

Jurisdiction	Language	Total number of eligible students sampled (participating, non-participating, and exempted)	Eligible students	Number of exempted students							
				Functional disabilities		Intellectual disabilities or socioemotional conditions		Language (non-native-language speakers)		Exemption rate*	
				n	%	n	%	n	%	n	%
British Columbia	English	3719	3580	4	0	96	3	39	1	139	4
	French	211	203	0	0	7	3	1	0	8	4
Alberta	English	3140	2968	7	0	107	4	58	2	172	5
	French	374	370	0	0	4	1	0	0	4	1
Saskatchewan	English	3815	3602	9	0	123	3	71	2	213	6
	French	106	100	1	1	3	3	2	2	6	6
Manitoba	English	3703	3592	3	0	72	2	36	1	111	3
	French	395	386	0	0	8	2	1	0	9	2
Ontario	English	3529	3527	0	0	1	0	1	0	2	0
	French	2411	2411	0	0	0	0	0	0	0	0
Quebec	English	2169	2100	4	0	44	2	21	1	69	3
	French	4158	4144	6	0	5	0	3	0	14	0
New Brunswick	English	2210	2117	3	0	79	4	11	1	93	4
	French	1372	1265	4	0	100	8	3	0	107	8
Nova Scotia	English	3052	2930	10	0	102	3	10	0	122	4
	French	345	344	0	0	1	0	0	0	1	0
Prince Edward Island	English	882	832	3	0	44	5	3	0	50	6
	French	47	46	0	0	1	2	0	0	1	2
Newfoundland and Labrador	English	2015	1924	4	0	82	4	5	0	91	5
	French	9	8	1	13	0	0	0	0	1	11
Canada		**37662**	**36449**	**59**	**0.2**	**879**	**2**	**265**	**1**	**1213**	**3**

* The students' exemption rate is calculated the following way: number of exempted students/total number of eligible students sampled (participating students + non-participating students + exempted students)

TABLE I-3 **School response rates**

Jurisdiction	Language	Number of selected schools (participating and non-participating) (n)	Number of participating schools (after replacement) (n)	School participation rate* (%)
British Columbia	English	150	150	100
	French	12	12	100
Alberta**	English	137	137	100
	French	19	19	100
Saskatchewan	English	186	184	99
	French	7	7	100
Manitoba	English	150	150	100
	French	18	18	100
Ontario	English	150	149	99
	French	125	125	100
Quebec	English	86	83	97
	French	150	149	99
New Brunswick	English	78	78	100
	French	55	55	100
Nova Scotia	English	129	126	98
	French	11	11	100
Prince Edward Island	English	22	22	100
	French	3	3	100
Newfoundland and Labrador	English	114	114	100
	French	3	2	67
Canada		**1605**	**1594**	**99**

* The schools' participation rate was calculated the following way: number of participating schools/number of selected schools (participating schools + non-participating schools)

** Alberta participated in two concurrent studies that surveyed Grade 8 teachers, PCAP and Teaching and Learning International Survey (TALIS). The requirement for non-overlapping samples of teachers required a high number of replacement schools (34%).

APPENDIX II

Science

TABLE II.1 Achievement scores in science by jurisdiction

Jurisdiction	Mean score	95% Confidence interval
British Columbia	501	4.2
Alberta	521	4.9
Saskatchewan	486	4.2
Manitoba	465	3.1
Ontario	511	4.5
Quebec	485	3.6
New Brunswick	469	3.7
Nova Scotia	492	3.6
Prince Edward Island	491	5.0
Newfoundland and Labrador	500	4.3
Canada	**500**	**1.9**

TABLE II.2 Achievement scores in science by language

	Anglophone school system		Francophone school system		Difference (A-F)
	Mean score	95% Confidence interval	Mean score	95% Confidence interval	
British Columbia	501	4.3	495	7.8	6
Alberta	521	4.2	488	4.9	33*
Saskatchewan	486	4.5	474	1.6	12*
Manitoba	465	3.5	453	3.6	12*
Ontario	513	5.1	464	4.0	49*
Quebec	484	5.0	485	3.7	-1
New Brunswick	467	3.7	475	5.1	-8
Nova Scotia	493	4.2	466	3.8	27*
Prince Edward Island	492	5.2	--	--	
Newfoundland and Labrador	500	4.8	--	--	
Canada	**505**	**2.3**	**483**	**2.6**	**22***

* significant difference

TABLE II.3 **Achievement scores in science by gender**

	Females		Males		Difference (F-M)
	Mean score	95% Confidence interval	Mean score	95% Confidence interval	
British Columbia	503	5.4	498	4.8	5
Alberta	525	6.2	516	6.4	9*
Saskatchewan	481	5.0	490	6.1	-9*
Manitoba	463	4.6	467	4.6	-4
Ontario	511	5.6	511	5.7	0
Quebec	485	4.8	485	4.5	0
New Brunswick	472	5.5	467	5.3	5
Nova Scotia	491	5.7	492	5.2	-1
Prince Edward Island	488	7.2	495	5.6	-7
Newfoundland and Labrador	500	6.7	500	7.7	0
Canada	**501**	**2.6**	**499**	**2.3**	**2**

* significant difference

TABLE II.4 **Percentage of students at each level of performance in science by jurisdiction**

