Report on Science Assessment

SAIP

School Achievement Indicators Program

1999

Council of Ministers of Education, Canada

The Council of Ministers of Education, Canada (CMEC), created in 1967, provides the ministers responsible for education in the provinces and territories with a mechanism for consultation on educational matters of mutual interest and concern, facilitates cooperation among the provinces and territories on a broad range of activities at the elementary, secondary, and postsecondary levels. CMEC Secretariat offices are located in Toronto.

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TABLE OF CONTENTS

INTRODUCTION

SCHOOL ACHIEVEMENT INDICATORS PROGRAM (SAIP)

Canadians, like citizens of many other countries, want their children to have the best educational preparation possible. Consequently, they are asking how well our educational systems prepare students for lifelong learning and for participation in the global economy.

To help answer this question, ministries[1] of education have participated in a variety of studies since the mid-eighties. At the international level, through the Council of Ministers of Education, Canada (CMEC), Canadian provinces and territories took part in the international Indicators of Educational Systems program of the Organisation for Economic Co-operation and Development (OECD). Individual jurisdictions participated in various achievement studies such as those of the International Assessment of Educational Progress (IAEP) and the International Association for the Evaluation of Educational Achievement (IEA). Typical of international studies are the Third International Mathematics and Science Study (TIMSS), in 1995, and its replication in 1999, and the OECD Programme for International Student Assessment, to be administered in 2000. In addition, in most jurisdictions, ministries undertook or enhanced measures at the jurisdictional level to assess students at different stages of their schooling.

Since all ministers of education wish to bring the highest degree of effectiveness and quality to their systems, they have long recognized a need for collective action to assess these systems. They acknowledge that achievement in school subjects is generally considered to be one worthwhile indicator of the performance of an education system. In particular, the ministers wanted to answer as clearly as possible the question: "How well are our students doing in mathematics, reading and writing, and science?"

In that context, in 1989, CMEC initiated the School Achievement Indicators Program (SAIP). It was a first-ever attempt by all the ministers of education to arrive at a consensus on the elements of a national assessment. In December 1991, in a memorandum of understanding, the ministers agreed to assess the achievement of 13- and 16-year-olds in reading, writing, and mathematics. In September 1993, the ministers further agreed to include the assessment of science. They decided to administer the same assessment instruments to the two age groups to study the change in student knowledge and skills due to the additional years of instruction. The information collected through the SAIP assessments would be used by each jurisdiction to set educational priorities and plan program improvements.

It was decided to administer the assessments in the spring of each year as follows:

Mathematics	Reading and Writing	Science
1993	1994	1996
1997	1998	1999
2001	*Assessments to be determined in 2002, 2004*	

The first cycle of assessments took place as scheduled, and the reports were published in December 1993, December 1994, and January 1997, respectively. The second cycle has also proceeded as scheduled, with the second science assessment administered in the spring of 1999.

[1] In this report, "ministry" means "department" as well, and "jurisdiction" means both "province" and "territory."

Because this is the second science assessment, two questions are asked. In addition to the initial question: "How well have Canadian 13- and 16-year-old students learned science in 1999?" there is also the question: "Has the achievement of Canadian 13- and 16-year-old students in science changed since 1996?"

School curricula differ from one part of the country to another, so comparing test data resulting from these diverse curricula is a complex and delicate task. Young Canadians in different jurisdictions, however, do learn many similar skills in reading and writing, mathematics, and science. The SAIP assessments should help determine whether these students attain similar levels of performance at about the same age.

In the SAIP assessments, the achievement of individual students is not identified, and no attempt is made to relate an individual's achievement to that of other students. The SAIP assessments essentially measure how well the education system of each jurisdiction is doing in teaching the assessed subjects. They do not replace individual student assessments, which are the responsibility of teachers, school boards, and ministries of education. Similarly, no attempt is made to compare schools or school districts. The results are reported at the Canadian and jurisdictional levels only.

Funding for the SAIP assessments is provided jointly by CMEC, ministries of education, and Human Resources Development Canada.

SCIENCE EDUCATION IN CANADA

The Science Council of Canada, in its 1984 report *Science for Every Student: Educating Canadians for Tomorrow's World,*[2] described the importance to Canada of its citizens acquiring a good working knowledge of science concepts and the inquiry skills that allow the application of these concepts to everyday life in the world around them. The report endorsed the concept of a science education program for each of Canada's students, in all regions and provinces, regardless of ability and interest that would

- develop citizens able to participate fully in the political and social choices facing a technological society
- train those with special interest in science and technology fields for further study
- provide an appropriate preparation for the modern work world
- stimulate intellectual and moral growth to help students develop into rational, autonomous individuals[3]

Since the release of this influential report, curriculum development in Canada and in other countries has emphasized the importance of developing a scientifically literate population, while at the same time providing for those students with special aptitudes and interest in these fields, opportunities to grow in a challenging learning environment. The evolution of a significant role for Science–Technology–Society–Environment (STSE) in emerging curriculum is a strong indication of the influence of this report and others like it.

Typical of this development in Canada are two recent publications. An important pan-Canadian initiative was the 1997 release of the *Common Framework of Science Learning Outcomes*,[4] a product of the CMEC Pan-Canadian Protocol for Collaboration on School Curriculum. This document is intended as a tool for the developers of future science curricula. An example of the interest taken in science education by a nongovernmental organization is the publication of *Science Literacy and the World of*

[2] Science Council of Canada. *Science For Every Student: Educating Canadians for Tomorrow's World*. Report 36. Ottawa: Science Council of Canada, 1984.

[3] Ibid.

[4] Council of Ministers of Education, Canada. *Common Framework of Science Learning Outcomes*. Toronto: Council of Ministers of Education, Canada, 1997.

Work[5] by the Conference Board of Canada. This pamphlet describes "scientific, technological and mathematical competencies for an innovative, productive, and competitive workplace."

The SAIP Science Assessment Framework and Criteria reflects the intent of many of these recent initiatives. While the understanding of the process of teaching and learning about science is continually being refined, the Framework and Criteria used in 1999 is identical to that used in 1996. This is to allow the comparability of results between the two assessments — an important feature of SAIP.

LEARNING ABOUT SCIENCE

Science is more than a body of complex and abstract knowledge and theories about the universe. It is also more than a set of processes that guide scientific inquiry and discovery. While both of these images of science are important to the working scientist, for effective learning, science must relate to the everyday life of students and must engage them in the process of learning about the world around them. All students learn most effectively about their world by guided, direct observation and hands-on experiences that allow them to gain knowledge and acquire skills in an environment in which they find application to their daily lives.

> By gaining lots of experience *doing* science, becoming more sophisticated in conducting investigations, and explaining their findings, students will accumulate a set of concrete experiences on which they can draw to *reflect* on the process. At the same time conclusions presented to students … about how scientists explain phenomena should … be augmented by information on how the science community arrived at these conclusions.[6]

THE ASSESSMENT OF SCIENTIFIC LITERACY

For many students, the SAIP Science Assessment was a new and different testing experience. Rather than a test that emphasizes the simple recall of information, students encountered an assessment that asked them to relate their understanding of science to real-life situations that were familiar to them.

In the written component of this assessment, students' knowledge of science concepts and their application to society around them, as well as their understanding of the nature of science, were measured by responses to multiple-choice and short, written-response questions. For those who participated in this part of the assessment, the questions were presented in groups within simple and common scenarios that required the application of knowledge to situations familiar to young people.

While the attainment of science inquiry skills is universally acknowledged to be an essential aspect of science education, the assessment of achievement in this area, particularly on a large scale, often has been seen as difficult, if not impossible. The SAIP Science Assessment attempted to achieve this goal by conducting a hands-on practical task assessment, challenging students to apply the science inquiry and problem-solving skills found in the *Science Assessment Framework and Criteria*[7] to simple hands-on tasks. For each of the seven tasks, students who participated in this part of the assessment were asked to respond to a series of questions that assessed their level of understanding of specific science skills.

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[5] The Conference Board of Canada. *Science Literacy and the World of Work*. Ottawa: The Conference Board of Canada, 1996.

[6] American Association for the Advancement of Science. *Benchmarks for Science Literacy*. New York: Oxford University Press, 1993.

[7] See page 9.

OVERVIEW OF THE 1999 SCIENCE ASSESSMENT

In April and May 1999, the science assessment was administered to a random sample of students drawn from all provinces and territories. Approximately 31,000 students made up the total sample — 16,000 thirteen-year-olds and 15,000 sixteen-year-olds. About 22,500 students completed the science assessment in English, and 8,500 in French. For some provinces and territories, where the total number of students was small, the whole age group population was selected. Detailed breakdowns of the numbers of students assessed in each jurisdiction are presented in the appendix of this report.

As in other SAIP assessments, students in both age groups responded to the same assessment instruments. Participating students were asked to complete one of two components. A written assessment focussed on their knowledge of science concepts, the nature of science, and the relationship of science to technology and societal issues. A practical task assessment focussed on science inquiry skills by presenting practical problems in a hands-on environment. For the written assessment, a representative sample from each jurisdiction was drawn of sufficient size to allow reporting at the national level as well as the jurisdictional level. A national sample was drawn by CMEC for the practical task assessment. In addition, three jurisdictions — Saskatchewan, Ontario, and Quebec — took the option of over-sampling all or part of their sample populations to allow reporting data at a provincial level.

As in the past, to assist with the interpretation of outcomes for the SAIP Science Assessment 1996, CMEC convened a pan-Canadian panel of educators and non-educators, each of whom attended one of the three sessions held in Western, Central, and Atlantic Canada in October–November 1999. A collaborative, two-stage process was used to define pan-Canadian expectations for student performance in both the written and practical components of the assessment. Details of the process and the results of their deliberations can be found under Pan-Canadian Expectations, page 27.

COMPARABILITY OF THE 1996 AND 1999 ASSESSMENTS

An important reason for conducting this assessment, only three years after the first science assessment, was to ask the question: "Has the achievement of Canadian 13- and 16-year-old students in science changed since 1996?" A primary concern of the 1999 development team was to ensure that changes to assessment instruments and scoring procedures were kept to a minimum. The same framework and criteria were used to assess 1999 student work. Scoring procedures and conditions were replicated as much as possible from information provided by the previous team.

Changes to the written assessment instruments were restricted and minimal:

- corrections to typographical or minor linguistic matters
- standardizing formatting for all questions and ensuring a consistent format for both French and English
- minor wording changes for clarity in a very few places
- including all questions in one booklet with three colour-coded sections, rather than three separate booklets as in 1996

Changes to the practical task assessment were somewhat more significant. Since one of the tasks had been compromised through inclusion in the 1996 public report, it was replaced. In addition, minor modifications were made to two others to remove some unnecessarily confusing wording.

For 1999, the scoring of the practical task booklets was enhanced by two factors:

- a greater number of experienced scorers
- more clearly defined scoring criteria (not different criteria, but more clearly defined)

A combination of these factors enabled the professional educators who were the scorers to exercise their professional judgment in a more consistent manner. The effects of this enhanced scoring process are expected to have improved the consistency of scoring and thus the confidence that one can have in the results.

All changes were subject to fresh field trials in the schools of the consortium jurisdictions to ensure the appropriateness of the changed instruments.

In all other ways, the assessment materials were the same. For the written assessment, a placement test was administered, in which students were asked to answer a preliminary set of twelve level 3 questions to assist in assigning the levels of remaining questions. Administration procedures for both the written and practical task components were essentially the same in 1999 as in 1996.

In the sampling procedure, student selection was modified slightly from the 1996 assessment. In 1999, students were selected without any exclusions, while in 1996, students could be excluded before the final sample was drawn. In 1999, school administrators, together with school staff could consider that a student had very limited abilities in science and that it would serve no purpose to have the student write the assessment. If the student could not make a reasonable attempt at answering any of the level 1 questions included in the *Information Bulletin for Schools*, the school could exempt the student and designate him or her as below level 1. It is therefore likely that more students were included in the 1999 sample that would not meet the criteria for level 1.

A second source of comparability from 1996 included the involvement of a number of scoring leaders and scorers from the 1996 sessions in the 1999 scoring sessions for practical task booklets. This assisted in establishing similar scoring communities with similar contexts for scoring.

BASIS OF THE ASSESSMENT

ASSUMPTIONS AND LIMITATIONS OF THE ASSESSMENT

Although the content of this assessment was consistent with that of science curricula across Canada, it could not be comprehensive enough to include everything that appears in every science program. It is as much an assessment of scientific literacy as a science test in the usual meaning of the word. The assessment focussed on knowledge and skills that can be measured in paper-and-pencil testing and on practical tasks. The teamwork or cooperative problem-solving approach, often used in solving scientific problems, was not evaluated in this assessment.

In both assessments, scoring was based upon a comparison of students' responses to the criteria in the Science Assessment Framework and Criteria upon which the items were based. For the written assessment, recent faculty of education graduates, using a template of acceptable responses, scored the extended-response (written) questions. In the case of the practical task assessment, experienced science educators were trained to compare student responses to exemplars chosen from actual student papers by the development team. A number of scoring leaders and scorers returned from the 1996 administration. This ensured increased consistency in the scoring process.

DEVELOPMENT OF THE 1996 ASSESSMENT MATERIALS AND THEIR REVISION FOR 1999

The 1996 Assessment

The development of the components of the 1996 SAIP Science Assessment began in the fall of 1993 when CMEC asked the ministries of education in Alberta, Saskatchewan, Ontario, and New Brunswick (francophone) to form a consortium of subject and assessment specialists. These specialists were asked to develop science material that would describe and assess five levels of achievement for 13- and 16-year-olds. The consortium worked in cooperation with other ministries of education.

Provincial curricular materials present science as a continuum of learnings from elementary through to the end of secondary school. Four areas within these science learnings form the framework for this assessment:

- knowledge and concepts of science
- nature of science
- relationship of science to technology and societal issues
- science inquiry skills

Criteria for the assessment were drafted to reflect the breadth of what students in Canadian schools are expected to know and be able to do with respect to these four areas. In keeping with the current emphasis on conceptual understanding of science, points of progress along the continuum were organized to represent five levels of progress.

As the Assessment Framework and Criteria evolved, each ministry of education reviewed draft proposals in the context of its curriculum and according to its own consultation procedures. Classroom teachers and professional groups also reviewed the criteria and proposed assessment framework. Their concerns and suggestions directed subsequent revisions of the criteria and the assessment design. Student evaluation and curriculum specialists from the universities, science experts, and representatives from nongovernmental organizations also reviewed the criteria. Teachers from across Canada developed questions and tasks for the assessment during the summer of 1994. Each ministry was then asked to carry out a curriculum and bias review of this material.

A first informal field test of the questions was carried out in the fall of 1994 in a limited number of classrooms in the four consortium provinces. In the spring of 1995, the assessment materials, including twice the number of items needed for the final test, were fully field-tested in all the provinces. Comments by teachers whose students had field-tested the instruments were very useful in the revision process. The developers also considered students' comments about the questions, the tasks, and the administrative procedure. Field-test scorers' comments and test results confirmed the appropriateness and range of difficulty of the questions, tasks, instructions, and administrative procedures. Particularly in the case of the practical task assessment, the deliberations at the marking session also confirmed the effectiveness of the criteria and the procedures for scoring in order that students would be placed at the appropriate skill level.

The 1999 Assessment

In April 1998 a team from Saskatchewan, Ontario, Quebec, Nova Scotia (francophone), and Newfoundland and Labrador came together to review the assessments and prepare them for re-administration. A close analysis of all 1996 assessment statistics and results, advice from statisticians and scorers, and a review of student exemplars informed the discussion. As described earlier,[8] changes to assessment instruments and scoring procedures were kept to a minimum. The same Framework and Criteria was used to assess 1999 student work. Scoring procedures and conditions as well as administration procedures were replicated as much as possible from documentation and information provided by the previous team.

In all of its work, the 1999 consortium team strove to make the second cycle of the assessment comparable to the 1996 assessment. Attention was paid to this factor at all levels — instrumentation, administration, scoring, data collection and analysis, and reporting.

ADMINISTRATION OF THE ASSESSMENT

Written Assessment

All students writing this assessment began by doing 12 questions at level 3. On the basis of their scores on those 12 questions, students were directed to a subsequent particular set of colour-coded pages in their test booklet. Each set of questions contained 66 items that covered a different combination of achievement levels. Section B covered levels 1, 2, and 3. Section C covered levels 3, 4, and 5, level 5 being the highest. The 66 questions in each section were a combination of multiple-choice and written-response questions. All students, regardless of which set of items they progressed to, wrote an identical set of 26 level 3 questions, 12 from the placement test and 14 repeated in each of parts B and C.

Practical Tasks

Specially trained external test administrators brought the hands-on testing materials to the sample schools and administered the assessment to the selected students. Students participating in the science inquiry skills assessment performed seven tasks that required them to generate and analyse their own data by applying science inquiry skills to questions of a scientific, technological, and/or societal nature.

[8] See page 4, "Comparability of the 1996 and 1999 Assessments."

The written assessment was scored in Sudbury, in June 1999 and the practical task assessment was scored in Montreal, during July and August. Data processing took place in Quebec City; statistical analysis was carried out in Vancouver. A consultant prepared drafts of the report for approval by the CMEC Secretariat, in cooperation with the Science Assessment Administration Management Team and the Report Development Group.

Contextual Data

Questions regarding opportunities students have had to learn science, some of their attitudes toward science and other demographic information were gathered in a student questionnaire.

For the 1999 assessment, in order to collect a broader selection of contextual information, school principals completed a school questionnaire, and science teachers were asked to complete a science teacher questionnaire.

COMPARISONS BETWEEN LANGUAGE GROUPS

From the outset, the instruments used in the science assessment were developed by English- as well as by French-speaking educators working together for the purpose of eliminating any possible linguistic bias. Whether they wrote in French or in English, the students responded to the same questions and executed the same tasks. Consequently, the statistical results presented for each language group in this report can be compared with reasonable confidence.

SCIENCE ASSESSMENT FRAMEWORK AND CRITERIA

With Exemplars Drawn from Student Responses

WRITTEN ASSESSMENT FRAMEWORK

Questions dealing with science concepts assessed student understanding in the following areas:

- **knowledge and concepts of science**
  - Matter has structure, and there are interactions among its components.
  - Life forms interact within environments in ways that reflect their uniqueness, diversity, genetic continuity, and changing nature.
  - Basic gravitational and electromagnetic forces result in the conservation of mass, energy, momentum, and charge.
  - Earth and the physical universe exhibit form, structure, and processes of change.

- **nature of science**
  - An understanding of the nature of scientific knowledge and the processes by which that knowledge develops.

- **relationship of science to technology and societal issues**
  - An understanding of the relationships among science, technology, and society.

Questions also dealt with conceptual knowledge and understanding, procedural knowledge and skills, and the ability to use science to solve problems.

Questions that assessed **conceptual knowledge and understanding** asked students to
- outline, explain, or define concepts
- identify suitable examples of concepts
- suggest new ways of representing concepts

Questions that assessed **procedural knowledge and skills** asked students to
- recognize when a particular procedure should be used
- suggest procedures to solve particular problems
- modify familiar procedures to solve new problems

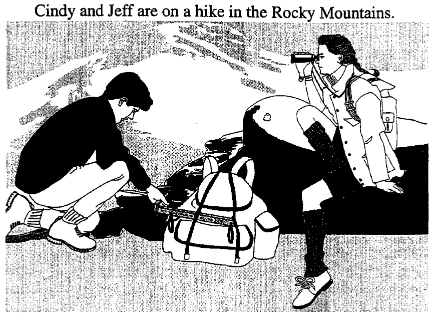
Questions that assessed the **ability to use science to solve problems** asked students to
- formulate problems
- apply a variety of strategies to solve problems
- produce solutions to problems
- assess given solutions to problems

At level one, the student can

- describe physical properties of objects
- distinguish living things from non-living things
- recognize that energy can appear in different forms
- recognize that objects in the universe undergo change
- demonstrate care and accuracy during scientific investigations
- identify various technologies important to society

The Hike

Cindy and Jeff are on a hike in the Rocky Mountains.



Cindy and Jeff use a net to help them in their investigation of the pond.

Name another piece of equipment they could use in their investigation. Briefly tell how this equipment will help them.

Equipment: Magnifying glass.

How does it help? Allows them to see small details or distinguishing characteristics on certain organisms.

While on the trip, the students will be experiencing more hours of daylight than at any other time of the year.

During which month are they going?

A. March
✻ **B.** June
C. September
D. December

At level two, the student can

- classify substances according to their physical properties
- compare various plant and animal adaptations
- know that the amount of energy in the universe is conserved but that it can change form and be transferred
- know that the movement and the tilt of Earth affect cycles such as years, days, and seasons
- explain that there are different forms of scientific investigations and that their results may contradict each other
- identify technologies that influence science, and science knowledge that leads to new technologies

Sun Protection Factor (SPF)

Helen knows that overexposure to ultraviolet rays is harmful to the skin. She devises an experiment to compare the effectiveness of a lotion with a Sun Protection Factor (SPF) 15 to one with a SPF 30.