	Level 1		Level 2		Level 3		Level 4	
	%	95% Confidence interval	%	95% Confidence interval	%	95% Confidence interval	%	95% Confidence interval
British Columbia	9	1.0	43	2.0	39	1.8	9	1.2
Alberta	6	1.2	37	2.2	44	2.4	12	1.4
Saskatchewan	11	1.2	47	1.8	35	1.6	6	0.8
Manitoba	15	1.4	53	2.0	29	1.4	4	0.6
Ontario	7	1.0	41	2.0	43	2.0	10	1.2
Quebec	9	1.0	50	1.8	36	1.6	5	0.8
New Brunswick	13	1.2	52	1.8	31	1.8	4	0.8
Nova Scotia	9	1.2	48	2.4	37	1.6	6	1.0
Prince Edward Island	7	1.4	50	2.5	37	2.7	6	1.2
Newfoundland and Labrador	6	1.0	47	2.2	39	2.4	8	1.2
Canada	**8**	**0.4**	**44**	**1.0**	**39**	**1.0**	**8**	**0.6**

TABLE II.5 **Percentage of students at each level of performance in science by language**

	Anglophone school system								Francophone school system							
	Level 1		Level 2		Level 3		Level 4		Level 1		Level 2		Level 3		Level 4	
	%	95% Confidence interval	%	95% Confidence interval	%	95% Confidence interval	%	95% Confidence interval	%	95% Confidence interval	%	95% Confidence interval	%	95% Confidence interval	%	95% Confidence interval
British Columbia	9	1.2	43	1.8	39	2.0	9	1.0	6	2.0	50	4.3	38	3.9	6	1.8
Alberta	6	1.0	37	2.2	45	2.2	12	1.4	10	1.4	46	2.4	39	2.2	5	0.8
Saskatchewan	11	1.6	47	1.8	35	2.0	6	0.8	11	0.6	51	1.2	35	1.0	3	0.2
Manitoba	14	1.4	53	1.8	29	1.8	4	0.6	16	1.4	56	2.0	26	1.6	2	0.4
Ontario	7	1.0	40	2.0	43	2.2	10	1.4	16	1.8	50	2.2	31	2.2	3	0.8
Quebec	9	1.4	50	2.7	36	2.7	5	1.0	9	1.0	50	2.0	36	1.6	5	0.8
New Brunswick	14	1.4	51	2.0	30	2.4	4	1.0	10	1.8	53	2.9	34	3.1	3	0.8
Nova Scotia	9	1.0	48	2.0	37	2.4	6	1.0	12	1.2	57	2.0	29	2.2	2	0.6
Prince Edward Island	7	1.4	50	2.9	37	2.4	6	1.2	--	--	--	--	--	--	--	--
Newfoundland and Labrador	6	1.0	47	2.4	39	2.4	8	1.4	--	--	--	--	--	--	--	--
Canada	**8**	**0.6**	**42**	**1.2**	**41**	**1.2**	**9**	**0.8**	**9**	**1.0**	**50**	**1.6**	**36**	**1.6**	**4**	**0.6**

TABLE II.6 **Percentage of students at each level of performance in science by gender**

	Females								Males							
	Level 1		Level 2		Level 3		Level 4		Level 1		Level 2		Level 3		Level 4	
	%	95% Confidence interval	%	95% Confidence interval	%	95% Confidence interval	%	95% Confidence interval	%	95% Confidence interval	%	95% Confidence interval	%	95% Confidence interval	%	95% Confidence interval
British Columbia	8	1.2	43	2.7	39	2.5	9	1.6	10	1.8	42	2.5	38	2.4	9	1.4
Alberta	6	1.4	37	2.7	45	2.7	13	1.8	7	1.4	38	2.7	44	2.9	11	1.8
Saskatchewan	12	1.6	49	2.7	33	2.0	6	1.2	10	2.4	46	2.7	38	2.9	6	1.2
Manitoba	15	2.0	53	2.5	28	2.4	4	0.8	14	1.8	52	2.7	29	2.5	4	0.8
Ontario	6	1.4	43	2.7	42	2.5	9	1.4	8	1.8	38	2.7	43	2.9	10	1.8
Quebec	9	1.2	50	2.0	36	2.4	5	1.2	8	1.4	51	2.4	36	2.2	4	0.8
New Brunswick	11	1.6	53	2.5	32	2.4	4	0.8	15	1.8	50	2.4	31	2.2	4	1.2
Nova Scotia	8	1.4	50	2.9	35	2.5	6	1.2	9	1.6	46	2.7	38	2.4	6	1.4
Prince Edward Island	6	1.8	51	3.9	36	3.7	7	1.6	7	2.4	48	3.5	38	4.1	6	1.6
Newfoundland and Labrador	6	1.6	47	3.5	39	3.5	8	2.0	7	1.6	47	3.9	39	3.1	8	2.0
Canada	**8**	**0.8**	**45**	**1.4**	**39**	**1.4**	**8**	**0.8**	**9**	**0.6**	**43**	**1.4**	**40**	**1.2**	**8**	**0.8**

TABLE II.7 **Achievement scores in nature of science by jurisdiction**

Jurisdiction	Mean score	95% Confidence interval
British Columbia	496	3.6
Alberta	524	3.9
Saskatchewan	485	3.1
Manitoba	469	3.0
Ontario	508	3.5
Quebec	489	2.7
New Brunswick	477	3.2
Nova Scotia	492	3.8
Prince Edward Island	490	5.5
Newfoundland and Labrador	495	5.1
Canada	**500**	**2.0**

TABLE II.8 **Achievement scores in nature of science by language**

	Anglophone school system		Francophone school system		Difference (A-F)
	Mean score	95% Confidence interval	Mean score	95% Confidence interval	
British Columbia	496	4.7	499	8.0	-3
Alberta	524	5.1	499	4.5	25*
Saskatchewan	485	3.1	484	1.7	1
Manitoba	470	4.4	463	4.0	7
Ontario	510	5.1	470	4.6	40*
Quebec	492	6.0	489	3.5	3
New Brunswick	476	5.0	481	5.0	-5
Nova Scotia	493	3.8	467	3.4	26*
Prince Edward Island	491	5.0	--	--	--
Newfoundland and Labrador	495	5.3	--	--	--
Canada	**504**	**2.2**	**487**	**2.6**	**17***

* significant difference

TABLE II.9 **Achievement scores in nature of science by gender**

	Females		Males		Difference (F-M)
	Mean score	95% Confidence interval	Mean score	95% Confidence interval	
British Columbia	497	5.0	495	6.1	2
Alberta	526	6.2	521	7.0	5
Saskatchewan	482	4.8	488	3.8	-6
Manitoba	470	4.9	469	5.4	1
Ontario	508	6.3	509	7.0	-1
Quebec	491	5.1	488	4.6	3
New Brunswick	480	4.3	475	5.8	5
Nova Scotia	494	5.6	491	6.5	3
Prince Edward Island	486	7.2	494	7.7	-8
Newfoundland and Labrador	493	7.2	496	6.5	-3
Canada	**501**	**2.7**	**499**	**2.8**	**2**

TABLE II.10 **Achievement scores in life science by jurisdiction**

Jurisdiction	Mean score	95% Confidence interval
British Columbia	513	4.0
Alberta	513	4.0
Saskatchewan	491	4.2
Manitoba	481	4.2
Ontario	508	3.9
Quebec	482	3.2
New Brunswick	474	4.0
Nova Scotia	490	3.4
Prince Edward Island	488	4.3
Newfoundland and Labrador	506	4.6
Canada	**500**	**2.0**

TABLE II.11 **Achievement scores in life science by language**

	Anglophone school system		Francophone school system		Difference (A-F)
	Mean score	95% Confidence interval	Mean score	95% Confidence interval	
British Columbia	513	4.6	503	8.8	10
Alberta	513	4.5	483	4.7	30*
Saskatchewan	491	4.5	480	2.0	11*
Manitoba	481	3.3	468	4.2	13*
Ontario	509	4.5	474	4.8	35*
Quebec	483	5.4	482	3.7	1
New Brunswick	474	4.9	474	5.1	0
Nova Scotia	491	4.1	472	4.4	19*
Prince Edward Island	489	4.8	--	--	--
Newfoundland and Labrador	506	4.6	--	--	--
Canada	**506**	**2.6**	**481**	**3.0**	**25***

* significant difference

TABLE II.12 **Achievement scores in life science by gender**

	Females		Males		Difference (F-M)
	Mean score	95% Confidence interval	Mean score	95% Confidence interval	
British Columbia	517	4.9	508	5.0	9*
Alberta	517	5.7	508	6.2	9*
Saskatchewan	487	4.1	494	9.1	-7
Manitoba	478	4.9	484	5.4	-6
Ontario	506	5.1	510	4.7	-4
Quebec	484	5.3	481	4.6	3
New Brunswick	478	5.3	471	4.8	7
Nova Scotia	491	4.3	489	5.6	2
Prince Edward Island	491	7.8	486	8.0	5
Newfoundland and Labrador	506	7.8	507	7.6	-1
Canada	**501**	**2.5**	**499**	**2.1**	**2**

* significant difference

TABLE II.13 **Achievement scores in physical science by jurisdiction**

Jurisdiction	Mean score	95% Confidence interval
British Columbia	498	3.6
Alberta	509	3.7
Saskatchewan	489	4.6
Manitoba	470	3.2
Ontario	511	3.7
Quebec	489	3.1
New Brunswick	477	3.2
Nova Scotia	497	4.1
Prince Edward Island	494	5.1
Newfoundland and Labrador	494	4.3
Canada	**500**	**2.0**

TABLE II.14 **Achievement scores in physical science by language**

	Anglophone school system		Francophone school system		Difference (A-F)
	Mean score	95% Confidence interval	Mean score	95% Confidence interval	
British Columbia	498	3.9	494	8.6	4
Alberta	509	4.0	496	6.0	13*
Saskatchewan	489	3.7	470	1.9	19*
Manitoba	471	4.7	462	3.6	9*
Ontario	512	4.5	479	4.5	33*
Quebec	489	4.5	488	3.7	1
New Brunswick	471	4.4	493	4.6	-22*
Nova Scotia	497	4.0	493	4.0	4
Prince Edward Island	494	5.6	--	--	--
Newfoundland and Labrador	495	4.9	--	--	--
Canada	**504**	**2.3**	**488**	**3.3**	**16***

* significant difference

TABLE II.15 **Achievement scores in physical science by gender**

	Females		Males		Difference (F-M)
	Mean score	95% Confidence interval	Mean score	95% Confidence interval	
British Columbia	500	5.7	496	5.5	4
Alberta	509	6.6	510	6.9	-1
Saskatchewan	484	4.7	493	6.1	-9*
Manitoba	466	5.7	475	5.7	-9*
Ontario	511	5.5	511	5.7	0
Quebec	484	5.4	493	5.0	-9*
New Brunswick	477	4.6	477	4.5	0
Nova Scotia	494	5.9	500	4.8	-6
Prince Edward Island	489	6.9	499	6.5	-10
Newfoundland and Labrador	490	5.5	499	7.2	-9
Canada	**499**	**2.5**	**501**	**2.4**	**-2**