Helen's hypothesis: "The higher the SPF value, the better the protection."

She needs: – samples of SPF 15 and SPF 30 lotions from the same company
– 10 volunteers with similar complexion and skin colour

Why did Helen choose volunteers with the same skin type?

Answer: That would be her controlled varible. Need same skin type to make experiment true.

Canoe Trip

Three friends decide to celebrate the Canada Day holiday by taking a short canoe trip on a nearby lake.

Alice describes the behaviour of the birds. Some behaviours were inherited and others were learned.

Which of the following describes a behaviour that the birds would have learned?

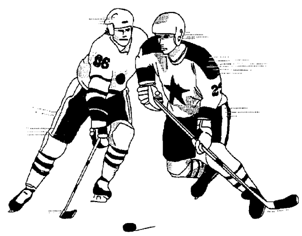
A. Bringing food back to the nest to feed their young
* B. Looking for their food near campsites
C. Sleeping while perched on a branch
D. Building nests with small twigs

At level three, the student can

- use chemical properties to compare and classify substances
- know that some life forms are unicellular and others are multicellular, and that life forms are involved in the transfer of energy
- compare gravitational and electrical forces
- compare changes in Earth's surface and their causes
- analyse experiments and judge their validity
- identify areas where science knowledge and technologies address societal problems

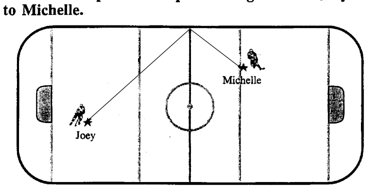
Hockey

Joey and Michelle play hockey.



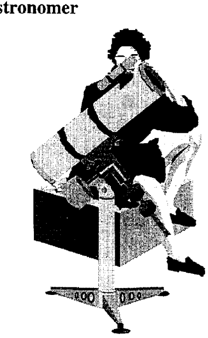
Joey shoots the puck off the boards and it goes to Michelle.

Draw lines to show the path of the puck as it goes from Joey to the boards and then to Michelle.



Amateur Astronomer

Michelle, an amateur astronomer, observes the night sky with her binoculars and her telescope.



Michelle knows that light reflected from the Moon's surface reaches Earth in about one second. She also knows that light from Alpha Centauri, the star nearest our solar system, takes about five years to reach Earth.

About how long does it take for light to travel from the Sun to Earth?

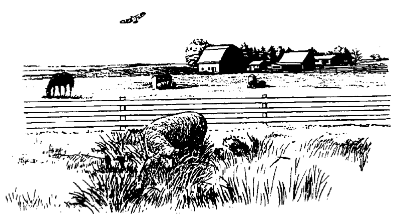
A. 1 second
* **B.** 8 minutes
C. 5 years
D. 10 years

At level four, the student can

- describe and compare particles in terms of protons, neutrons, and electrons
- state the importance and role of DNA
- analyse uniform motion in one dimension
- use the theory of plate tectonics to explain various geological activities
- explain that scientific progress is the result of ongoing experimentation and evaluation
- describe a situation where science or technology has affected our view of what the world is like

Farm

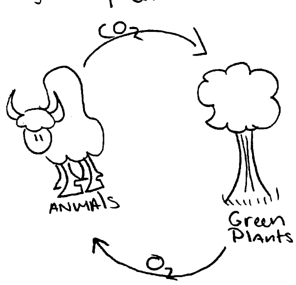
Diane and Eric visit their grandparents' farm in Manitoba.



Oxygen, $O_{2(g)}$, is an important component of the air found in the soil. Like many other substances, oxygen is cycled in nature.

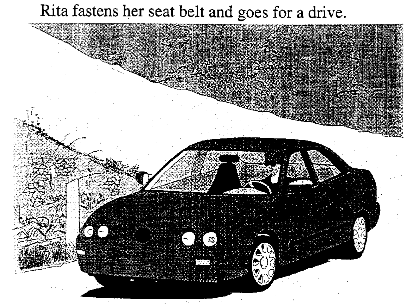
Describe the oxygen cycle in nature. Use a labelled diagram if you wish.

Answer: oxygen is used in respiration by animals. CO_2 a waste of respiration, is used by Green Plants in Photosynthesis. Photosynthesis also Produces oxygen, wich Animals breath compleating the cycle.

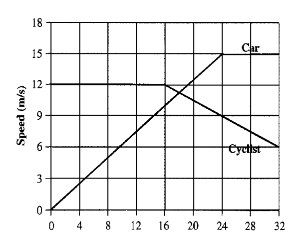


A Car Ride

Rita fastens her seat belt and goes for a drive.



As soon as Rita resumes driving, a cyclist passes her car. A speed versus time graph representing Rita's car and the cyclist follows:



At 32 s, which one will be ahead of the other and by what distance?

A. The car by 96 m
B. The cyclist by 96 m
C. The car by 36 m
* **D.** The cyclist by 36 m

- relate properties of substances to their molecular structure
- know that various factors can mutate DNA and that some mutations may be passed on to offspring
- analyse uniform motion in two dimensions
- evaluate evidence for the theory of plate tectonics
- explain conditions used to evaluate scientific theories
- show the influence of world views on science and technology

Farm

Diane and Eric visit their grandparents' farm in Manitoba.

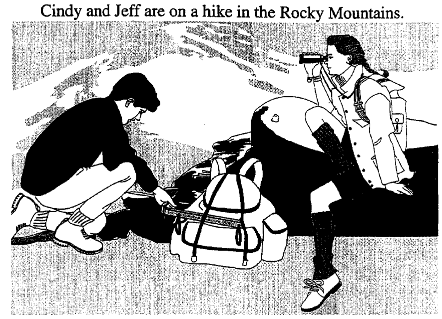
Methane, $CH_{4(g)}$, is another fuel used in homes. Both methane and propane are gases at room temperature and pressure. Water, $H_2O_{(l)}$, on the other hand, is a liquid at room temperature and pressure.

Under these conditions, why is water a liquid when methane and propane are both gases?

A. Methane and propane have more hydrogen making them more gaseous.
B. Methane and propane have large spaces between the molecules.
* C. Water has more attractive forces between the molecules.
D. Water molecules are smaller and will pack together more tightly.

The Hike

Cindy and Jeff are on a hike in the Rocky Mountains.



Above the cliffs, they notice some Peregrine falcons. The falcons prey on swallows, and these in turn prey on mosquitoes.

What is one effect that human activity could have on these and other species in this area?

Answer: Reduce the number of mosquitoes, reducing the number of swallows, then falcons, and eventually as the bottom of the food chain is destroyed, all other lifeforms, including humans, are affected.

PRACTICAL TASKS ASSESSMENT FRAMEWORK

Science inquiry skills are used to answer questions and solve problems about the world around us. These skills facilitate the application of scientific knowledge to a variety of scientific, technological, and societal issues.

Tasks that assessed science inquiry skills required students to

- identify questions that are, or should be, investigated
- carry out procedures
- select and use proper equipment and materials
- identify variables and controls in an experiment
- collect, organize, interpret, and communicate data
- design procedures

PRACTICAL TASKS ASSESSMENT CRITERIA BY LEVEL AND EXEMPLAR — A SUMMARY

At level one, the student can

- ask and identify relevant questions
- carry out identified procedures
- make relevant observations

At level two, the student can

- infer or predict possible answers to questions
- identify appropriate procedures and important variables
- organize and record observations and measurements accurately

At level three, the student can

- identify sources of error
- identify patterns, trends, and simple relationships
- extrapolate or interpolate

At level four, the student can

- formulate hypotheses and/or predictions to guide research
- organize and present data in concise and effective forms such as data charts, graphs, and mathematical and statistical treatments
- develop explanations by relating data to known information
- suggest alternatives or improvements to an experimental design

At level five, the student can

- design appropriate experiments
- evaluate the reliability and accuracy of data and explain its limitations
- evaluate the effects of sources of error
- identify factors that influence the acceptance or rejection of a body of evidence or a theory

The exemplar that follows includes the task assigned to participants, followed by the actual response of a student who successfully completed questions at all five levels.

CRATER CREATION

Context

Photographs taken of Earth, Moon, Mars and Mercury indicate that there are craters on the surfaces of these bodies that were created by collisions with meteors. In this task, you will simulate crater production by dropping a ball into sand.

Problem

What is the relationship between the height from which the ball is dropped and the width of the crater it creates in the sand?

You should have the following materials

- A tray with dry sand sitting inside a larger tray
- 1 metre stick
- 1 small plastic ruler
- 1 ball (20 g)
- safety goggles **(MUST be worn throughout this task)**

CRATER CREATION

6-1. Use the small plastic ruler to level the sand in the tray. (2cm)

6-2. Drop the ball from a height of 25 cm into the tray of sand.

6-3. Measure the width of the crater formed. If necessary, remove the ball from the sand.

6-4. Record this measurement on the chart provided.

6-5. Repeat steps 6-1 to 6-4 two more times.

6-6. Repeat steps 6-1 to 6-5, using heights of 50 cm and 75 cm.

	Crater Width (cm)		
Height (cm)	Trial 1	Trial 2	Trial 3
25	5	5	5
50	5.5	5.9	5.5
75	5.9	6.0	6

6-7. Based on your results what is the relationship between the height from which the ball is dropped and the width of the crater it creates?

Relationship: the higher the ball is dropped, the larger the crater it creates.

6-8. Identify a source of error in this experiment.

the height at which ball is dropped is not exact, the measuring of the width of crater is only a approximation (no definite lines.)

What effect does this source of error have on the accuracy of your results?

the accuracy of the experiment is very important to the outcome of the result & final conclusion. My measurements could have a very high % error and maybe what the ball actually does in real life is not what is observed in this experiment

6-9. The same data as yours was collected on another planet. What is one assumption that you would have to make if the relationship you gave in question 6-7 is to remain valid?

the amount of gravity has a very important factor in this experiment. on another planet, very different measurements can be observed. A planet where gravity is greater than earth, the relationship with earth's is the same but the width of the crater created would be much larger given the same height the ball is dropped. A planet where there is very little gravity, a very different result would be observed.

RESULTS OF THE 1999 SCIENCE ASSESSMENT

NOTE: In this report, performance-by-level charts are based upon cumulative results and actually show percentages of students *at or above* each level. Each bar on a graph indicates the percentage of students at or above a particular level of performance while excluding those students performing at lower levels. The bar for level 3 or above represents all those students who scored at levels 3, 4, or 5. Students who scored below level 3 are not included.

NOTES ON STATISTICAL INFORMATION

Confidence Intervals

In this study, the percentages calculated are based on samples of students. Therefore, these are estimates of the actual achievement students would have demonstrated had all of the students in the population taken the assessment. Because an estimate based on a sample is rarely exact, it is common practice to provide a range of percentages within which the actual achievement is likely to fall. This range of percentage values is called a confidence interval. The confidence interval represents the high- and low-end points between which the actual achievement level would fall 95 % of the time. In other words, one can be confident that the actual achievement level of all students would fall somewhere into the established range 19 times out of 20 if the assessment were repeated with different samples from the same population.

In the charts of this report, confidence intervals are represented by ├─┤. In tables, confidence intervals are represented in parentheses. If the confidence intervals of two groups overlap, the differences between the two are not statistically significant. It should be noted that the size of the confidence interval depends upon the size of the sample. In smaller jurisdictions, a large interval may indicate difficulties in obtaining a large sample, and does not reflect upon the competency of the students to whom the assessment was administered.

Differences

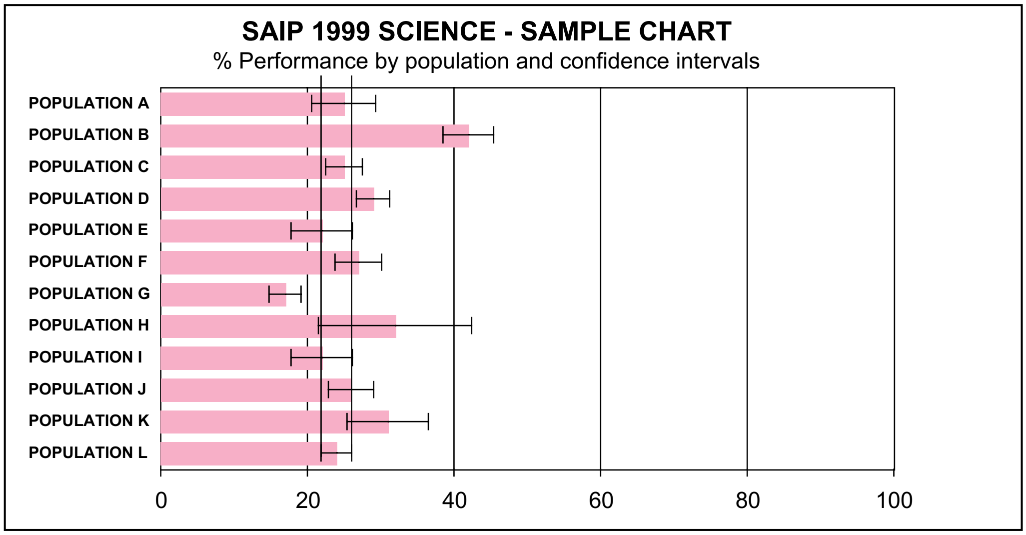
In this report the terms "difference" and "different," used in the context of performance levels and percentages, refer to a difference that is not due to chance. In a technical sense, they refer to a statistically significant difference.

Percentages

Percentages in this report are rounded to the nearest decimal.

Sample Chart

The following chart is provided to help readers interpret the confidence intervals used in this report. For example, there is no significant difference between Population L and Populations A, C, E, F, H, I, J, and K, but there is a significant difference between Population L and Populations B, D, and G because their confidence intervals do not overlap.

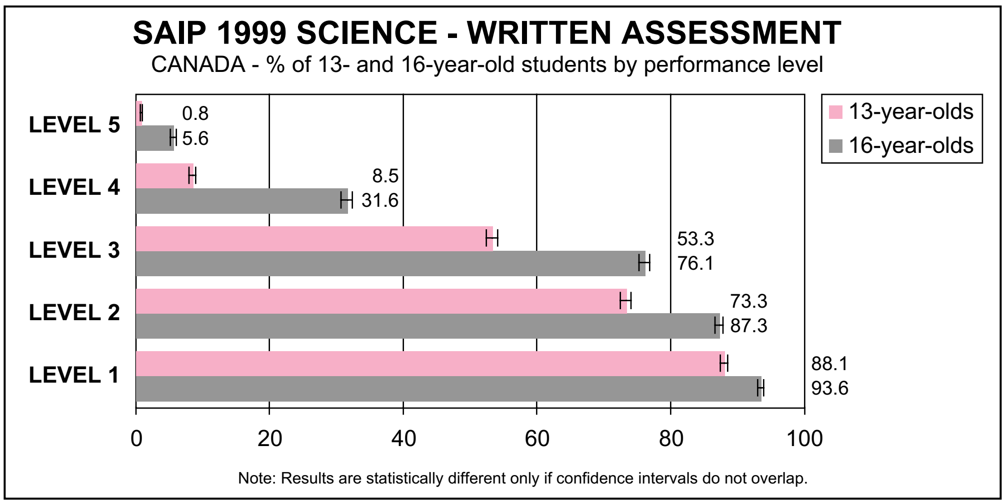


Results for Canada

Charts 1 and 2 compare overall results combining performances in all jurisdictions and both languages for both age groups in 1999 for the written (chart 1) and the practical task (chart 2) assessments. Frequency tables on which the various charts are based and which contain actual percentages and confidence intervals are included in the appendix.

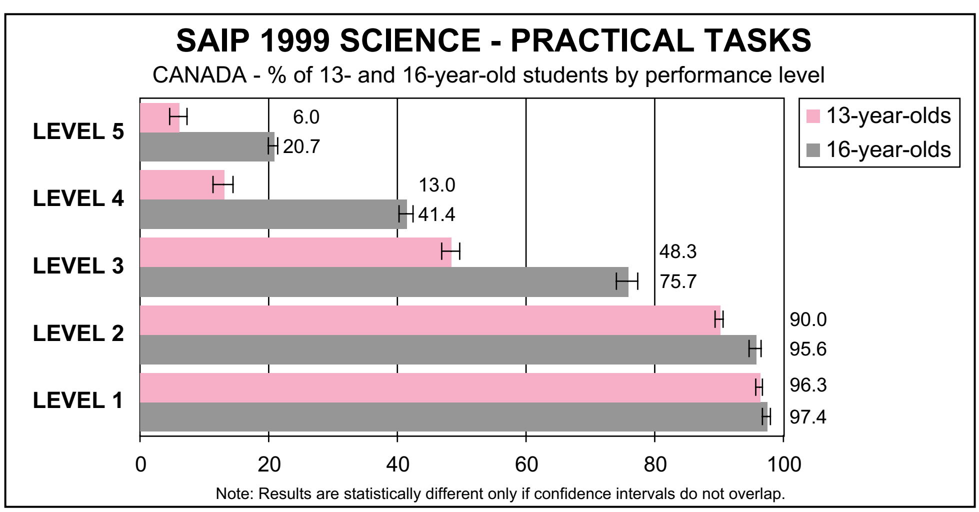
In both cases, as might be expected, there are more students from the 16-year-old population at higher levels, since students from both age groups were presented with identical instruments. With this data, what once would only have been an expectation can now be stated with some certainty.

CHART 1



In the written assessment, nearly three-quarters of 13-year-olds were able to reach level 2, where they demonstrated such abilities as comparing various plant and animal adaptations, and identifying technologies that influence science, and the science knowledge that leads to new technologies. Over 76% of 16-year-olds reached level 3 and were able to demonstrate such abilities as using chemical properties to compare and classify substances and analyse experiments and judge their validity.

CHART 2



In the practical task assessment, higher achievement by older students is again demonstrated. In this case, however, the difference seems to be greater at the higher levels. Some 90% of 13-year-olds and over 95% of 16-year-olds reached level 2 where they can demonstrate such skills as identifying appropriate procedures and important variables.

Many more 16-year-olds than 13-year-olds reached levels 3, 4, and 5, where criteria require the demonstration of considerably more sophisticated skills as can be seen in the relevant criteria. In addition, 16-year-olds have likely gained more exposure to science tasks in their daily lives and more practical experience in science laboratories than their younger contemporaries.

Achievement Differences between 1996 and 1999

Written Assessment

Differences in achievement of both 13-year-olds and 16-year-olds are significant at levels 3, 4, and 5. In each case a significantly higher proportion of students reached these levels in 1999. This demonstrates a general increase in the sophistication of science understandings by Canadian students in the period 1996–99.

CHART 3

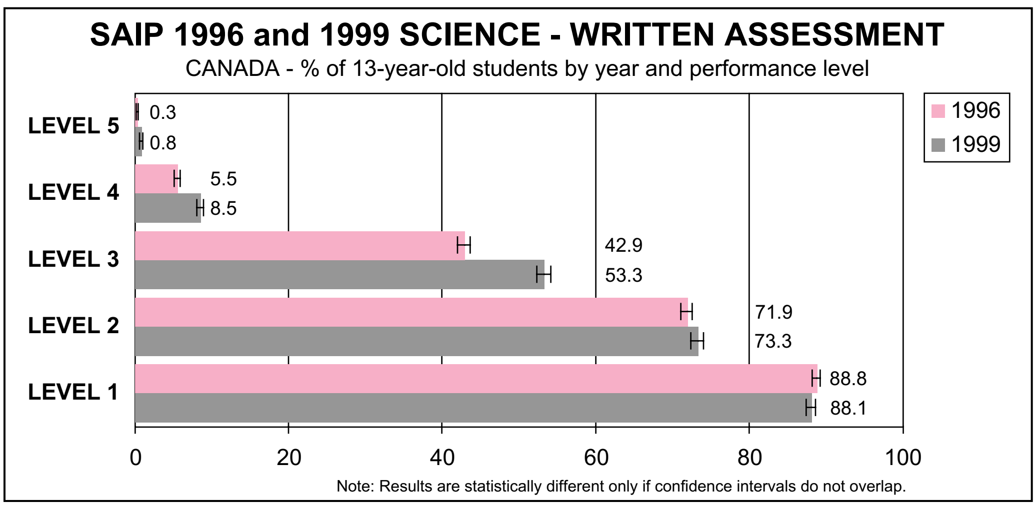
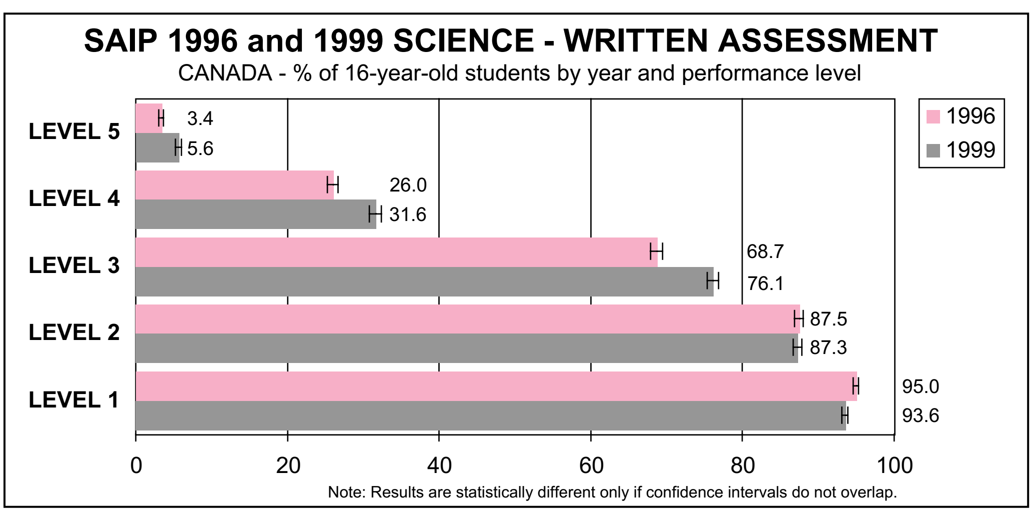


CHART 4



Practical Tasks

As with the written assessment, there are significant differences in results at nearly all levels in both age groups, with 1999 achievements higher than in the 1996 assessment. These differences may reflect the changes in the scoring process for the practical task assessment, as described on page 4. The same criteria were used in 1996, but in 1999 were more clearly defined, allowing the experienced educators who were scoring to exercise their professional judgment in a more consistent manner. Higher scores may also reflect increased emphasis on the application of science skills in Canadian science classrooms.