* significant difference

TABLE II.16 **Achievement scores in Earth science by jurisdiction**

Jurisdiction	Mean score	95% Confidence interval
British Columbia	497	3.8
Alberta	513	4.2
Saskatchewan	494	3.7
Manitoba	477	3.5
Ontario	505	3.7
Quebec	494	3.4
New Brunswick	481	2.7
Nova Scotia	498	3.7
Prince Edward Island	504	5.6
Newfoundland and Labrador	506	5.9
Canada	**500**	**1.6**

TABLE II.17 **Achievement scores in Earth science by language**

	Anglophone school system		Francophone school system		Difference (A-F)
	Mean score	95% Confidence interval	Mean score	95% Confidence interval	
British Columbia	497	3.9	488	7.2	9
Alberta	514	4.2	479	4.0	35*
Saskatchewan	494	3.6	492	1.8	2
Manitoba	477	3.7	468	3.7	9*
Ontario	507	5.7	468	3.5	39*
Quebec	484	5.6	495	3.6	-11*
New Brunswick	483	3.7	476	4.2	7
Nova Scotia	499	4.0	475	4.6	24*
Prince Edward Island	505	5.2	--	--	--
Newfoundland and Labrador	506	5.5	--	--	--
Canada	**502**	**2.5**	**492**	**2.4**	**10***

* significant difference

TABLE II.18 **Achievement scores in Earth science by gender**

	Females		Males		Difference (F-M)
	Mean score	95% Confidence interval	Mean score	95% Confidence interval	
British Columbia	497	5.2	497	4.6	0
Alberta	519	6.1	507	6.1	12*
Saskatchewan	489	4.5	498	4.8	-9*
Manitoba	475	5.3	479	4.9	-4
Ontario	506	6.1	504	5.6	2
Quebec	493	3.8	495	4.1	-2
New Brunswick	479	4.6	483	4.4	-4
Nova Scotia	493	4.5	503	5.2	-10*
Prince Edward Island	497	6.5	511	6.7	-14
Newfoundland and Labrador	512	6.9	500	6.8	12*
Canada	**501**	**3.3**	**500**	**2.9**	**1**

* significant difference

TABLE II.19 **Achievement scores in science inquiry by jurisdiction**

Jurisdiction	Mean score	95% Confidence interval
British Columbia	496	3.4
Alberta	525	3.7
Saskatchewan	485	3.3
Manitoba	469	3.8
Ontario	508	4.7
Quebec	489	3.3
New Brunswick	475	3.2
Nova Scotia	494	4.4
Prince Edward Island	492	5.7
Newfoundland and Labrador	496	4.7
Canada	**500**	**1.7**

TABLE II.20 **Achievement scores in science inquiry by language**

	Anglophone school system		Francophone school system		Difference (A-F)
	Mean score	95% Confidence interval	Mean score	95% Confidence interval	
British Columbia	496	4.0	501	8.9	-5
Alberta	525	4.2	501	3.8	24*
Saskatchewan	485	3.3	484	2.0	1
Manitoba	469	4.3	463	3.8	6
Ontario	509	5.4	470	3.9	39*
Quebec	491	4.9	489	4.1	2
New Brunswick	474	5.0	479	4.5	-5
Nova Scotia	495	3.8	466	4.1	29*
Prince Edward Island	492	5.3	--	--	--
Newfoundland and Labrador	496	4.9	--	--	--
Canada	**504**	**2.0**	**487**	**2.8**	**17***

* significant difference

TABLE II.21 **Achievement scores in science inquiry by gender**

	Females		Males		Difference (F-M)
	Mean score	95% Confidence interval	Mean score	95% Confidence interval	
British Columbia	501	5.2	492	6.4	9*
Alberta	530	6.3	520	5.8	10*
Saskatchewan	483	4.8	488	6.0	-5
Manitoba	471	5.1	467	5.3	4
Ontario	510	6.7	505	5.1	5
Quebec	493	5.6	486	3.8	7*
New Brunswick	479	4.5	472	5.2	7*
Nova Scotia	498	5.0	490	5.6	8*
Prince Edward Island	489	7.6	494	6.9	-5
Newfoundland and Labrador	498	6.8	494	7.3	4
Canada	**503**	**2.6**	**497**	**3.3**	**6***

* significant difference

TABLE II.22 **Achievement scores in problem solving by jurisdiction**

Jurisdiction	Mean score	95% Confidence interval
British Columbia	495	3.6
Alberta	506	3.7
Saskatchewan	492	3.4
Manitoba	473	3.4
Ontario	510	4.1
Quebec	491	3.4
New Brunswick	482	4.7
Nova Scotia	495	4.1
Prince Edward Island	501	5.2
Newfoundland and Labrador	498	5.5
Canada	**500**	**1.8**

TABLE II.23 **Achievement scores in problem solving by language**

	Anglophone school system		Francophone school system		Difference (A-F)
	Mean score	95% Confidence interval	Mean score	95% Confidence interval	
British Columbia	495	3.8	491	7.2	4
Alberta	506	4.0	484	4.3	22*
Saskatchewan	492	3.6	474	2.1	18*
Manitoba	473	4.3	463	3.5	10*
Ontario	512	5.1	475	5.7	37*
Quebec	486	4.7	491	3.1	-5
New Brunswick	478	4.2	492	5.8	-14*
Nova Scotia	495	3.5	484	4.7	11*
Prince Edward Island	502	5.7	--	--	--
Newfoundland and Labrador	498	4.8	--	--	--
Canada	**503**	**2.1**	**490**	**3.2**	**13***

* significant difference

TABLE II.24 **Achievement scores in problem solving by gender**

	Females		Males		Difference (F-M)
	Mean score	95% Confidence interval	Mean score	95% Confidence interval	
British Columbia	497	4.9	493	5.2	4
Alberta	506	5.1	506	5.4	0
Saskatchewan	485	4.8	498	5.4	-13*
Manitoba	469	6.3	476	4.6	-7*
Ontario	509	5.5	512	5.7	-3
Quebec	488	4.9	494	3.8	-6*
New Brunswick	486	5.1	478	5.1	8*
Nova Scotia	493	5.8	497	5.8	-4
Prince Edward Island	500	6.5	501	8.1	-1
Newfoundland and Labrador	497	6.9	499	5.5	-2
Canada	**499**	**3.0**	**501**	**2.4**	**-2**

* significant difference

TABLE II.25 **Achievement scores in scientific reasoning by jurisdiction**

Jurisdiction	Mean score	95% Confidence interval
British Columbia	507	3.7
Alberta	515	4.5
Saskatchewan	489	4.3
Manitoba	472	2.8
Ontario	509	3.4
Quebec	484	3.4
New Brunswick	471	3.8
Nova Scotia	492	4.4
Prince Edward Island	492	6.5
Newfoundland and Labrador	505	5.4
Canada	**500**	**2.0**

TABLE II.26 **Achievement scores in scientific reasoning by language**

	Anglophone school system		Francophone school system		Difference (A-F)
	Mean score	95% Confidence interval	Mean score	95% Confidence interval	
British Columbia	507	4.0	496	8.7	11
Alberta	515	4.1	483	5.2	32*
Saskatchewan	489	4.3	478	1.6	11*
Manitoba	473	4.3	459	3.8	14*
Ontario	511	4.8	469	3.6	42*
Quebec	483	4.4	484	4.2	-1
New Brunswick	470	4.6	474	4.9	-4
Nova Scotia	492	3.4	474	4.8	18*
Prince Edward Island	492	5.4	--	--	--
Newfoundland and Labrador	505	4.7	--	--	--
Canada	**505**	**1.9**	**482**	**2.7**	**23***

* significant difference

TABLE II.27 **Achievement scores in scientific reasoning by gender**

	Females		Males		Difference (F-M)
	Mean score	95% Confidence interval	Mean score	95% Confidence interval	
British Columbia	507	4.5	507	5.4	0
Alberta	518	5.5	511	7.5	7*
Saskatchewan	486	5.2	493	6.8	-7*
Manitoba	468	5.7	477	4.7	-9*
Ontario	508	5.1	512	6.1	-4
Quebec	482	5.1	485	4.3	-3
New Brunswick	470	5.1	473	6.3	-3
Nova Scotia	488	4.5	495	4.9	-7
Prince Edward Island	486	6.7	497	7.1	-11
Newfoundland and Labrador	504	8.3	506	6.9	-2
Canada	**499**	**2.5**	**501**	**2.7**	**-2**

* significant difference

Reading

TABLE II.28 Achievement scores in reading by jurisdiction

Jurisdiction	Mean score	95% Confidence interval
British Columbia	502	3.4
Alberta	502	3.7
Saskatchewan	487	3.1
Manitoba	469	2.9
Ontario	524	3.6
Quebec	503	2.5
New Brunswick	471	3.0
Nova Scotia	488	3.2
Prince Edward Island	494	4.4
Newfoundland and Labrador	495	3.8
Canada	**508**	**2.0**

TABLE II.29 Achievement scores in reading by language

	Anglophone school system		Francophone school system		Difference (A-F)
	Mean score	95% Confidence interval	Mean score	95% Confidence interval	
British Columbia	502	3.3	499	8.3	3
Alberta	503	4.0	473	4.0	30*
Saskatchewan	487	2.5	478	2.4	9
Manitoba	469	2.8	471	3.1	-2
Ontario	526	3.5	481	3.2	45*
Quebec	497	3.9	504	3.3	-7
New Brunswick	466	3.7	485	4.6	-19*
Nova Scotia	489	4.0	468	3.9	21*
Prince Edward Island	496	5.5	--	--	--
Newfoundland and Labrador	495	4.5	--	--	--
Canada	**510**	**2.1**	**501**	**2.2**	**9***

* significant difference

TABLE II.30 **Achievement scores in reading by gender**

	Females		Males		Difference (F-M)
	Mean score	95% Confidence interval	Mean score	95% Confidence interval	
British Columbia	518	4.2	486	4.7	32*
Alberta	518	5.1	485	5.1	33*
Saskatchewan	498	3.9	476	5.3	22*
Manitoba	480	4.3	459	4.2	21*
Ontario	538	4.8	510	5.5	28*
Quebec	514	4.6	493	4.3	21*
New Brunswick	485	4.0	459	5.2	26*
Nova Scotia	499	5.2	477	5.0	22*
Prince Edward Island	509	5.9	479	7.2	30*
Newfoundland and Labrador	503	4.8	486	7.8	17*
Canada	**521**	**2.2**	**494**	**2.3**	**27***