CHART 5

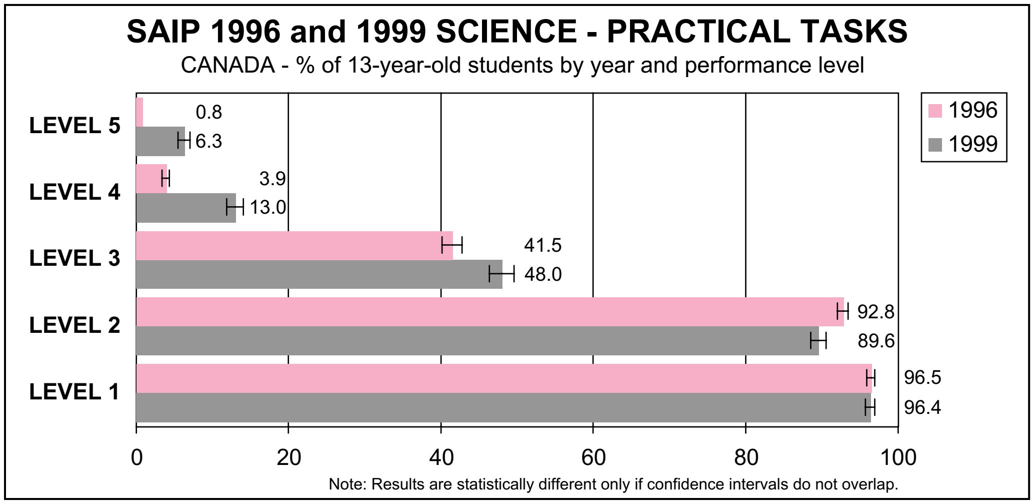
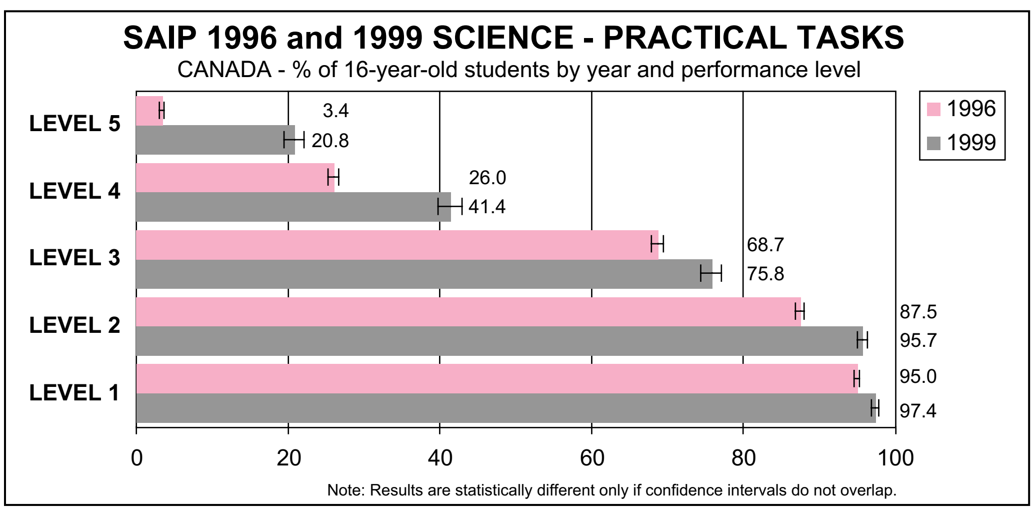


CHART 6



Achievement Differences by Gender

Charts 7 and 8 show that for the written assessment there is no significant difference in achievement between males and females at most levels. There are slightly more females at level 1 or above in both age groups, and there are slightly more 16-year-old males at level 4 or above. The overall message given by this data suggests that the efforts to make science education more relevant to, and more inclusive of, young women continue to have a positive influence on science achievement.

CHART 7

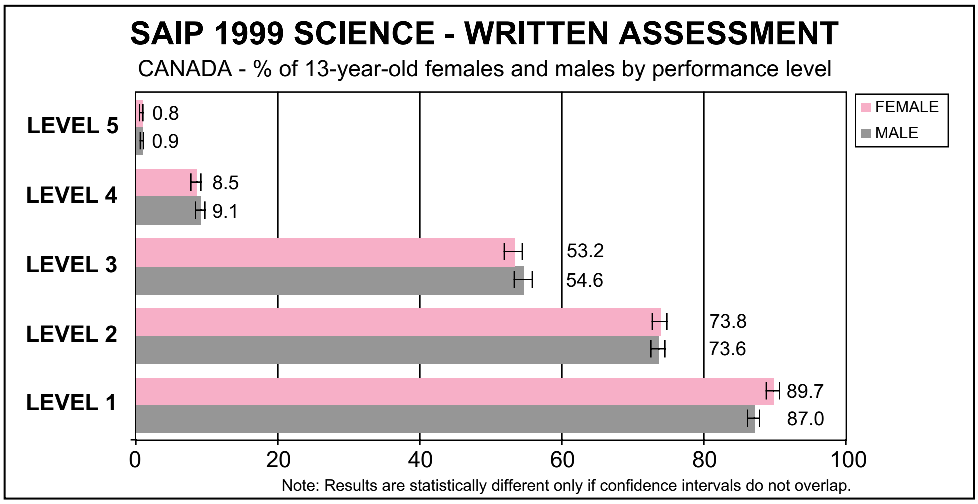
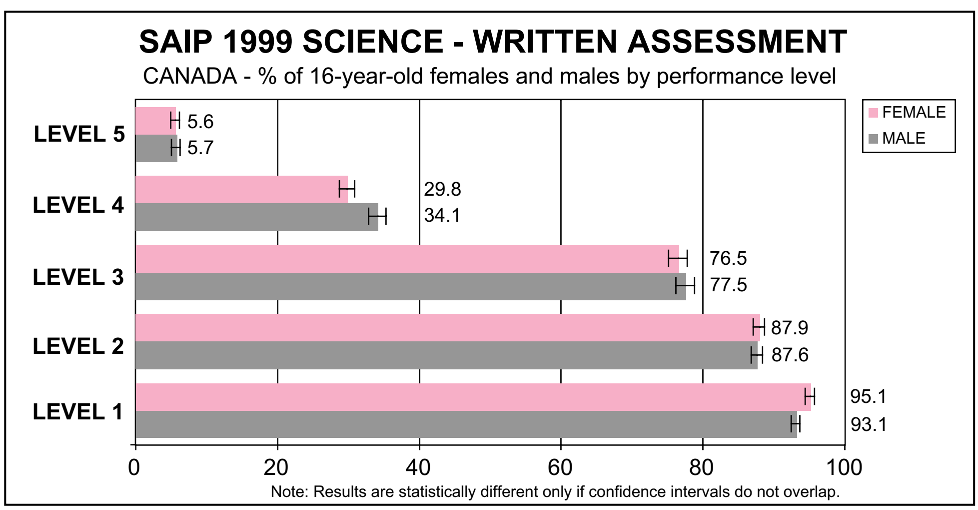


CHART 8



Gender differences for the practical task assessment are similar in many respects to the written assessment, except that there are significant differences at levels 4 and 5 for 13-year-olds where significantly more females perform at the higher levels.

CHART 9

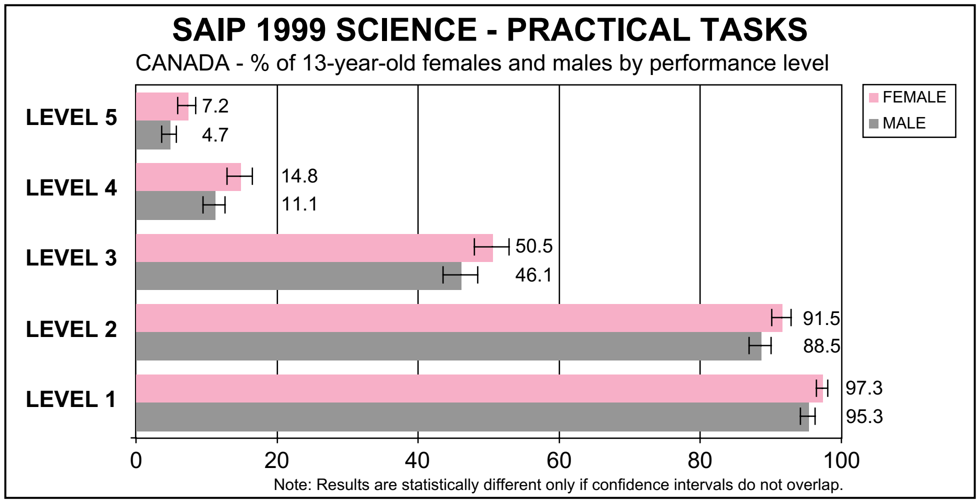
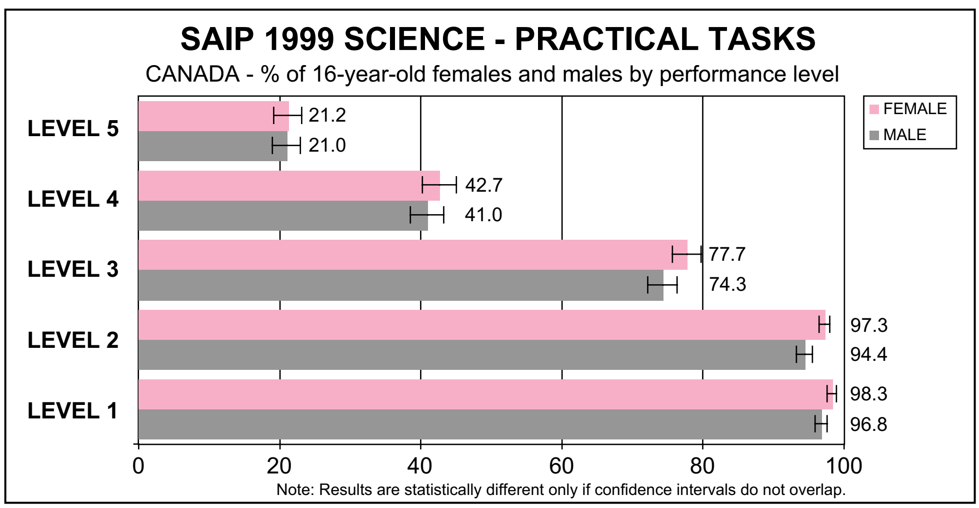


CHART 10



Achievement Differences by Language

Written Assessment

There are slight differences in the percentage of students achieving at levels 1, 2, 4, and 5 in favour of those who wrote in English, with no significant difference at level 3 and above. For 16-year-olds, there are significant differences at levels 1, 2, and 3 in favour of those who wrote in French, with no significant differences at levels 4 and 5.

CHART 11

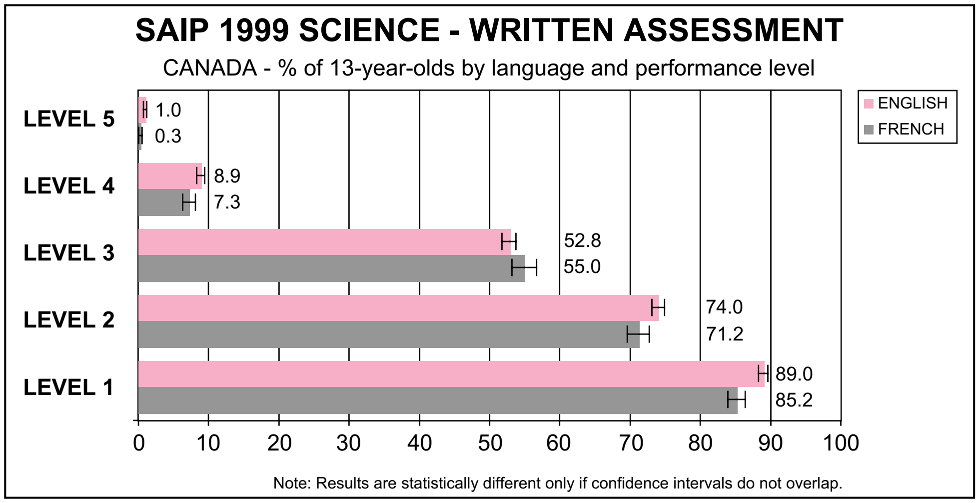
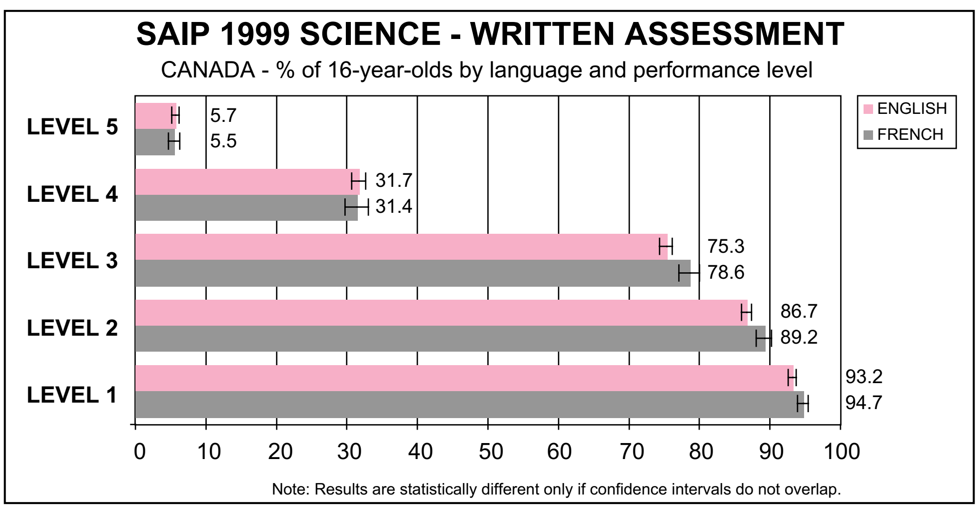


CHART 12



Practical Tasks

For 13-year-olds, results for the practical task assessment show significant differences at levels 1, 3, 4, and 5 in favour of students who responded in English. For 16-year-olds, there is a significant difference at level 2, where more francophone students reached level 2.

CHART 13

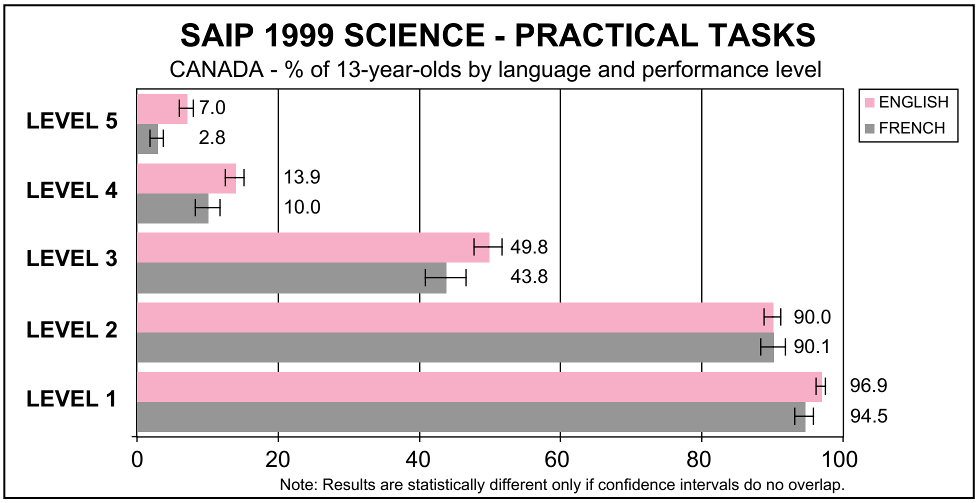
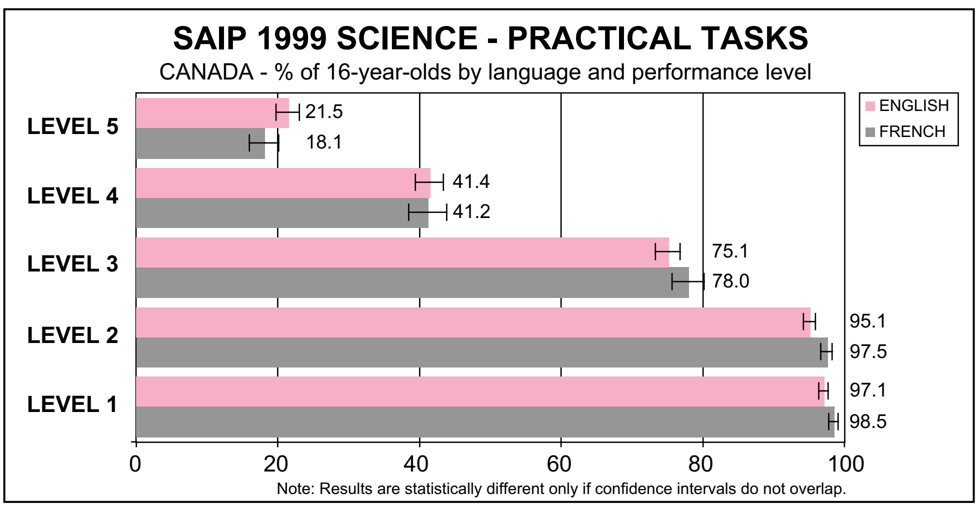


CHART 14



Comparison of these results with those from the 1996 assessment[9] shows a considerable decrease in the differences in achievement between students who wrote in each language.

[9] Council of Ministers of Education, Canada. SAIP *Report on the Science Assessment, 1996* (1996)

Pan-Canadian Expectations for Performance in Science in 1999

To assist with the interpretation of outcomes for the SAIP 1999 Science Assessment, the Council of Ministers of Education, Canada (CMEC) convened a pan-Canadian panel of educators and non-educators. Each panellist attended one of the three sessions held in Atlantic, Central, and Western Canada during October and November 1999. This anonymous panel consisted of teachers, students, parents, university academics and curriculum specialists, Aboriginal teacher trainers, business and industry leaders, community leaders, and members of national organizations with an interest in science education. The panel featured representatives from across Canada. The 93-member panel reviewed all assessment instruments, both written and practical task, scoring procedures, and actual student results to determine the percentage of 13- and 16-year-old students who should achieve at each of the five performance levels. Full and open disclosure was provided to panellists of any information pertinent to the assessment, including sampling of students and the varying opportunities that students across the country have in learning science.

A collaborative process was used to define pan-Canadian expectations for student achievement in science. Specifically, participants were asked to answer independently the questions: "What percentage of Canadian students should achieve at or above each of the five performance levels, as illustrated by the Framework and Criteria and by the questions asked?"

Panellists' answers to that question were collected to determine the desired Canadian student performance and to help interpret how students should do in comparison with actual results. These expectations will be used over the next three years as guidelines by the ministries of education when enhancing science programs across the country. In charts 15 to 18, the interquartile range of expectations and the median (mid-point) expectation are identified for each level of achievement. This range, presented as the screened colour around the median, represents the expectations set by 50% of the panellists. Where no screened colour appears, the range of expectations did not vary from the median.

With respect to the written assessment, as shown on charts 15 and 16, panellists were satisfied with the achievements of 16-year-olds at all levels, with the exception of level 5. Panellists felt that 13-year-olds did not match their expectations at level 4.

Charts 17 and 18 show that both educators and non-educators are generally satisfied with the performance of Canadian students in the practical task assessment. At all levels, 13- and 16-year-old students' performance fell within the range expected of them.

In general, students did accomplish what is expected of them in science, in particular in the practical task assessment. In the written assessment, more students should be able to achieve at the higher levels, demonstrating relatively sophisticated science knowledge and skills.