* significant difference

TABLE II.31 **Changes over time in reading achievement: 2013, 2010, and 2007**

	2013		2010		2007		Difference (2013 – 2010)	Difference (2013 – 2007)
	Mean score	95% Confidence interval	Mean score	95% Confidence interval	Mean score	95% Confidence interval		
British Columbia	502	3.4	499	3.7	495	4.1	3	7
Alberta	502	3.7	506	4.0	502	4.1	-4	0
Saskatchewan	487	3.1	491	3.9	482	4.1	-4	5
Manitoba	469	2.9	478	3.8	477	3.9	-9*	-8
Ontario	524	3.6	515	3.9	515	4.2	9*	9
Quebec	503	2.5	481	3.6	538	5.7	22*	-35*
New Brunswick	471	3.0	479	3.9	471	3.2	-8*	0
Nova Scotia	488	3.2	489	4.0	483	4.1	-1	5
Prince Edward Island	494	4.4	481	9.0	471	4.6	13	23*
Newfoundland and Labrador	495	3.8	486	5.2	478	4.1	9*	17*
Canada	**508**	**2.0**	**500**	**2.2**	**512**	**2.3**	**8***	**-4**

* significant difference

Note: In order to allow for a valid comparison, 2007 scores have been rescaled onto the 2010 metric. Also, 2007 scores are based on only the Grade 8 students completing the test rather than the full 2007 population of 13-year-olds.

TABLE II.32 **Changes over time in reading achievement by language: 2013, 2010, and 2007**

Jurisdiction	Language	2013		2010		2007		Difference (2013 – 2010)	Difference (2013 – 2007)
		Mean score	95% Confidence interval	Mean score	95% Confidence interval	Mean score	95% Confidence interval		
British Columbia	English	502	3.3	499	3.8	495	4.6	3	7
	French	499	8.3	473	5.1	476	13.9	26*	23*
Alberta	English	503	4.0	506	4.0	502	4.0	-3	1
	French	473	4.0	490	5.2	490	7.5	-17	-17*
Saskatchewan	English	487	2.5	492	3.9	482	4.0	-5	5
	French	478	2.4	468	8.0	474	28.2	10*	4
Manitoba	English	469	2.8	478	4.0	482	4.6	-9*	-13*
	French	471	3.1	468	4.0	437	7.7	3	34
Ontario	English	526	3.5	517	5.0	516	4.6	9*	10*
	French	481	3.2	481	3.7	482	5.3	0	-1
Quebec	English	497	3.9	492	5.9	492	5.4	5	5
	French	504	3.3	480	3.6	544	6.3	24*	-40*
New Brunswick	English	466	3.7	486	5.3	471	3.9	-20*	-5
	French	485	4.6	464	4.5	470	3.9	21*	15*
Nova Scotia	English	489	4.0	489	3.5	484	3.9	0	5
	French	468	3.9	475	2.9	479	10.3	-7	-11
Prince Edward Island	English	496	5.5	482	10.3	470	4.0	14	26*
Newfoundland and Labrador	English	495	4.5	486	5.0	478	5.1	9	17*
Canada	**English**	**510**	**2.1**	**507**	**2.1**	**504**	**2.7**	**3**	**6***
	French	**501**	**2.2**	**480**	**3.6**	**536**	**4.9**	**21***	**-35***

* significant difference

Note: In order to allow for a valid comparison, 2007 scores have been rescaled onto the 2010 metric. Also, 2007 scores are based on only the Grade 8 students completing the test rather than the full 2007 population of 13-year-olds.

TABLE II.33 **Changes over time in reading achievement by gender: 2013, 2010, and 2007**

Jurisdiction	Gender	2013		2010		2007		Difference (2013 – 2010)	Difference (2013 – 2007)
		Mean score	95% Confidence interval	Mean score	95% Confidence interval	Mean score	95% Confidence interval		
British Columbia	Females	518	4.2	511	5.7	505	6.0	7*	13*
	Males	486	4.7	491	5.4	485	6.4	-5	1
Alberta	Females	518	5.1	516	5.4	511	5.8	2	7
	Males	485	5.1	497	4.5	492	6.2	-12*	-7
Saskatchewan	Females	498	3.9	504	5.9	490	5.8	-6	8
	Males	476	5.3	482	5.1	476	5.0	-6	0
Manitoba	Females	480	4.3	494	5.5	485	6.2	-14*	-5
	Males	459	4.2	466	5.9	471	5.2	-7	-12
Ontario	Females	538	4.8	530	6.1	523	7.0	8	15*
	Males	510	5.5	503	5.6	506	6.8	7	4
Quebec	Females	514	4.6	498	4.5	550	7.2	16*	-36*
	Males	493	4.3	471	5.4	524	7.8	22*	-31*
New Brunswick	Females	485	4.0	501	4.9	484	4.0	-16*	1
	Males	459	5.2	462	5.9	457	4.4	-3	2
Nova Scotia	Female	499	5.2	501	5.0	491	6.2	-2	8
	Males	477	5.0	480	5.8	475	6.2	-3	2
Prince Edward Island	Females	509	5.9	491	13.5	481	5.1	18	28*
	Males	479	7.2	474	13.6	461	5.8	5	18*
Newfoundland and Labrador	Females	503	4.8	506	7.4	496	7.8	-3	7
	Males	486	7.8	468	7.3	458	6.3	18*	28*
Canada	**Females**	**521**	**2.2**	**515**	**2.6**	**522**	**3.1**	**6***	**-1**
	Males	**494**	**2.3**	**489**	**3.3**	**501**	**3.4**	**5**	**-7***

* significant difference

Note: In order to allow for a valid comparison, 2007 scores have been rescaled onto the 2010 metric. Also, 2007 scores are based on only the Grade 8 students completing the test rather than the full 2007 population of 13-year-olds.