CHART 15

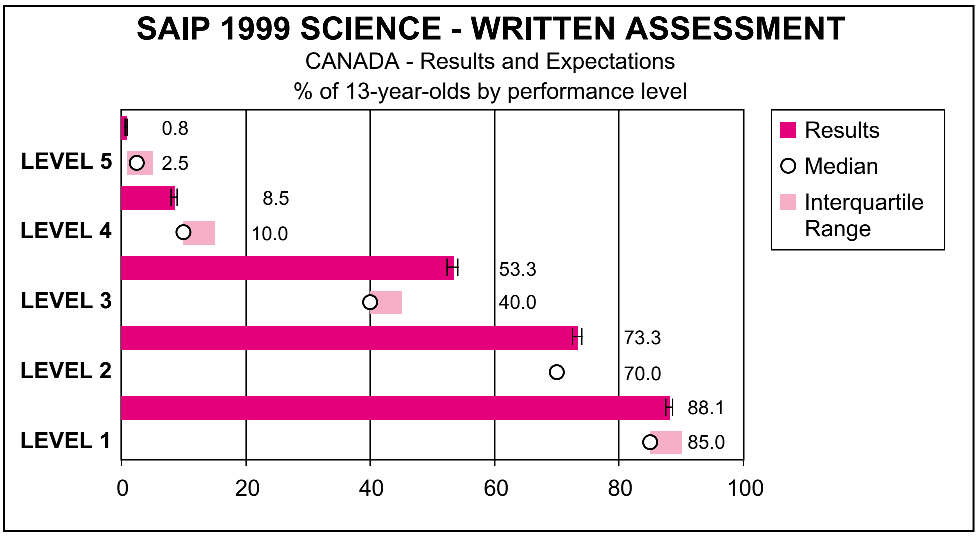


CHART 16

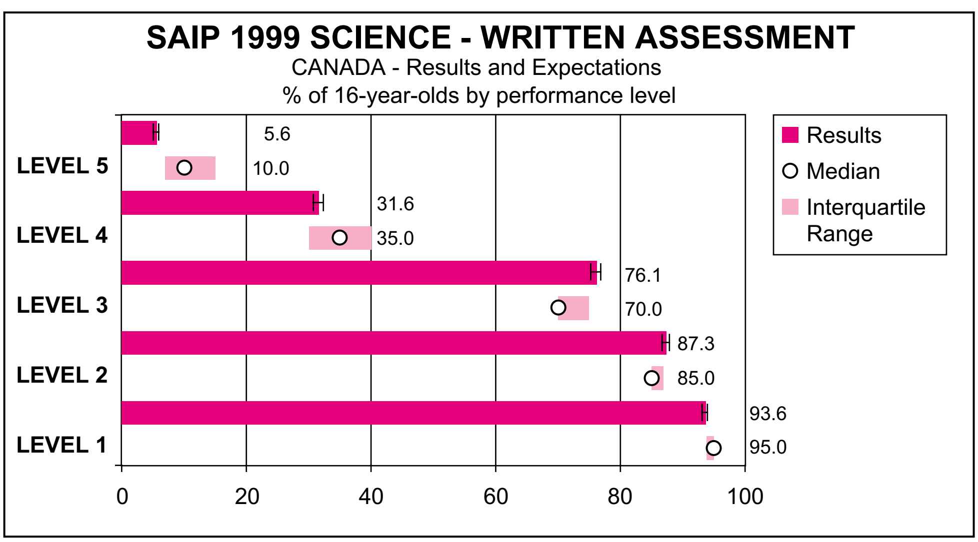


CHART 17

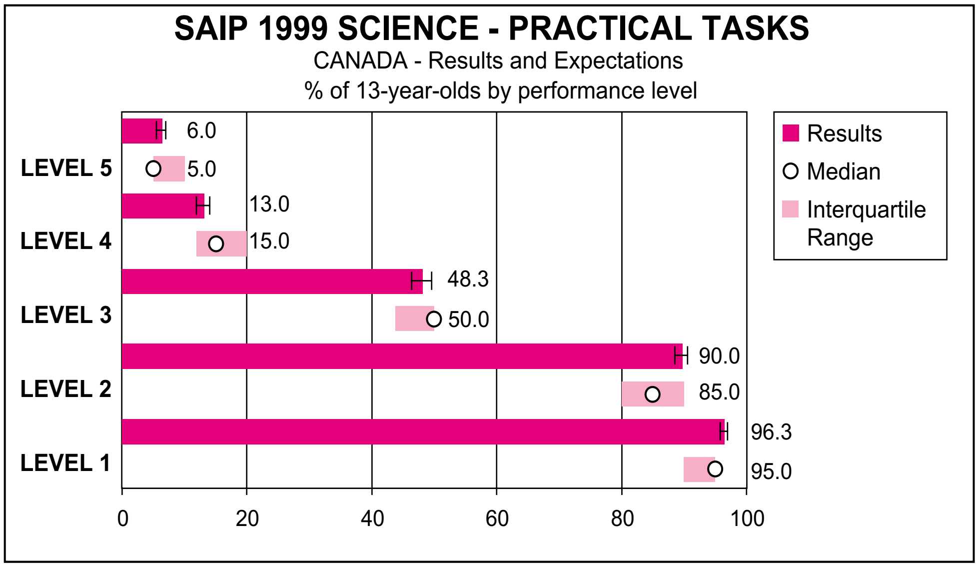
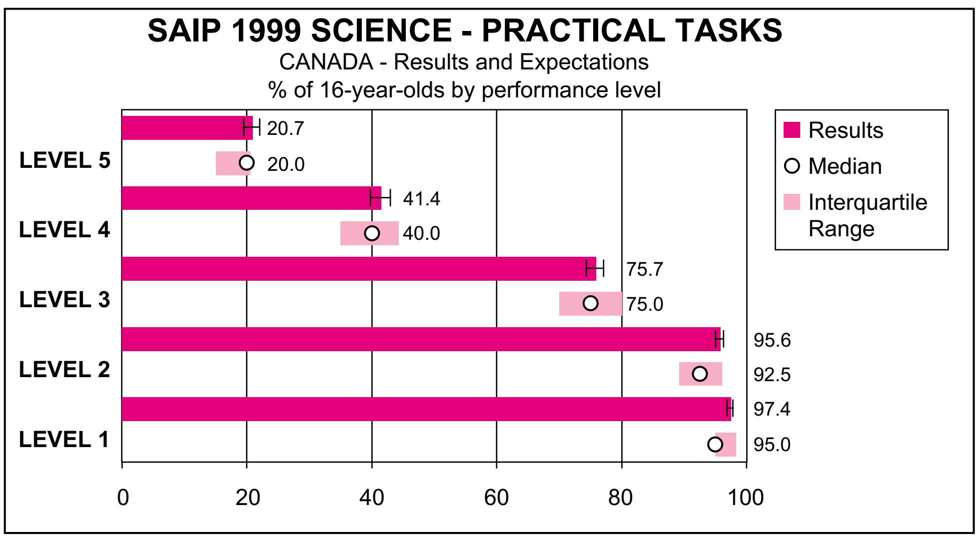


CHART 18



Results for the Jurisdictions

This section of the report presents a series of charts entitled "Overview of Achievement by Level." This is then followed by results for each individual jurisdiction.

OVERVIEW OF ACHIEVEMENT BY LEVEL

The following charts present the cumulative achievement levels for all jurisdictions. The data shown is an overview and displays the percentage of students at or above a particular level. This is a useful way to present comparisons between provincial results and the Canadian results, as the percentage of students at or above a particular level is more directly comparable than performance at any one level, except level 5. It is not always better to have a high percentage of students achieve at a particular level (for example, a high percentage of students achieving at level 1 would not be desirable). Percentages are weighted to represent more accurately the total student population of 13- and 16-year-olds.

The results do vary from jurisdiction to jurisdiction. The charts show that some provinces perform better than others. Achievement in some is significantly higher or lower than the Canadian results.

As before, percentages are based on samples of students. For all populations, performances are only statistical estimates of the actual achievement students would have demonstrated if all of the students in the population had taken the assessment. These estimates are shown through the use of *confidence intervals* as described previously in **Notes on Statistical Information**, page 18. Where confidence intervals overlap, there is **not** a statistically significant difference in the two percentages.

Charts 19 – 23 provide written assessment results for 13-year-olds

CHART 19

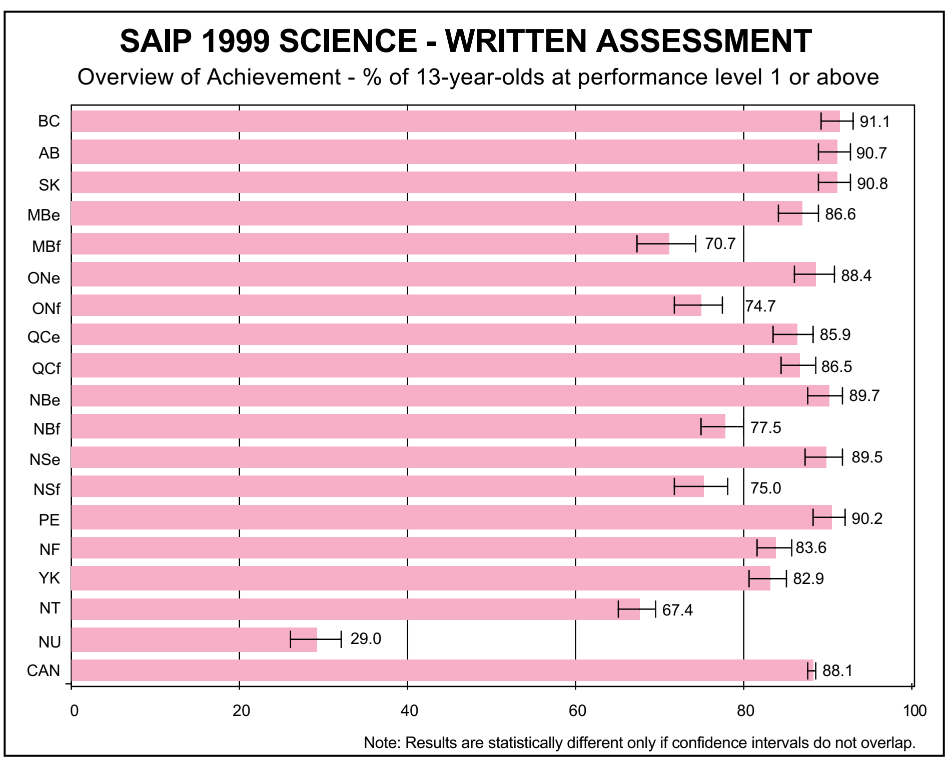


CHART 20

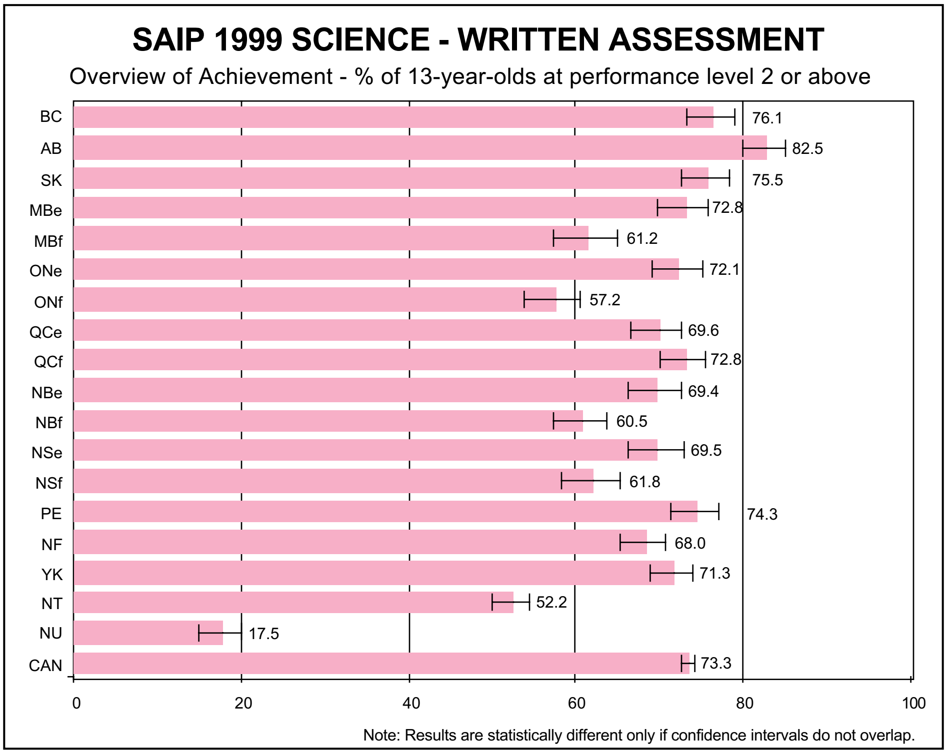


CHART 21

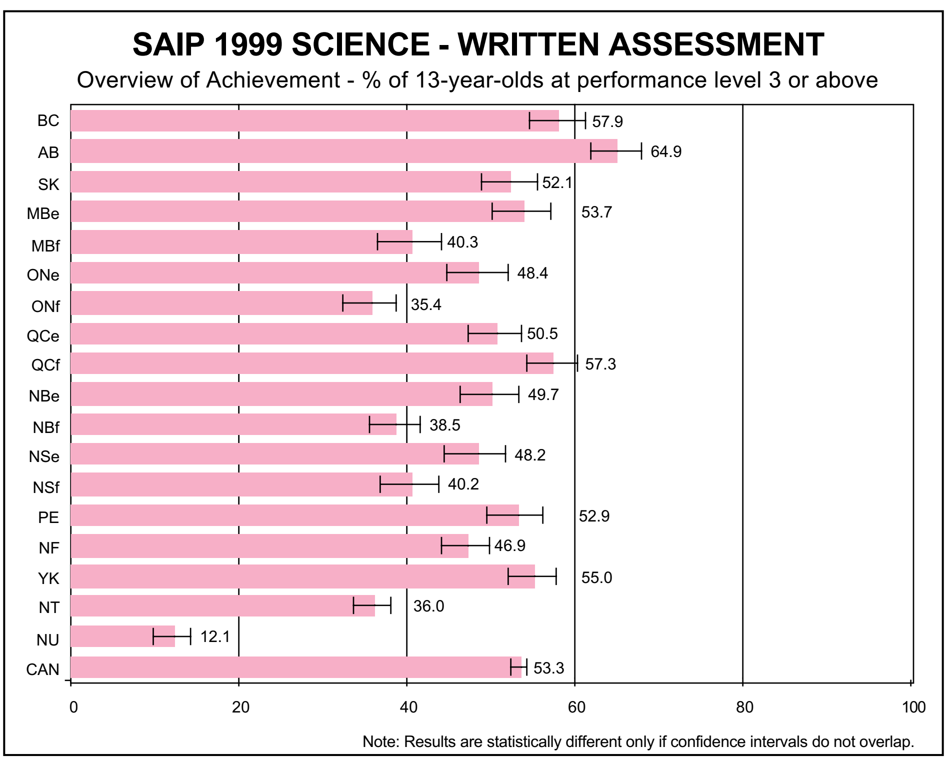


CHART 22

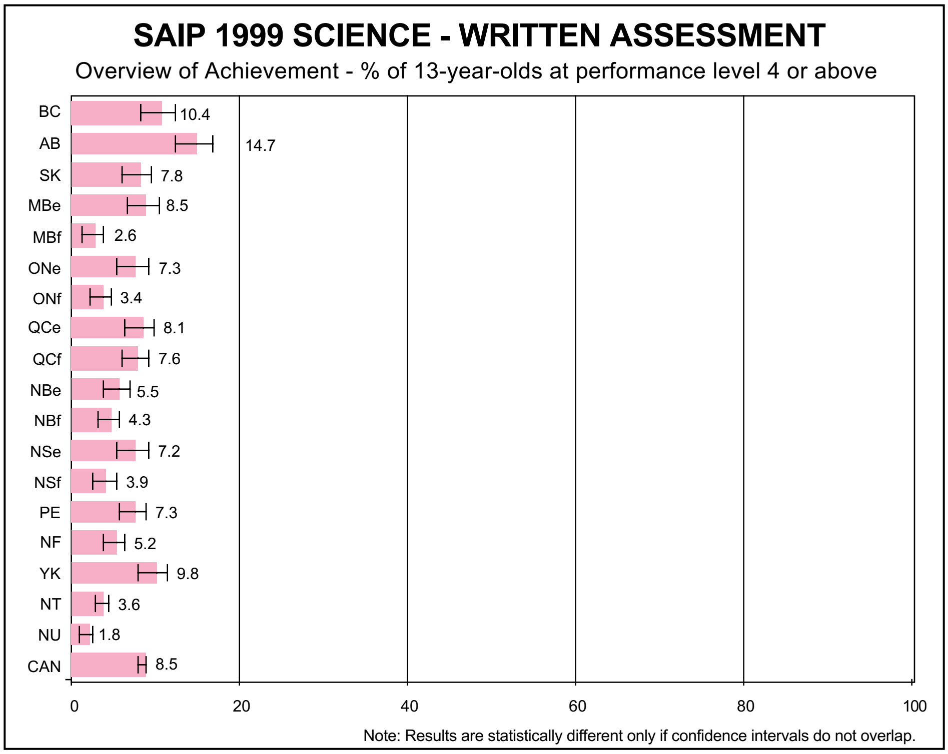
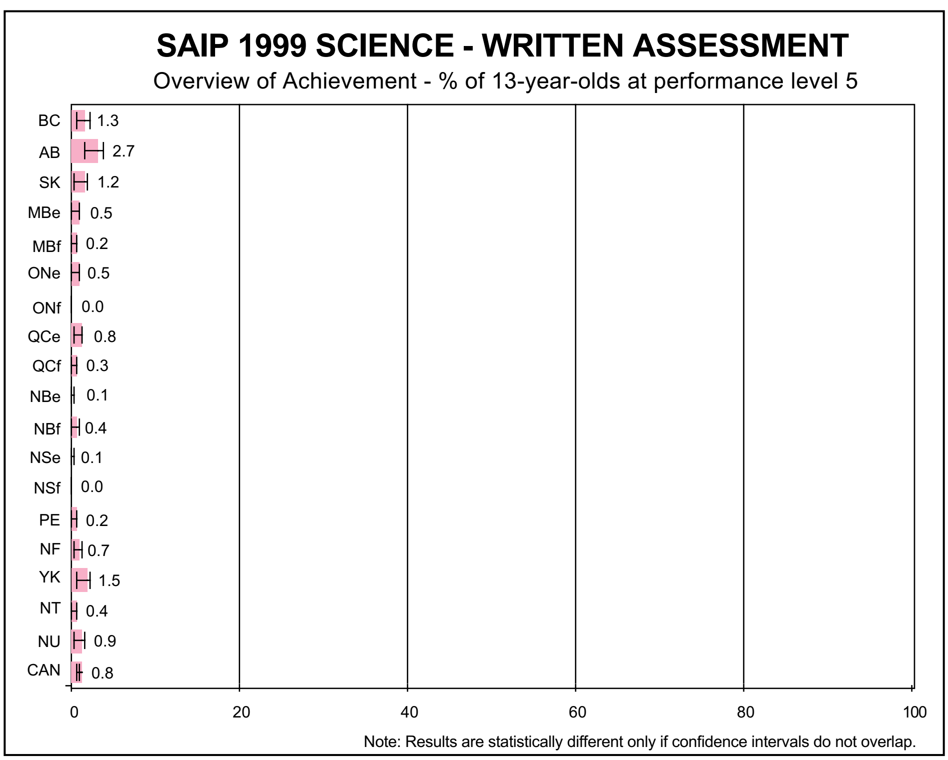