Mathematics

TABLE II.34 Achievement scores in mathematics by jurisdiction

Jurisdiction	Mean score	95% Confidence interval
British Columbia	489	3.2
Alberta	502	3.9
Saskatchewan	488	3.9
Manitoba	471	3.3
Ontario	512	3.5
Quebec	527	2.9
New Brunswick	480	3.5
Nova Scotia	488	3.3
Prince Edward Island	492	3.7
Newfoundland and Labrador	487	4.7
Canada	**507**	**2.0**

TABLE II.35 Achievement scores in mathematics by language

	Anglophone school system		Francophone school system		Difference (A-F)
	Mean score	95% Confidence interval	Mean score	95% Confidence interval	
British Columbia	489	3.3	513	6.2	-24*
Alberta	502	4.0	502	3.6	0
Saskatchewan	487	3.4	518	2.1	-31*
Manitoba	470	2.6	476	2.9	-6
Ontario	512	2.9	500	3.9	12*
Quebec	509	4.0	529	3.5	-20*
New Brunswick	470	3.8	507	5.7	-37*
Nova Scotia	488	4.0	499	3.6	-11*
Prince Edward Island	492	4.3	--	--	--
Newfoundland and Labrador	487	4.7	--	--	--
Canada	**501**	**1.9**	**526**	**3.0**	**-25***

* significant difference

TABLE II.36 **Achievement scores in mathematics by gender**

	Females		Males		Difference (F-M)
	Mean score	95% Confidence interval	Mean score	95% Confidence interval	
British Columbia	491	4.3	487	4.4	4
Alberta	504	5.1	499	5.3	5
Saskatchewan	487	4.6	488	6.6	-1
Manitoba	470	3.8	471	4.1	-1
Ontario	511	5.3	514	5.6	-3
Quebec	528	4.8	526	3.4	2
New Brunswick	483	4.3	477	5.2	6
Nova Scotia	489	4.0	487	4.4	2
Prince Edward Island	498	5.9	485	7.2	13*
Newfoundland and Labrador	489	4.9	484	6.8	5
Canada	**507**	**1.9**	**507**	**2.9**	**0**

* significant difference

TABLE II.37 **Changes over time in mathematics achievement: 2013 and 2010**

	2013		2010		Difference (2013 – 2010)
	Mean score	95% Confidence interval	Mean score	95% Confidence interval	
British Columbia	489	3.2	481	3.6	8*
Alberta	502	3.9	495	4.0	7*
Saskatchewan	488	3.9	474	3.8	14*
Manitoba	471	3.3	468	4.2	3
Ontario	512	3.5	507	4.0	5
Quebec	527	2.9	515	3.9	12*
New Brunswick	480	3.5	478	3.9	2
Nova Scotia	488	3.3	474	3.9	14*
Prince Edward Island	492	3.7	460	8.3	32*
Newfoundland and Labrador	487	4.7	472	5.2	15*
Canada	**507**	**2.0**	**500**	**2.2**	**7***

* significant difference

TABLE II.38 **Changes over time in mathematics achievement by language: 2013 and 2010**

Jurisdiction	Language	2013		2010		Difference (2013 – 2010)
		Mean score	95% Confidence interval	Mean score	95% Confidence interval	
British Columbia	English	489	3.3	481	3.8	8*
	French	513	6.2	504	5.0	9*
Alberta	English	502	4.0	495	3.9	7*
	French	502	3.6	504	5.3	-2
Saskatchewan	English	487	3.4	474	3.8	13*
	French	518	2.1	498	7.1	20*
Manitoba	English	470	2.6	467	4.2	3
	French	476	2.9	480	3.5	-4
Ontario	English	512	2.9	507	4.7	5
	French	500	3.9	511	3.7	-11*
Quebec	English	509	4.0	507	6.6	2
	French	529	3.5	516	3.5	13*
New Brunswick	English	470	3.8	466	4.9	4
	French	507	5.7	507	5.3	0
Nova Scotia	English	488	4.0	473	4.3	15*
	French	499	3.6	503	3.2	-4
Prince Edward Island	English	492	4.3	460	10.3	32*
Newfoundland and Labrador	English	487	4.7	472	5.2	15*
Canada	**English**	**501**	**1.9**	**495**	**2.4**	**6***
	French	**526**	**3.0**	**515**	**3.8**	11*

* significant difference

TABLE II.39 **Changes over time in mathematics achievement by gender: 2013 and 2010**

Jurisdiction	Gender	2013		2010		Difference (2013 – 2010)
		Mean score	95% Confidence interval	Mean score	95% Confidence interval	
British Columbia	Females	491	4.3	475	4.9	16*
	Males	487	4.4	490	5.4	-3
Alberta	Females	504	5.1	491	4.8	13*
	Males	499	5.3	500	4.8	-1
Saskatchewan	Females	487	4.6	475	5.3	12*
	Males	488	6.6	477	5.0	11*
Manitoba	Females	470	3.8	468	5.1	2
	Males	471	4.1	470	6.0	1
Ontario	Females	511	5.3	509	6.1	2
	Males	514	5.6	508	5.8	6
Quebec	Females	528	4.8	513	4.6	15*
	Males	526	3.4	523	5.5	3
New Brunswick	Females	483	4.3	486	5.8	-3
	Males	477	5.2	473	5.3	4
Nova Scotia	Females	489	4.0	478	4.6	11*
	Males	487	4.4	473	5.9	14*
Prince Edward Island	Females	498	5.9	453	11.1	45*
	Males	485	7.2	468	11.7	17
Newfoundland and Labrador	Females	489	4.9	476	6.4	13*
	Males	484	6.8	471	8.0	13*
Canada	**Females**	**507**	**1.9**	**499**	**3.0**	**8***
	Males	**507**	**2.9**	**504**	**2.9**	**3**