CHART 23



Charts 24 – 28 provide written assessment results for 16-year-olds

CHART 24

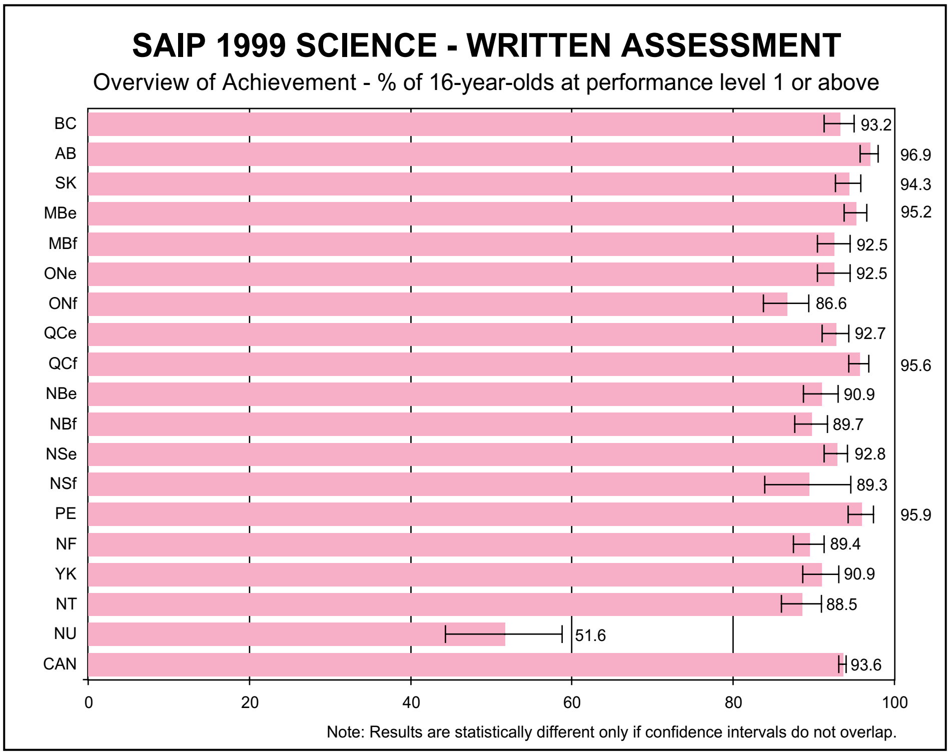


CHART 25

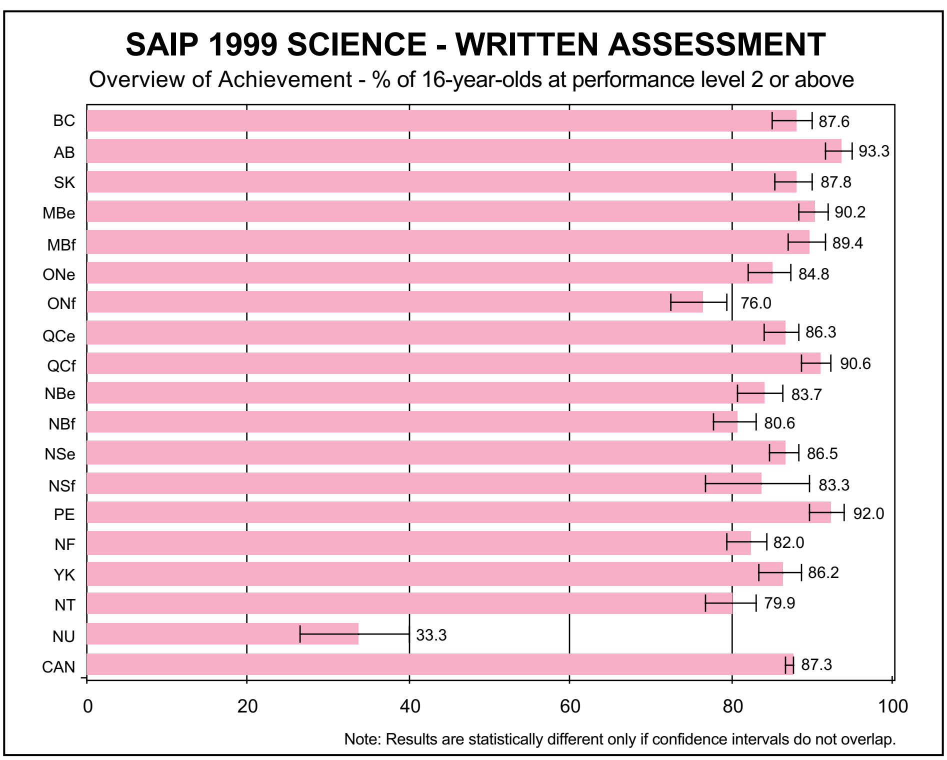


CHART 26

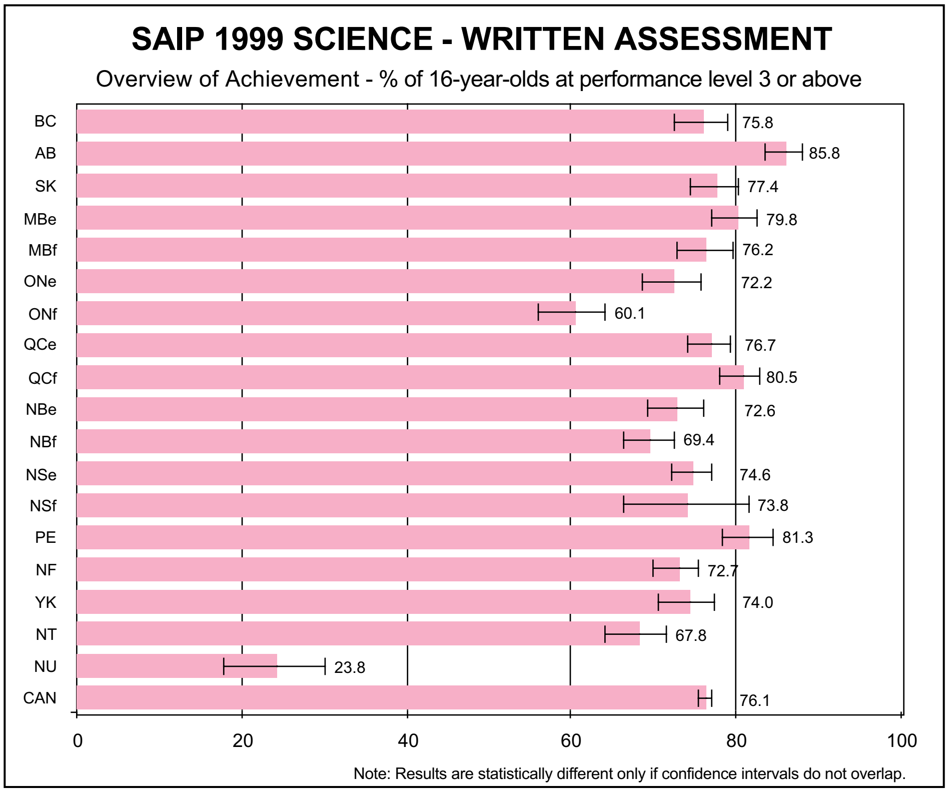


CHART 27

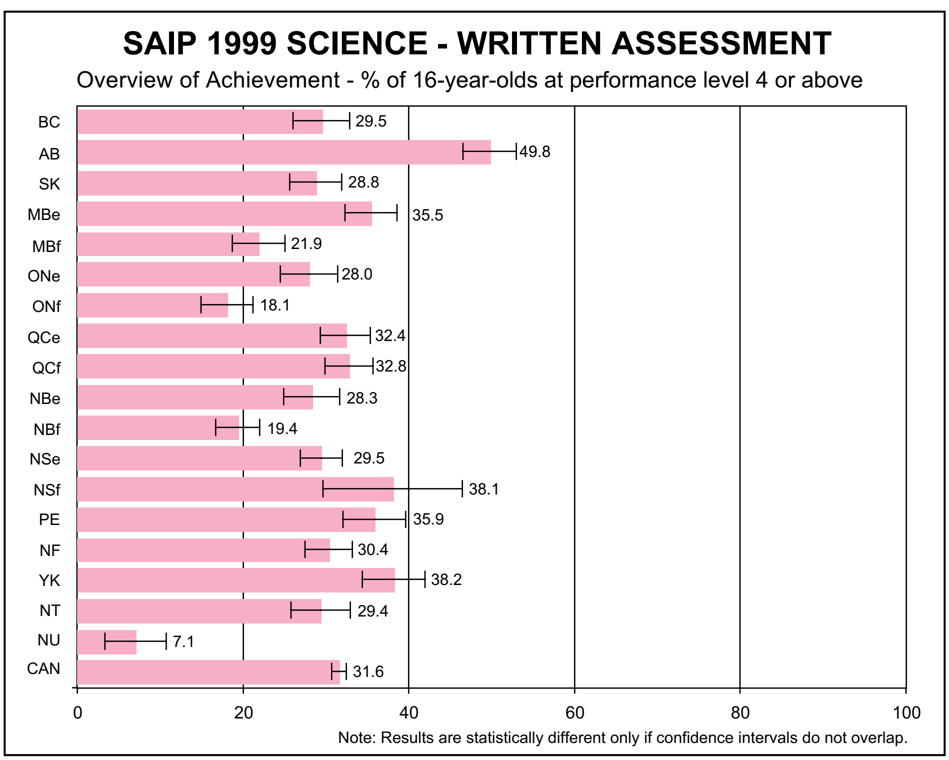
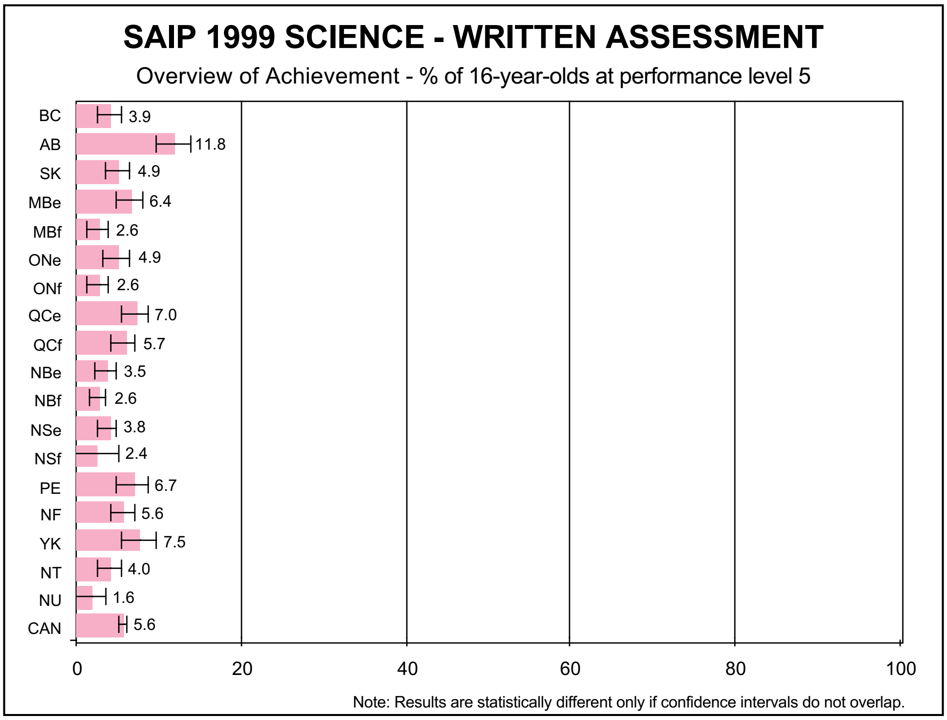


CHART 28



Charts 29 - 33 provide practical task assessment results for 13-year-olds

CHART 29

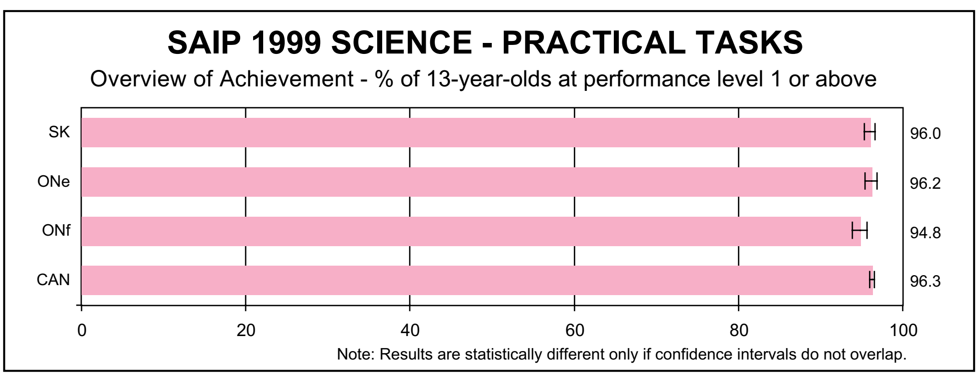


CHART 30

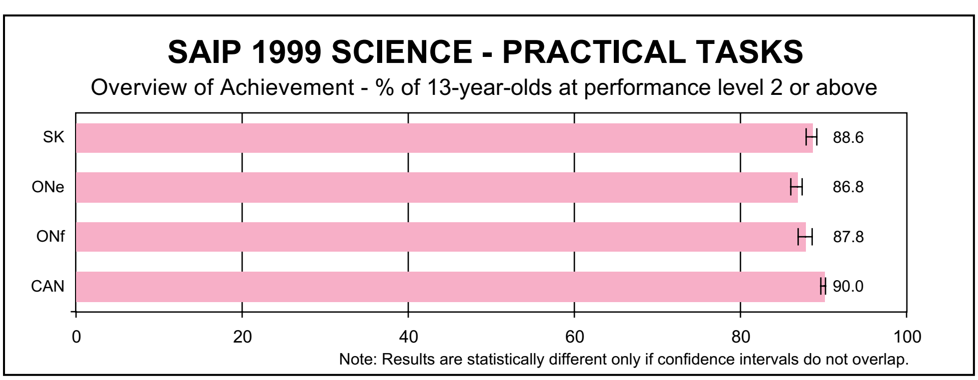


CHART 31

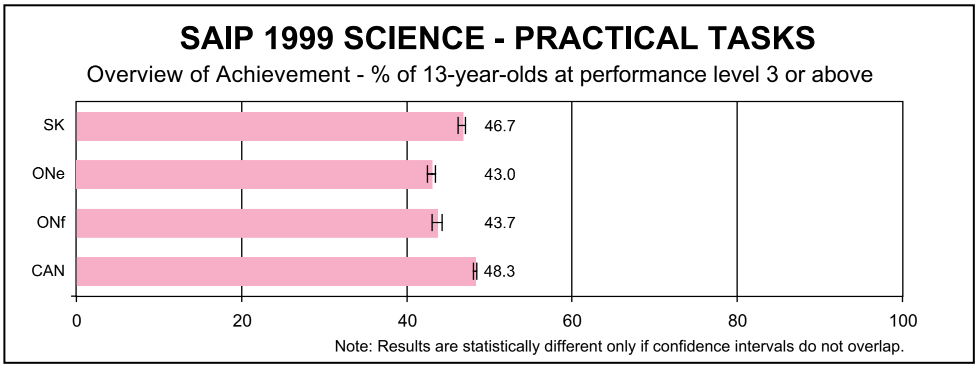


CHART 32

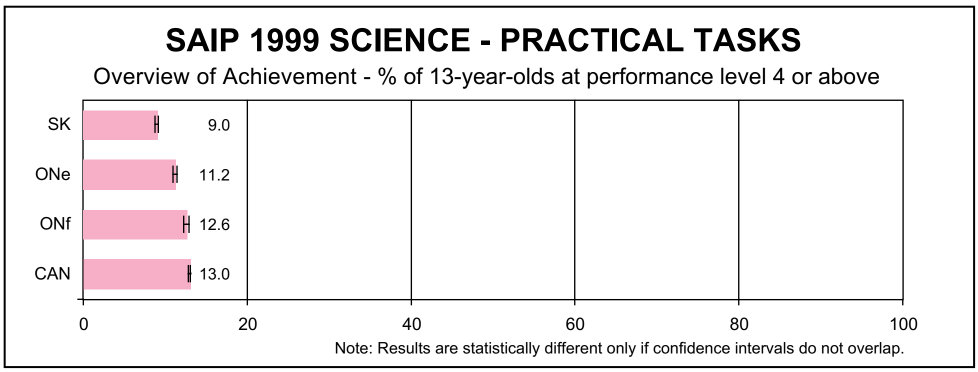
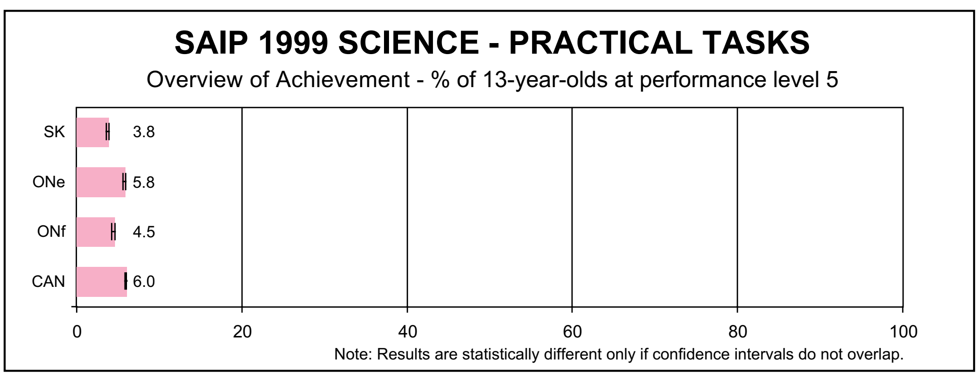


CHART 33



Charts 34 – 38 provide practical task assessment results for 16-year-olds

CHART 34

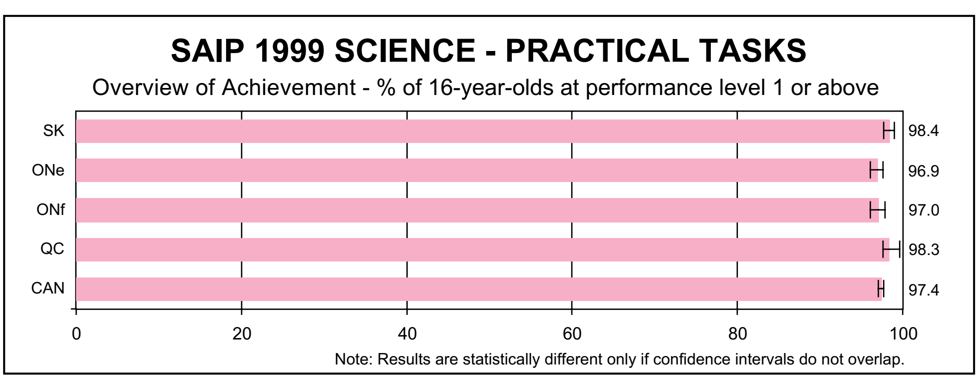


CHART 35

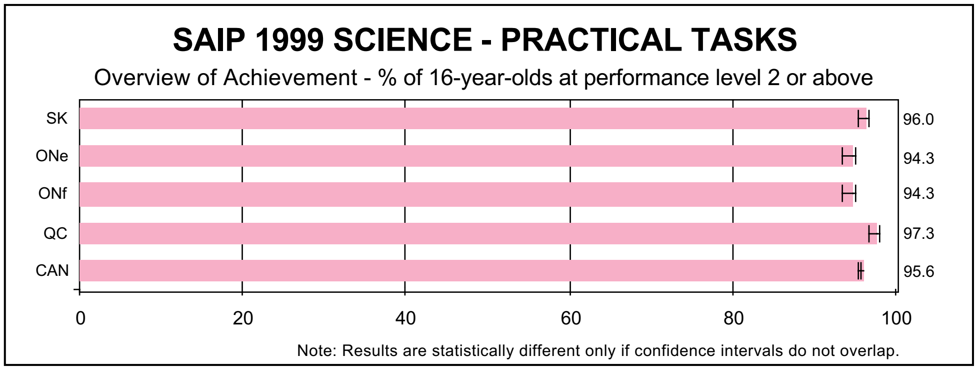


CHART 36

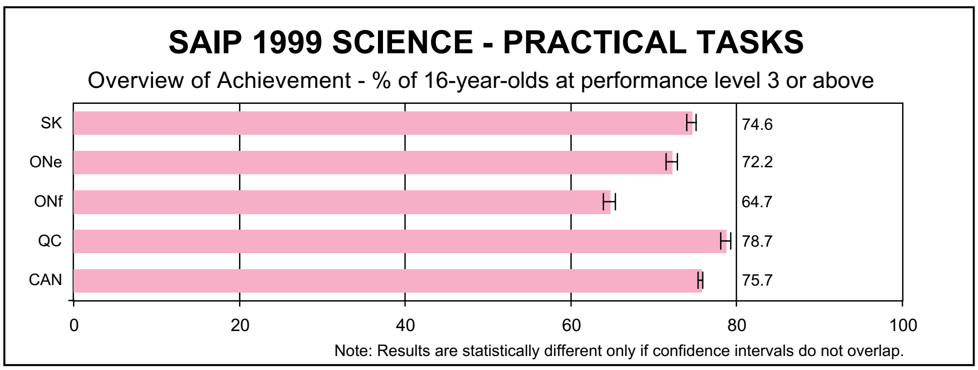


CHART 37

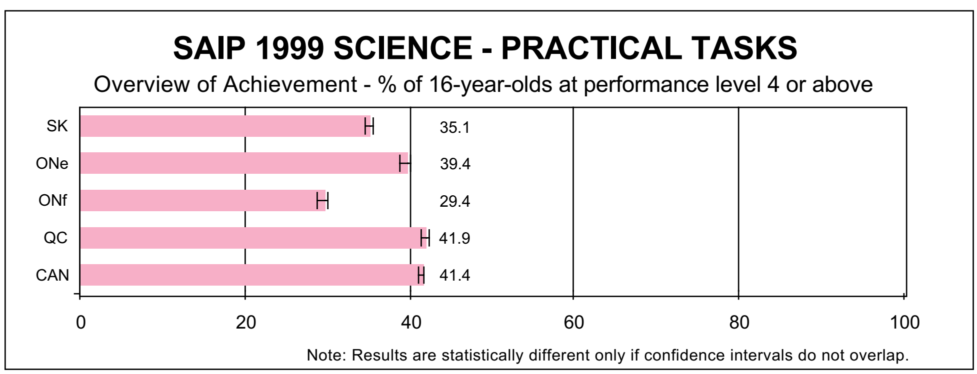
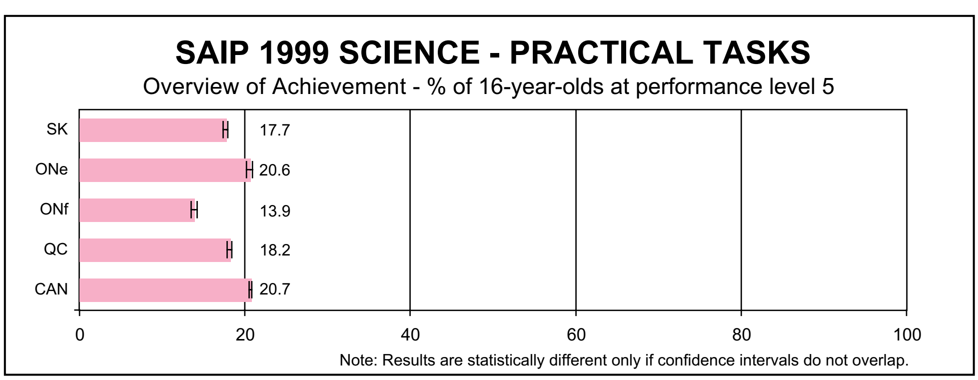


CHART 38



Social Context

British Columbia has a population of approximately 4 million, with 82% of people living in urban areas. An issue of ongoing interest is the provision of educational services to an increasing number of students from immigrant families, three-quarters of whom are from Asian countries. Approximately 13% of the student population are enrolled in English-as-a-Second Language (ESL) classes or programs. Enrolment in ESL has increased by 279% in the last 10 years. This influx has placed heavy demands on schools in the province to provide ESL instruction, 90% of which is in the Greater Vancouver Area. A further 11% of the student population is enrolled in Special Education programs, an increase of 83% in the last 10 years.

Organization of the School System

The public school system enrols about 614,000 students, employs about 39,000 educators, and is organized into 59 school districts that are highly diverse in both population and geography. Almost all 13-year-olds are in grade 8 or 9, where science is one of the subjects taught. Most 16-year-olds are in programs at the grade 11 or 12 level. Grade 10 is the last grade in which all students must take a common science course. At grades 11 and 12, students are required to take at least one grade 11 or 12 science course such as biology, chemistry, physics, applications of physics, geology, forests, agriculture, information technology, and science and technology.

Science Teaching

British Columbia has reviewed its science curriculum, and revisions have been incorporated into Integrated Resource Packages (IRPs), which are implemented in schools across the province. The learning outcome statements contained in the IRPs are content standards for the provincial education system. They are statements of what students are expected to know and do at an indicated grade and comprise the prescribed curriculum, which is mandated by the minister of education. However, teachers select the appropriate methods of instruction, and a wide range of teaching and learning strategies is used, based on the needs of the learner and the preferences of the teacher.

The science curriculum of British Columbia provides a foundation for the scientific literacy of citizens, for the development of a highly skilled and adaptable work force, and for the development of new technologies. It is the foundation on which teachers can develop a science program that provides a comprehensive set of knowledge, skills, and experience related to science. The intent is to encourage cooperative learning and authentic science opportunities and experiences for students.

Science Testing

In addition to participating in national and international assessments, British Columbia has, since 1976, assessed students in grades 4, 7, and 10 in mathematics, reading and writing, science, and social studies approximately every four years. As part of its provincial assessment program, the ministry has recently introduced an annual census assessment of reading comprehension, writing, and numeracy. Assessments in science and other subject areas will be conducted periodically as required and will be done on a sample basis.

All students taking chemistry, biology, physics, applications of physics, or geology at the grade 12 level are required to write Provincial Examinations, which count for 40% of their final grade.

In this province, all students performed as well as or better than Canadians as a whole. Slightly more 13-year-olds reached levels 1 and 3 than the Canadian average.

The performance of 13-year-old British Columbia students showed significant improvement between 1996 and 1999 at levels 3 and 4 while the performance of British Columbia 16-year-old students was significantly better in 1999 at level 3.

CHART 39

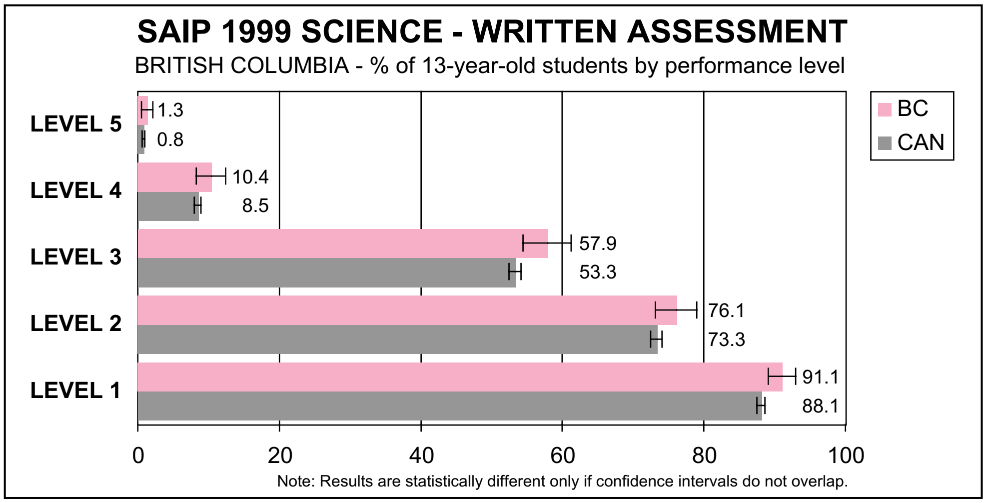
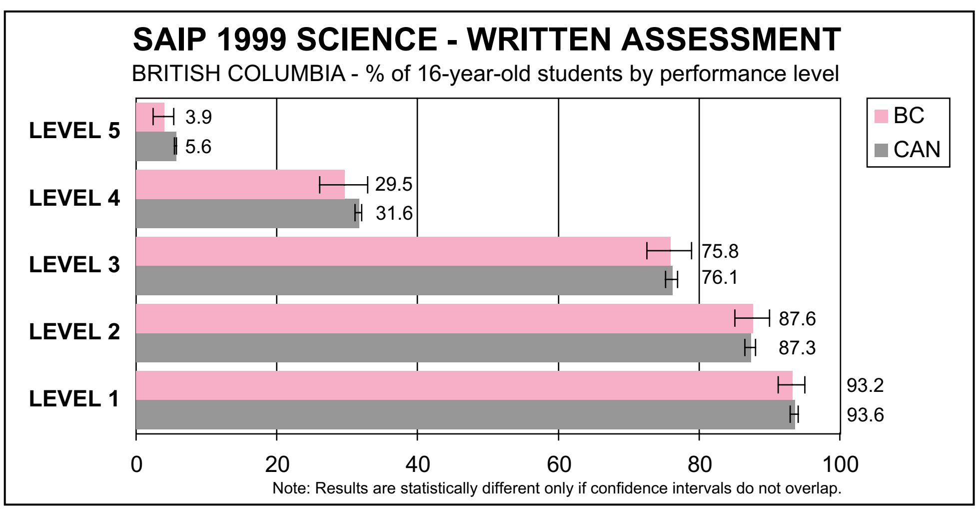


CHART 40



Social Context

Alberta has a population of approximately 3 million. All children are required to attend school from the ages of 6 to 16.

The Minister of Learning defines the curriculum and standards for student achievement in consultation with employers, parents, school authorities, teachers, and other stakeholders. Schools, school authorities, and the Ministry of Learning assess and report yearly to the public on a range of learner outcomes.

Organization of the School System

Nearly all (99.0%) of the 43,696 13-year-old students in Alberta are enrolled in junior high school. Only one science course is offered at each of grades 7, 8, and 9. The distribution of students by grade is shown below.

	1995–96	*1998–99*
Grade 7	9.6	6.5
Grade 8	63.2	66.0
Grade 9	24.6	26.5

	1995–96	*1998–99*
French Immersion	5.7	4.9
Francophone	0.6	0.6

Of the 40,602 16-year-old students in the province, nearly all (98.6%) are enrolled in senior high school. The senior high school science program has six course sequences: Science 10-20-30; Science 10, Biology 20-30; Science 10, Chemistry 20-30; Science 10, Physics 20-30; Science 14-24; Science 16-26. The 10-30 sequences are designed for students in academically focussed programs contemplating postsecondary study; the 14-24 sequence is for general program students, some of whom are not planning postsecondary studies; and the 16-26 sequence is for students enrolled in the Integrated Occupational Program. The following table shows the proportion of 16-year-old students taking science.

	1995–96	*1998–99*
Number of 16-year-old-students in the province	36,458	40,602
Number of 16-year-old students taking a science course	30,402	33,203
Percentage of 16-year-old students taking a science course	83.4	81.8

The following table summarizes course completions of 16-year-old students as a percentage of the population:

Grade 10		
	1995–96	1998–99
Number and % in grade		5,160 (12.7%)
Science 10	11%	9%
Science 14	9%	8%
Science 16	1%	1%

Grade 11		
	1995–96	1998–99
		25,313 (62.3%)
Science 20	3%	5%
Biology 20	29%	27%
Chemistry 20	29%	28%
Physics 20	18%	19%
Science 24	22%	11%
Science 26	1%	1%

Grade 12		
	1995–96	1998–99
		9,526 (23.5%)
Science 30	1%	1%
Biology 30	15%	13%
Chemistry 30	14%	12%
Physics 30	7%	7%

Curriculum

Alberta Learning reviews and revises science curriculum in a ten-year cycle. As core programs, science programs provide opportunities for students to develop the knowledge, skills, and attitudes they need for responsible citizenship, and at the same time, to explore interests and prepare for further education and careers.

To become scientifically literate, students must develop a thorough knowledge of science and its relationship to technologies and society. Students must also develop the skills needed to identify and analyse problems, to explore and test solutions, and to seek, interpret, and evaluate information. To ensure that a science program is relevant to students as well as to societal needs, the program must present science in a meaningful context — it must provide opportunities for students to explore the process of science, its applications and implications, and related technological problems and issues. By doing so, students become aware of the role of science in responding to social and cultural change and in meeting needs for a sustainable environment, economy, and society. The secondary science program is guided by the vision that all students should have the opportunity to develop scientific literacy.

The following goals for Canadian science education are addressed through the Alberta science program. Science education will

- encourage students at all grade levels to develop a critical sense of wonder and curiosity about scientific and technological endeavours
- enable students to use science and technology to acquire new knowledge and solve problems, so that they may improve the quality of their own lives and the lives of others
- prepare students to critically address science-related societal, economic, ethical, and environmental issues
- provide students with a foundation in science that enables them to pursue progressively higher levels of study, prepares them for science-related occupations, and engages them in science-related hobbies appropriate to their interests and abilities
- develop in students of varying aptitudes and interests a knowledge of the wide spectrum of careers related to science, technology, and the environment

Science Testing

Since 1982, data about student performance in science has been collected through a provincial student evaluation program for grades 6 and 9. Since 1995 these achievement tests have been administered annually. As well, since 1984, provincial diploma examinations have counted for 50% of a student's final mark in Biology 30, Chemistry 30, and Physics 30. A diploma examination in Science 30 has been offered since 1996. All diploma examinations include a written component that emphasizes the connections among science, technology, and society. The province has also developed classroom assessment materials (CAMP) for use by teachers in grades 1, 2, 4, 5, 7, 8, 10, and 11. This award-winning program provides examples of student work that illustrates provincial standards.

Provincial tests are based on Alberta's Program of Study. The tests help communicate provincial standards and provide information on the degree to which students in the province have met these standards.

Alberta students in both age groups performed significantly better than Canadian students as a whole at all levels.

The performance of 13-year-old Alberta students showed significant improvement between 1996 and 1999 at level 3, while the performance of Alberta 16-year-old students was significantly better in 1999 at levels 3 and 4.

CHART 41

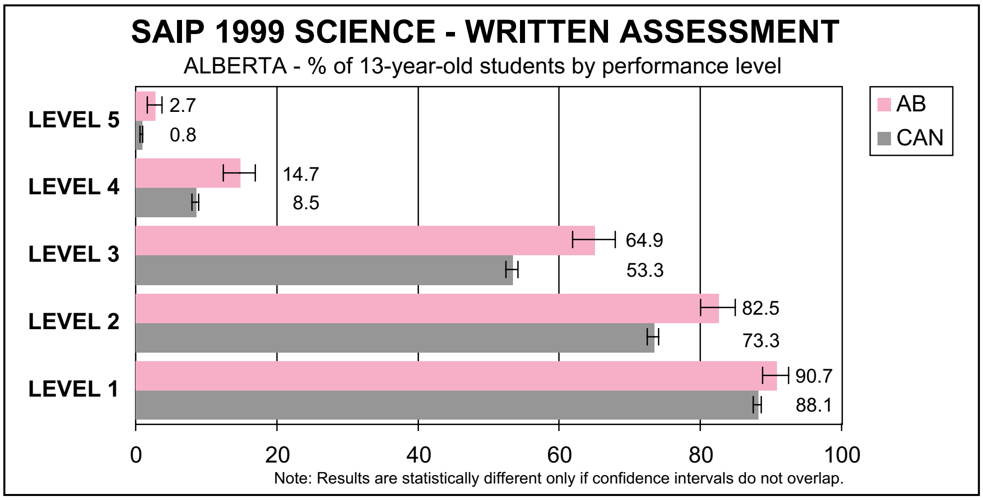
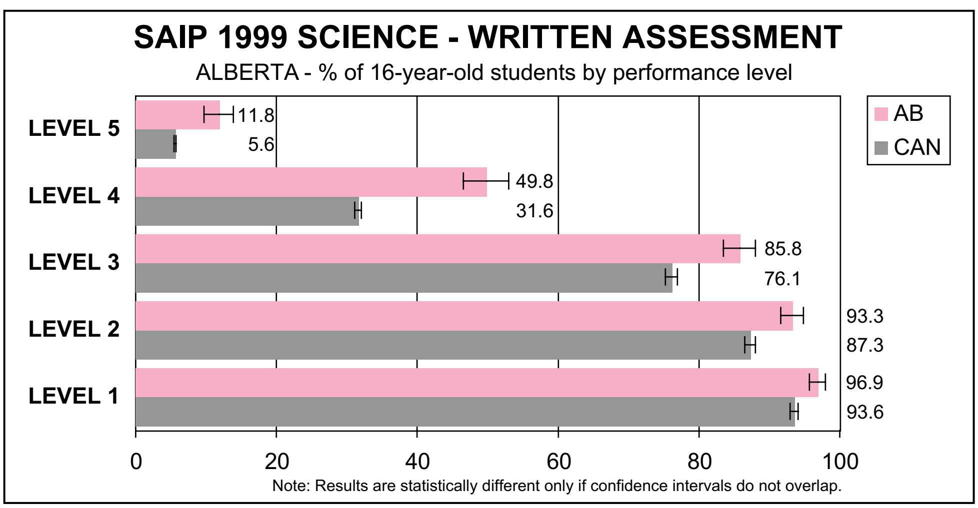


CHART 42



Social Context

Saskatchewan has a population of approximately one million people scattered across a vast geographic area. The setting is predominately rural; about half the population lives in towns, villages, rural municipalities, or on First Nations. Agriculture, potash and uranium mining, oil production, and forestry are major industries. Saskatchewan has a diverse cultural and ethnic heritage, including a large and growing Aboriginal population.

Organization of the School System

Saskatchewan has a population of approximately 210,000 students in kindergarten to grade 12. Just over 90% attend provincially funded schools, 6.5% attend school on the First Nations, and the remainder attend independent schools or are home-schooled. In 794 provincially funded schools, 11,319 educators teach 197 days per year. In September 1998, the student to educator ratio was 16.3:1. Because the category of educators includes classroom teachers, in-school administrators, teacher-librarians, and school psychologists, the provincial student to classroom teacher ratio was 21.2:1. Saskatchewan has a large proportion of small schools, with 199, or 25%, having 100 or fewer students while another 24% have enrolments from 101 to 200 students.

Over the past decade, the province has devoted considerable effort to reforming its curricula and, since 1990, nearly one hundred new courses from kindergarten to grade 12 have been developed and introduced to classrooms across the province. These courses emphasize a wide range of knowledge, skills, attitudes, and values, including basic and advanced thinking skills.

Science Teaching

K-12 science curricula in Saskatchewan are based on the concept of scientific literacy. For Saskatchewan schools, seven Dimensions of Scientific Literacy define this concept. This philosophical basis is derived from a broad conception of the purpose of science instruction as expressed in *Science for Every Student* (Report #36, Science Council of Canada, 1984). Actively participating in K-12 science will enable a student to

- understand the nature of science and scientific knowledge as a unique way of knowing
- understand and appropriately apply the concepts, laws, principles, and theories of science when interacting with society and the environment
- use the processes of science in solving problems, making decisions, and furthering understanding
- understand the joint enterprises of science and technology, and the interrelationships of these to each other in the context of society and the environment
- develop manipulative skills (especially of measurement) associated with science and technology
- interact with the various aspects of society and the environment in a way that is consistent with the values of science
- develop a unique view of technology, society, and the environment as a result of science education, and continue to extend this interest and maintain an inquiring attitude throughout life

The study of science should help students make better sense of the world. Students create their own conceptual maps of their environments and of the ideas they encounter. They learn in their science classes that those concepts and the maps that describe the links between concepts are tentative, are subject to questioning, and can be revised through investigation.

Science Assessment and Evaluation

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% of each student's final mark, and those who are accredited in a particular subject are responsible for assigning 100% of the grade 12 final mark.

Students are assessed on the full range of knowledge, 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 that they use in adapting the instruction to each class and to each student.

Written Assessment

Saskatchewan 13-year-olds and 16-year-olds performed as well as Canadian students as a whole at all levels. Slightly more 13-year-olds reached level 1 than in the Canadian sample.

The performance of 13-year-old Saskatchewan students showed significant improvement between 1996 and 1999 at levels 3, 4, and 5, while the performance of Saskatchewan 16-year-old students was significantly better in 1999 at level 3.

CHART 43

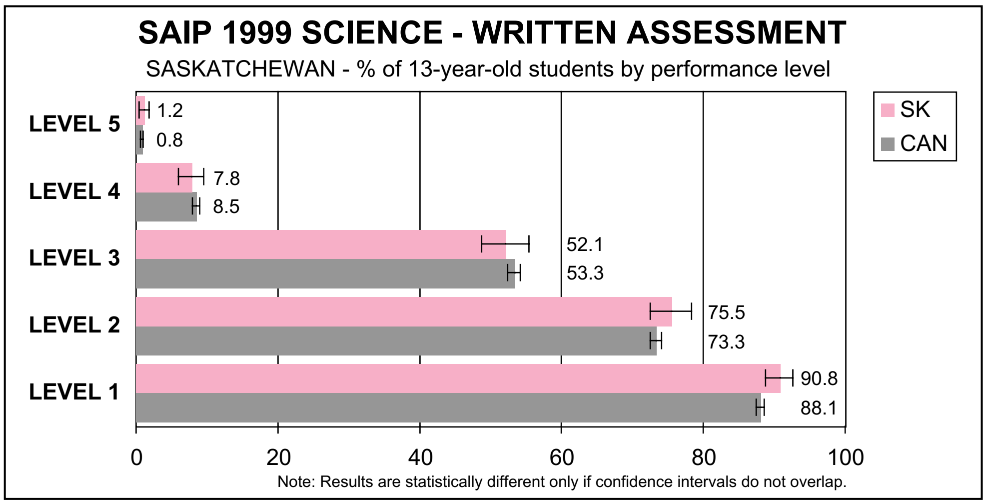
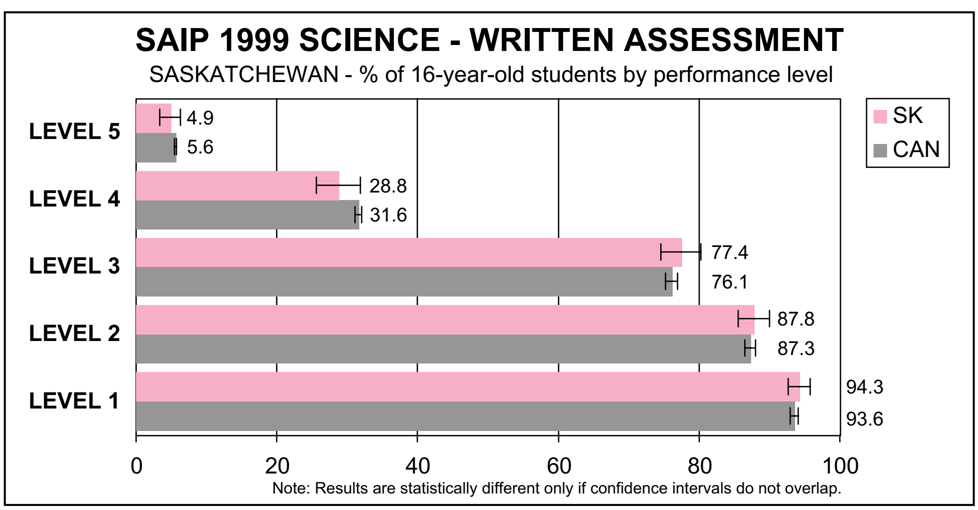


CHART 44



Practical Task Assessment

As in 1996, Saskatchewan chose to administer the practical task assessment to a large enough sample of students to allow reporting at the provincial level.