* significant difference

Multiple comparisons of overall achievement

TABLE II.40 **Multiple comparisons of overall science achievement***

Instructions: Choose a jurisdiction from the left-hand column. Read across the row to compare its performance with that of Canada and the jurisdictions, listed along the top of the chart. The symbols indicate whether its performance is above, below, or the same as that of Canada and the jurisdictions.

△ Average achievement significantly higher than comparison jurisdiction or Canada
▼ Average achievement significantly lower than comparison jurisdiction or Canada

Jurisdiction	Mean	CI	Alberta	Ontario	British Columbia	**Canada**	Newfoundland and Labrador	Nova Scotia	Prince Edward Island	Saskatchewan	Quebec	New Brunswick	Manitoba
Alberta	521	4.9			△	△	△	△	△	△	△	△	△
Ontario	511	4.5				△	△	△	△	△	△	△	△
British Columbia	501	4.2	▼							△	△	△	△
Canada	**500**	**1.9**	▼	▼				△	△	△	△	△	△
Newfoundland and Labrador	500	4.3	▼	▼						△	△	△	△
Nova Scotia	492	3.6	▼	▼		▼						△	△
Prince Edward Island	491	5.0	▼	▼		▼						△	△
Saskatchewan	486	4.2	▼	▼	▼	▼	▼					△	△
Quebec	485	3.6	▼	▼	▼	▼	▼					△	△
New Brunswick	469	3.7	▼	▼	▼	▼	▼	▼	▼	▼	▼		
Manitoba	465	3.1	▼	▼	▼	▼	▼	▼	▼	▼	▼		

* significant difference determined using Bonferonni adjusted t-test

TABLE II.41 **Multiple comparisons of overall reading achievement***

Instructions: Choose a jurisdiction from the left-hand column. Read across the row to compare its performance with that of Canada and the jurisdictions, listed along the top of the chart. The symbols indicate whether its performance is above, below, or the same as that of Canada and the jurisdictions.

△ Average achievement significantly higher than comparison jurisdiction or Canada
▼ Average achievement significantly lower than comparison jurisdiction or Canada

Jurisdiction	Mean	CI	Ontario	**Canada**	Quebec	British Columbia	Alberta	Newfoundland and Labrador	Prince Edward Island	Nova Scotia	Saskatchewan	New Brunswick	Manitoba
Ontario	524	3.6		△	△	△	△	△	△	△	△	△	△
Canada	**508**	**2.0**	▼		△	△	△	△	△	△	△	△	△
Quebec	503	2.5	▼	▼				△	△	△	△	△	△
British Columbia	502	3.4	▼	▼						△	△	△	△
Alberta	502	3.7	▼	▼						△	△	△	△
Newfoundland and Labrador	495	3.8	▼	▼	▼							△	△
Prince Edward Island	494	4.4	▼	▼	▼							△	△
Nova Scotia	488	3.2	▼	▼	▼	▼	▼					△	△
Saskatchewan	487	3.1	▼	▼	▼	▼	▼					△	△
New Brunswick	471	3.0	▼	▼	▼	▼	▼	▼	▼	▼	▼		
Manitoba	469	2.9	▼	▼	▼	▼	▼	▼	▼	▼	▼		

* significant difference determined using Bonferonni adjusted t-test

TABLE II.42 **Multiple comparisons of overall mathematics achievement***

Instructions: Choose a jurisdiction from the left-hand column. Read across the row to compare its performance with that of Canada and the jurisdictions, listed along the top of the chart. The symbols indicate whether its performance is above, below, or the same as that of Canada and the jurisdictions.

△ Average achievement significantly higher than comparison jurisdiction or Canada
▼ Average achievement significantly lower than comparison jurisdiction or Canada

Jurisdiction	Mean	CI	Quebec	Ontario	**Canada**	Alberta	Prince Edward Island	British Columbia	Saskatchewan	Nova Scotia	Newfoundland and Labrador	New Brunswick	Manitoba
Quebec	527	2.9		△	△	△	△	△	△	△	△	△	△
Ontario	512	3.5	▼			△	△	△	△	△	△	△	△
Canada	**507**	**2.0**	▼				△	△	△	△	△	△	△
Alberta	502	3.9	▼	▼			△	△	△	△	△	△	△
Prince Edward Island	492	3.7	▼	▼	▼	▼						△	△
British Columbia	489	3.2	▼	▼	▼	▼						△	△
Saskatchewan	488	3.9	▼	▼	▼	▼							△
Nova Scotia	488	3.3	▼	▼	▼	▼						△	△
Newfoundland and Labrador	487	4.7	▼	▼	▼	▼							△
New Brunswick	480	3.5	▼	▼	▼	▼	▼	▼		▼			△
Manitoba	471	3.3	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	

* significant difference determined using Bonferonni adjusted t-test