Saskatchewan students in both age groups performed at least as well as students in the Canadian sample, except that slightly fewer Saskatchewan 16-year-old students reached level 4.

The performance of 13-year-old Saskatchewan students in practical tasks showed significant improvement between 1996 and 1999 at levels 4 and 5, while the performance of Saskatchewan 16-year-old students was significantly better in 1999 at levels 3, 4, and 5.

CHART 45

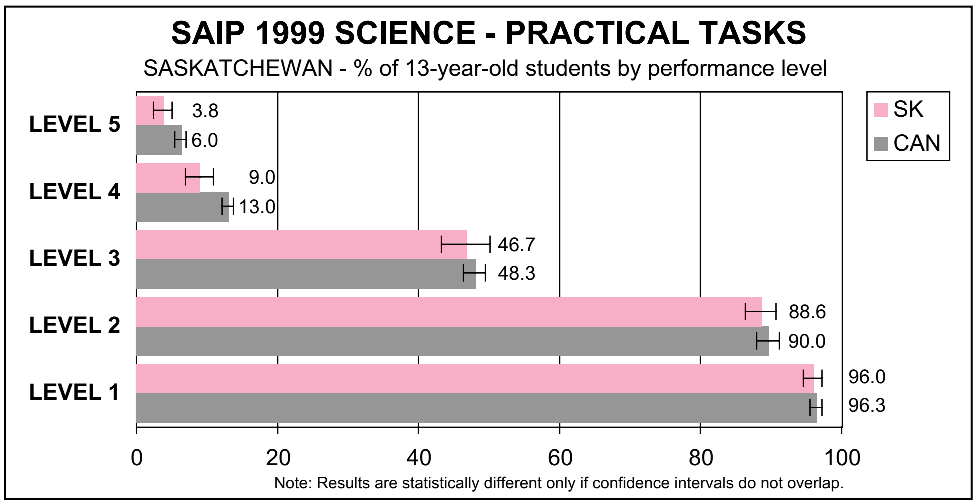
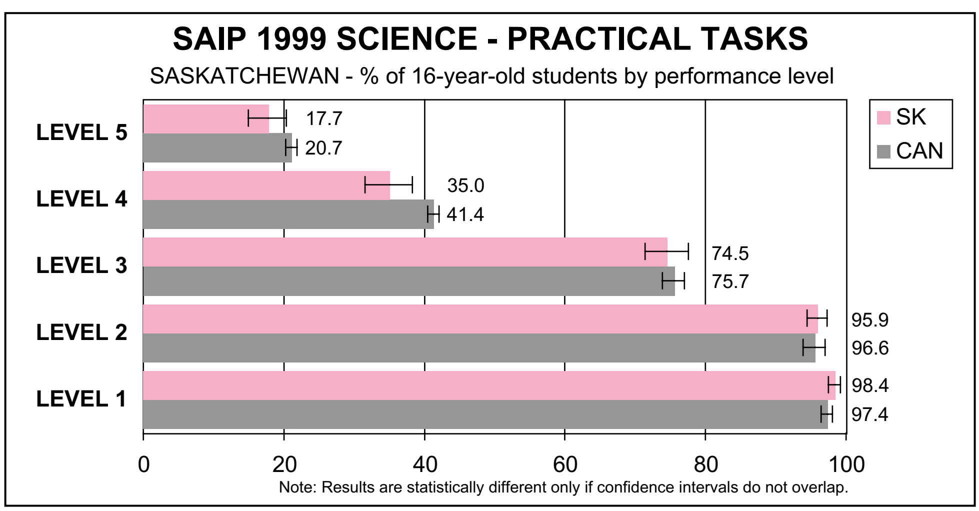


CHART 46



Social Context

Manitoba has a population of approximately one million, 60% of whom reside in the capital city of Winnipeg. Manitoba must meet the educational needs of a wide range of ethnic and cultural groups. English-as-a-Second-Language (ESL) instruction is provided for immigrant students. There is a strong Franco-Manitoban community in the province with students enrolled in the Français program. The French Immersion program has become an option for about 9% of students. In addition, there is a notable representation in the public schools of the Aboriginal community in both urban and rural/ remote regions of the province. Manitoba has a broad and diverse economic base.

Organization of the School System

Manitoba's school system enrols approximately 195,000 students in kindergarten to senior 4 (grade 12). It employs about 13,500 teachers in 46 school divisions and 8 districts. For program delivery purposes, schools are encouraged to group grades according to early years (kindergarten to grade 4), middle years (grades 5 to 8), and senior years (senior 1 to 4). Students may choose courses from four school programs — an English Program, Français Program, French Immersion Program, and a senior years Technology Education Program. The students selected to participate in the SAIP science assessment were either 13 or 16 years of age. Most 13-year-old students were in grade 8 or grade 9 (senior 1), and most 16-year-old students were in senior 3 or senior 4.

Science Teaching

Manitoba is currently in a state of transition with science curriculum development and implementation. New kindergarten to senior 4 (grade 12) science curricula are being developed based on the *Common Framework of Science Learning Outcomes*. The new Manitoba science curricula are being designed with the goal of developing scientifically literate students. The curricula have general learning outcomes in the following areas:

A. Nature of Science and Technology
B. Science, Technology, Society, and Environment (STSE)
C. Science and Technology Skills and Attitudes
D. Essential Science Knowledge
E. Unifying Concepts

Specific student learning outcomes are identified at each grade and linked to one or more of the general learning outcomes. New curricula emphasize the importance of teaching and learning science in real and relevant contexts and the acquisition of scientific and technological skills and attitudes. Science teachers are encouraged to use a wide variety of instructional strategies to address the needs of all students and to connect classroom teaching with the real world.

Science Testing

From 1979 to 1994, Manitoba Education and Training administered a provincial curriculum assessment program in major subject areas at early, middle and senior years. This program was suspended in November 1994 to enable the department to refocus its resources on a comprehensive standards testing program as part of the New Directions educational reform initiative.

For the SAIP Science Assessment, students were tested in the language of instruction.

Manitoba 13-year-olds who responded in English performed as well as students at all levels in the Canadian sample. Manitoba 16-year-olds who responded in English performed at least as well as the Canadian students as a whole and better than the Canadian students at levels 2 and 3 in the assessment.

The performance of both 13-year-old and 16-year-old Manitoba students who wrote the assessment in English showed significant improvement between 1996 and 1999 at level 3.

CHART 47

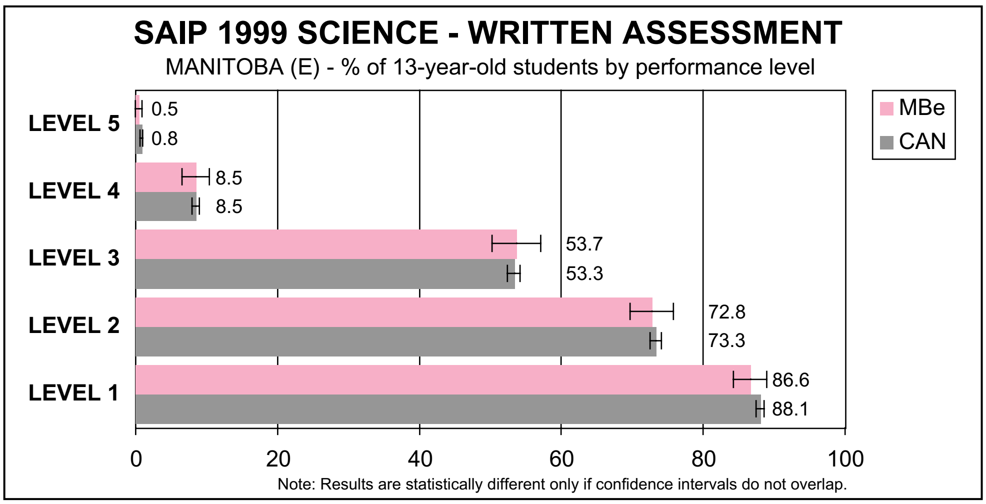
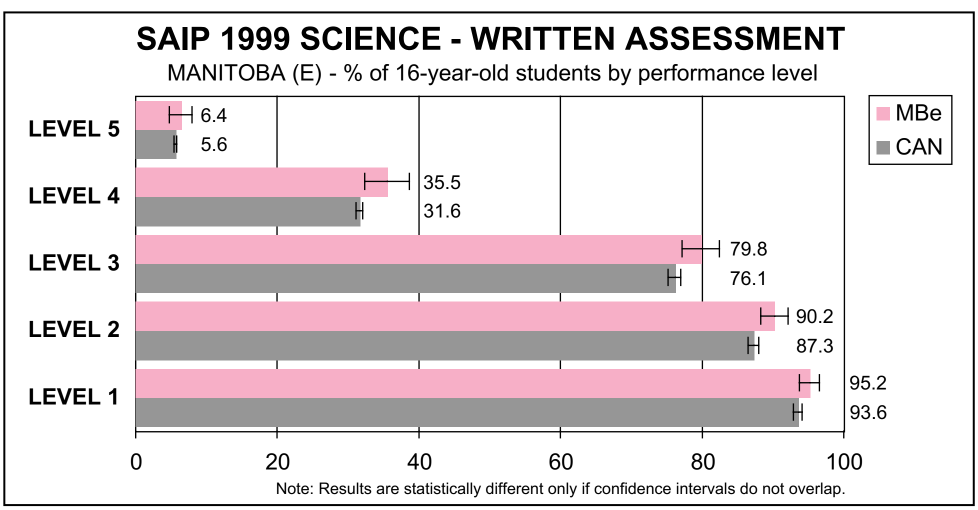


CHART 48



There are significant differences in performance between 13-year-old Manitoba students who wrote the assessment in French and Canadian students as a whole. Manitoba 16-year-olds who responded in French performed as well as the Canadian students for levels 1, 2, and 3.

The performance of both 13-year-old and 16-year-old Manitoba students who wrote the assessment in French showed significant improvement between 1996 and 1999 at level 3.

CHART 49

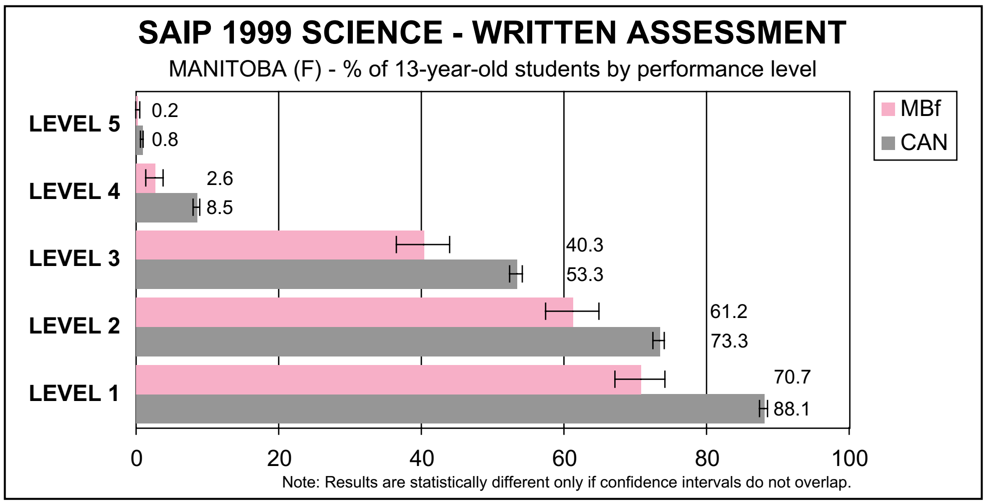
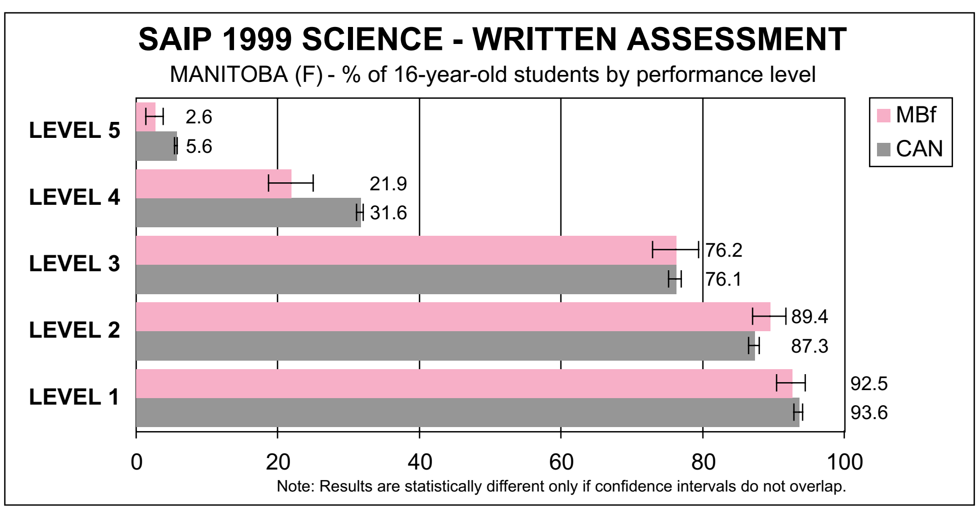


CHART 50



Social Context

Ontario is characterized by a range of boards, from large urban school boards that serve densely populated communities, to northern district school boards that serve small numbers of students spread over wide geographic areas. The school board system is made up of 60 English-language and 12 French-language boards as well as 37 school authorities, which are responsible for schools in small and remote communities. A critical issue in the provision of education programs and services is the diverse ethnocultural composition of Ontario's student population and the large number of children and youth from immigrant families. Through primary and secondary immigration, Ontario receives approximately 68% of Canada's newcomers. To overcome language and cultural barriers that could affect student achievement, boards and schools, especially in urban areas, have to provide instruction in English- and French-as-a-second-language, as well as community outreach services.

Organization of School System

Ontario has two types of publicly funded school boards: public boards, which enrol approximately 70% of the student population, and Catholic boards, which enrol the other 30% of the student population. Of the 5% of students enrolled in French-language school programs, about 80% are in Catholic schools.

In 1998–99, Ontario had 1,394,701 students enrolled in 3,946 elementary and 697,311 students enrolled in 805 secondary schools. There were approximately 117,452 full-time teachers. Seventy per cent of the boards offer French-language education. The school program can extend from junior kindergarten (age 4) to the Ontario academic courses (OACs) usually taken in the final year of secondary school, which are designed to prepare students for postsecondary education and the workplace. Students entering grade 9 in the fall of 1999 will graduate at the end of grade 12.

Science Teaching

Ontario has developed new, expectations-based curriculum in every subject from grades 1 through 12. The science expectations are included in the science and technology curriculum document for grades 1-8 and the science curriculum documents for grades 9-12. Earth and space science has not been a major part of Ontario science programs, other than a rarely offered geology program at the senior level.

Science from grades 1-8 is presented in an integrated science and technology, activity-based curriculum that encourages the exploration of a variety of areas in science and technology.

The new science program in grades 9 and 10 provides a broad overview of science including the subdisciplines of biology, chemistry, earth and space science, and physics. Grade 9 is the first year in which science courses are offered either as an applied or academic course. Students are required to take science to the end of grade 10, i.e., two credits are required in science for graduation.

In grades 11 and 12, science programs are delivered in the more specialized areas of chemistry, physics, biology, and earth and space science, and offered as university, college, university/college, or workplace courses.

Most 13-year-old students in this assessment are enrolled in either grade 9 science or grade 8 science and technology, both of which are mandatory core subjects. The science experiences of 16-year-old students are extremely varied — from having no science since grade 10 to having completed one or two specialized programs at the senior level.

Science Testing

Classroom teachers are responsible for classroom evaluation and promotion to the next grade level; Ontario does not conduct province-wide examinations for these purposes. The Education Quality and Accountability Office (EQAO) was established in 1995 to ensure greater accountability and to contribute to the enhancement of education in Ontario. In 1997 and 1998, the EQAO conducted a test of all grade 3 students in reading, writing, and mathematics. In 1997, it conducted an assessment in mathematics for a random sample of grade 6 students; in 1998, a similar assessment was administered to a random sample of grade 9 students. In 1999, the EQAO conducted a test of all grade 3 and grade 6 students in reading, writing, and mathematics based on the new curriculum expectations. Province-wide testing of all grade 3 and grade 6 students in these subjects will take place every year. The ministry has also announced that starting in the 2000–01 school year, all grade 9 students will be tested in mathematics, and all grade 10 students will have to pass a test of reading and writing skills to obtain their high school diploma. The following chart indicates the provincial assessment schedule.

Grade/Year	*1998–1999*	*1999–2000*	*2000–2001*
All grade 3 students	Reading, Writing, Mathematics	Reading, Writing, Mathematics	Reading, Writing, Mathematics
All grade 6 students	Reading, Writing, Mathematics	Reading, Writing, Mathematics	Reading, Writing, Mathematics
All grade 9 students			Mathematics
All grade 10 students			Reading and Writing Skills

With respect to the science program, Ontario has a history of involvement in international assessments, such as those conducted by the IEA and the IAEP. In addition, over the past decade, Ontario has conducted provincial reviews in senior division chemistry and physics programs.

Written Assessment

Except for 13-year-olds at level 3, where there is a slight difference, Ontario 13-year-olds and 16-year-olds who responded in English performed as well as Canadian students as a whole.

The performance of 13-year-old Ontario students who wrote in English showed significant improvement between 1996 and 1999 at level 3, while the performance of Ontario 16-year-old students was significantly better in 1999 at levels 3 and 4.

CHART 51

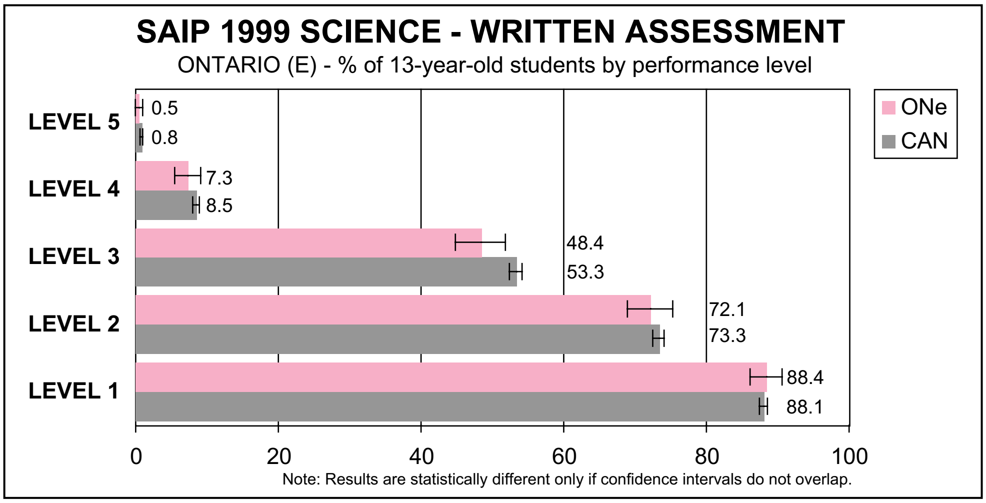
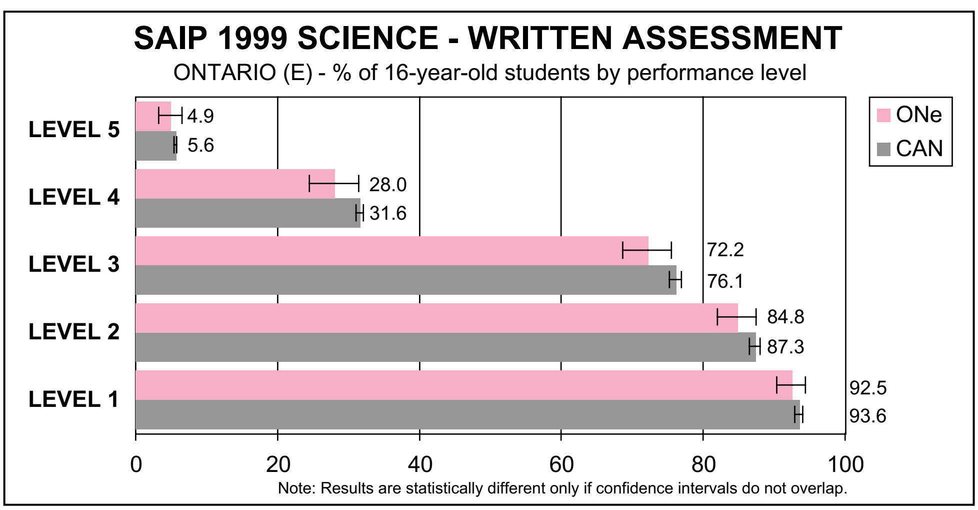


CHART 52



Practical Task Assessment

Ontario 13-year-olds and 16-year-olds who responded in English performed as well as Canadian students as a whole.

The performance of Ontario English 13-year-olds and 16-year-olds showed significant improvement between 1996 and 1999 at levels 3, 4, and 5.

CHART 53

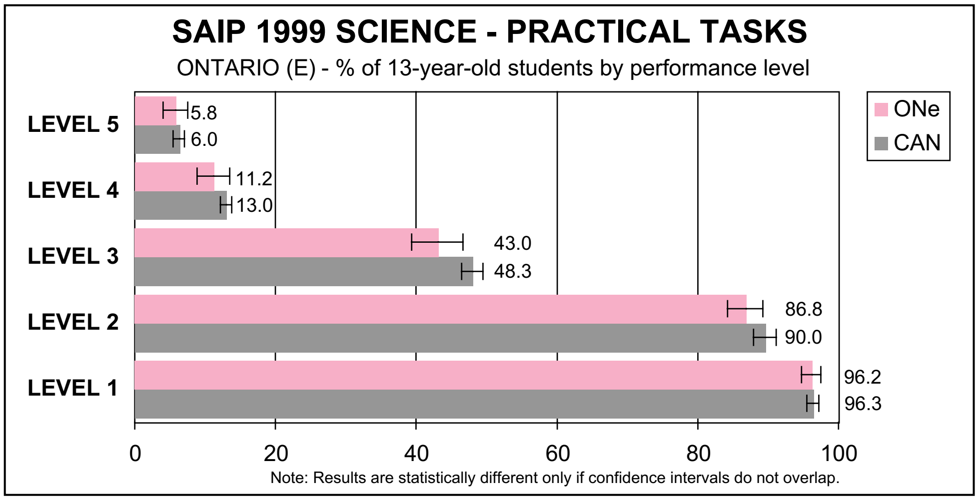
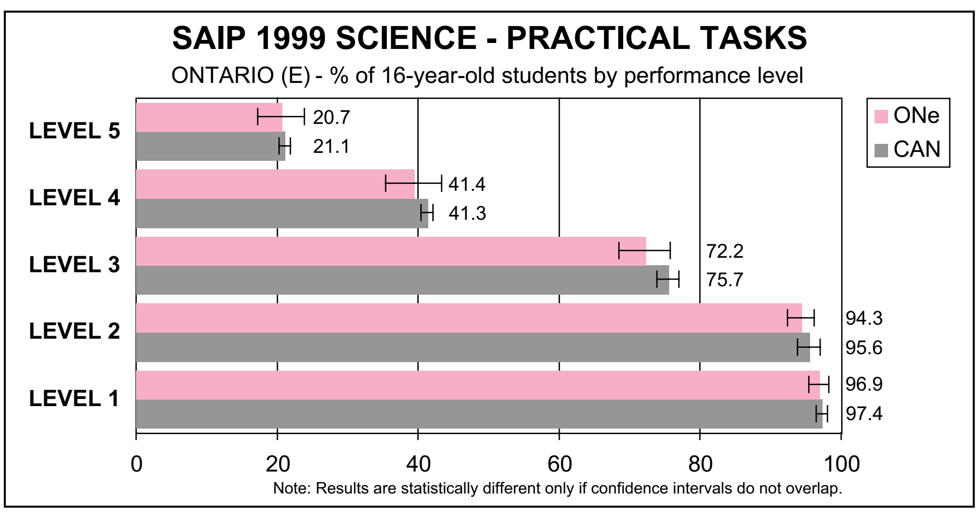


CHART 54



Written Assessment

There are significant differences in performance between both 13-year-old and 16-year-old Ontario students who wrote the assessment in French and Canadian students as a whole.

The performance of Ontario French 13-year-olds and 16-year-olds showed significant improvement between 1996 and 1999 at level 3.

CHART 55

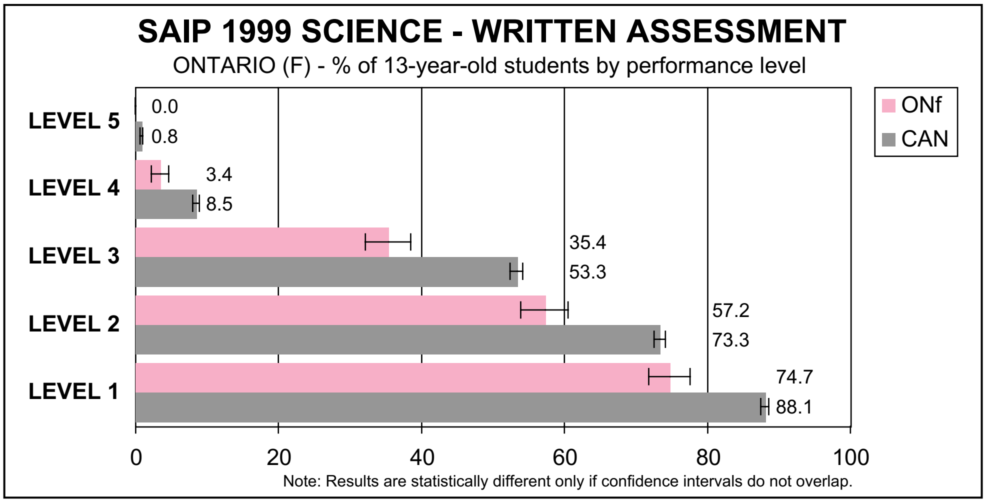
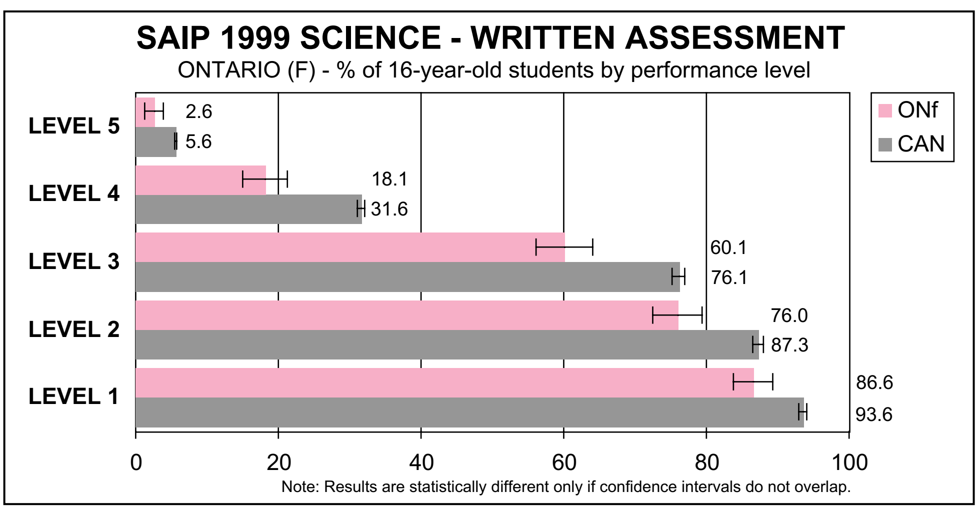


CHART 56



Practical Task Assessment

Ontario 13-year-olds who responded in French performed as well as the Canadian sample as a whole. Ontario 16-year-olds who responded in French performed as well as the Canadian sample at levels 1 and 2, but fewer students reached levels 3, 4, and 5 than did Canadian 16-year-olds as a whole.

The performance of Ontario French 13-year-olds showed significant improvement between 1996 and 1999 at all levels. The performance of Ontario French 16-year-olds showed significant improvement between 1996 and 1999 at levels 3, 4, and 5.

CHART 57

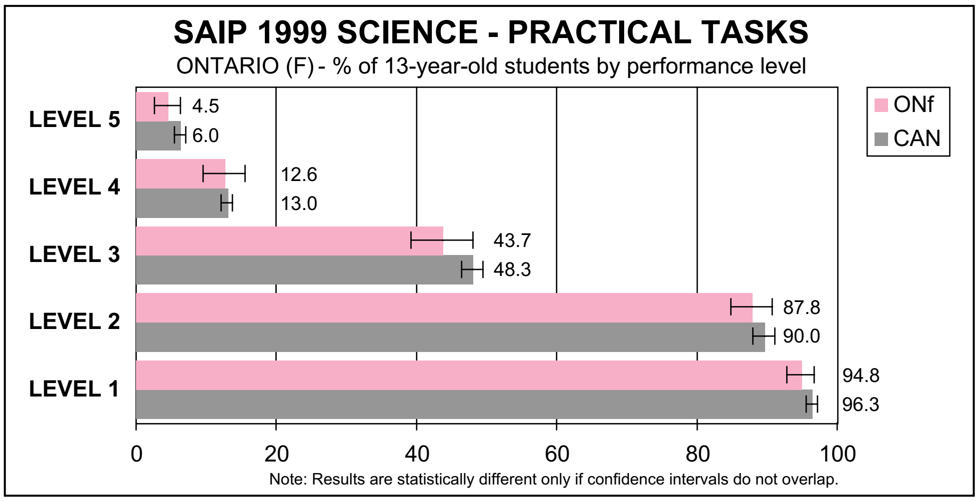
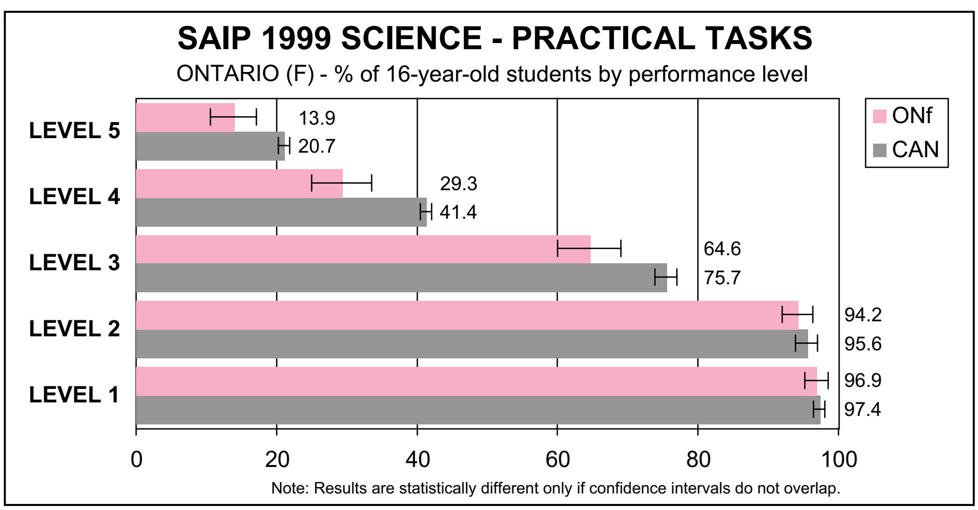


CHART 58



Social Context

For some years now, Quebec has been modernizing its education system in order to meet the requirements of today's society. The current education reform is the result of a democratic process. The Estates General on Education, initiated in 1995, were structured to involve people throughout Quebec in consultations on the problems in the education system, on the measures needed to remedy these problems, and on medium- and long-term adjustments required to ensure that the system adapts to the socioeconomic and sociocultural changes that are emerging as the 20th century draws to a close.

Quebec's population of over seven million is concentrated in the south of the province, mostly in its largest city, Montreal, and its capital, Quebec. The official language of Quebec is French. Francophones account for 80% of Quebec's total population. Anglophones make up about 9% and have access to a system of English educational institutions from preschool to university. There are eleven Native peoples in Quebec: eight under federal jurisdiction and three under the jurisdiction of the Quebec Ministry of Education. Both levels of government provide funding for education.

In addition, an increase in immigration, especially in the Greater Montreal area, has resulted in a massive inflow of students whose mother tongue is neither French nor English. These students attend French schools. Fully aware of the needs of this new client group, schools have implemented special measures, including initiation and francization programs and welcoming classes.

Organization of the School System

Quebec has four levels of education: elementary, secondary, college, and university. Children are admitted to elementary school at 6 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% 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. Some children from underprivileged backgrounds may have access to half-day kindergarten from the age of 4.

Elementary school lasts six years. The school year is made up of 180 days of classroom teaching. A normal school week consists of five full days and 23.5 hours of teaching. Students who experience learning difficulties or who have behavioural problems or minor disabilities are integrated into regular classrooms. Those with more significant problems attend special classes with fewer students.

Secondary school lasts five years and is divided into two levels. The school week is made up of five days and must include a minimum of 25 hours of educational activities. The first level or "cycle" (years 1 to 3) focusses on basic education. In the second cycle (years 4 and 5), students continue their general education, but also take optional courses to explore other avenues of learning before going on to college. In year 4 of secondary school, students can also undertake a two- or three-year course of vocational training leading to employment. Requirements for the secondary school or vocational training diploma are set in the basic school regulation.

At age 13, most students are in the second year of secondary school. At age 16, most are completing the fifth and final year of secondary school; some are starting their college studies.

In 1998–99, a total of 1,142,634 students were registered in Quebec's 2,892 public and private elementary and secondary schools. Of these, 2,554 are public schools run by 72 schools boards, and 338 are private schools.

Science Teaching

In Quebec, science is a compulsory subject from the beginning of elementary school to the fourth year of secondary school inclusive. It is an optional subject in the fifth year of secondary school; however, students wishing to study science or enrol in certain technical programs at the college level (college in Quebec being the twelfth and thirteenth years of schooling) must pass physics and chemistry in the fifth year of secondary school.

The following optional and compulsory programs and courses are offered in Quebec's schools in compliance with the basic school regulation, which fixes the time allotment for each subject.

Program	*Status*	*Recommended Time*
Natural Science		
Elementary 1, 2, and 3	Compulsory	1 hour/week
Natural Science		
Elementary 4, 5, and 6	Compulsory	1.5 hours/week
Ecology, Secondary I	Compulsory	100 hours/year
Physical Science, Secondary II	Compulsory	100 hours/year
Human Biology, Secondary III	Compulsory	100 hours/year
Physical Science, Secondary IV	Compulsory	150 hours/year
General Biology, Secondary IV or V	Optional	100 hours/year
Geology, Secondary IV or V	Optional	100 hours/year
The Tools and Methods of Science, Secondary IV or V	Optional	50 hours/year
Chemistry, Secondary V	Optional	100 hours/year
Physics, Secondary V	Optional	100 hours/year

The Ministry of Education determines curriculum content in close collaboration with groups of experts in the various subjects, curriculum developers, teachers, and school board science consultants.

The science curriculum is designed to provide all students with good basic scientific and technical literacy, and to prepare some students for more advanced science or specialized technical studies. It tries to convey a real-world vision of science by highlighting the links between science, technology, society, and the environment. Through a discovery and problem-solving approach in a laboratory setting, students learn to construct concepts and acquire work methods and thought processes that prepare them for life in society.

Science Testing

At the secondary level, schools develop their own tests for regularly assessing student learning in science. Students need not pass a natural science course in order to earn their secondary school diploma.

In the second cycle of secondary school (years 4 and 5), summative evaluation in physical science, chemistry, and physics involves written examinations worth 75% of the final mark and practical laboratory tests worth 25% of the final mark. The pass mark is 60%. The final mark takes into account the student's mark for work done throughout the school year and, where applicable, the student's mark on the uniform examination set by the Ministry of Education.

Written Assessment

Quebec 13-year-olds and Quebec 16-year-olds who responded to the assessment in English performed as well as the overall Canadian sample at all levels.

The performance of 13-year-old Quebec English-language students showed significant improvement between 1996 and 1999 at levels 3 and 4, while the performance of Quebec English-language 16-year-old students was significantly better in 1999 at levels 3, 4, and 5.

CHART 59

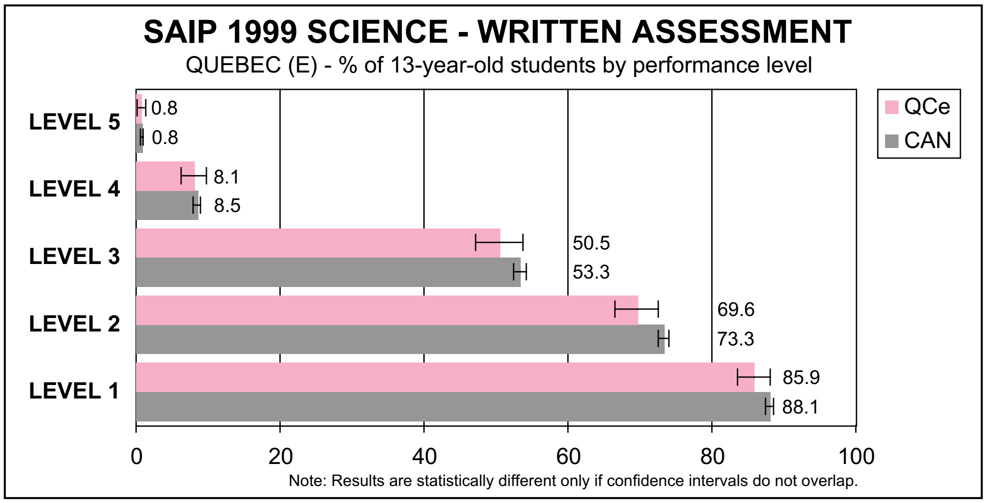
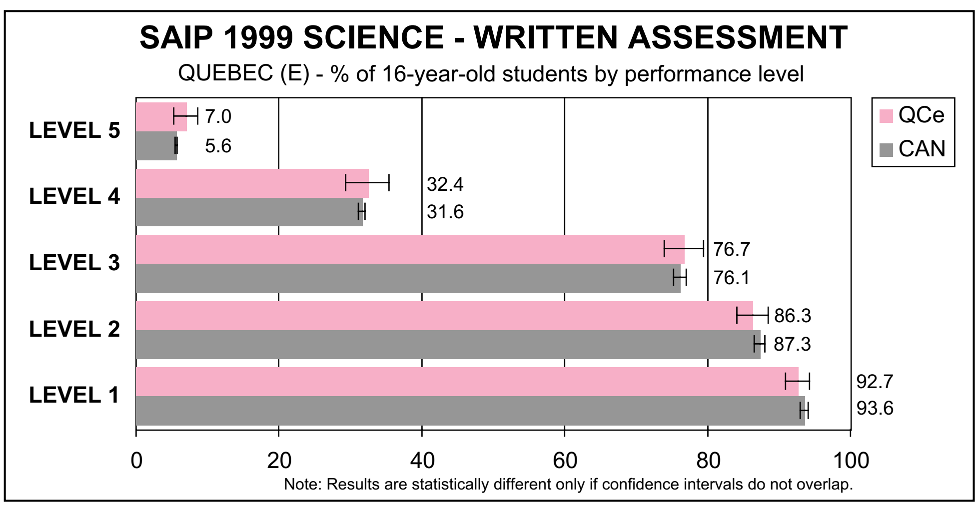


CHART 60



Written Assessment

Quebec 13-year-olds performed as well as at all levels as did students in the Canadian sample. Quebec 16-year-olds who wrote the assessment in French performed as well as or better than students in the Canadian sample. Slightly more Quebec 16-year-olds reached levels 1, 2, and 3 than did students in the Canadian sample.

The performance of 13-year-old Quebec French-language students showed significant improvement between 1996 and 1999 at levels 3 and 4, while the performance of Quebec French-language 16-year-old students was significantly better in 1999 at levels 3 and 5.

CHART 61

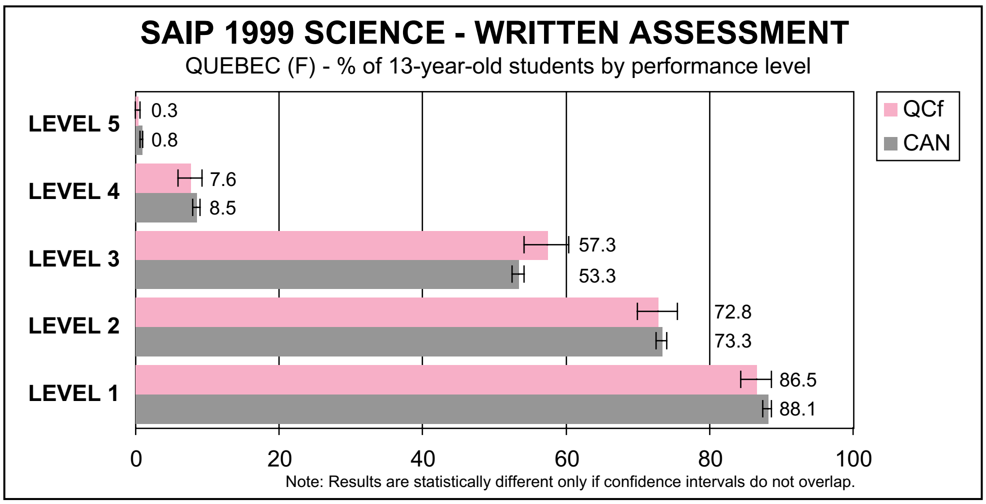
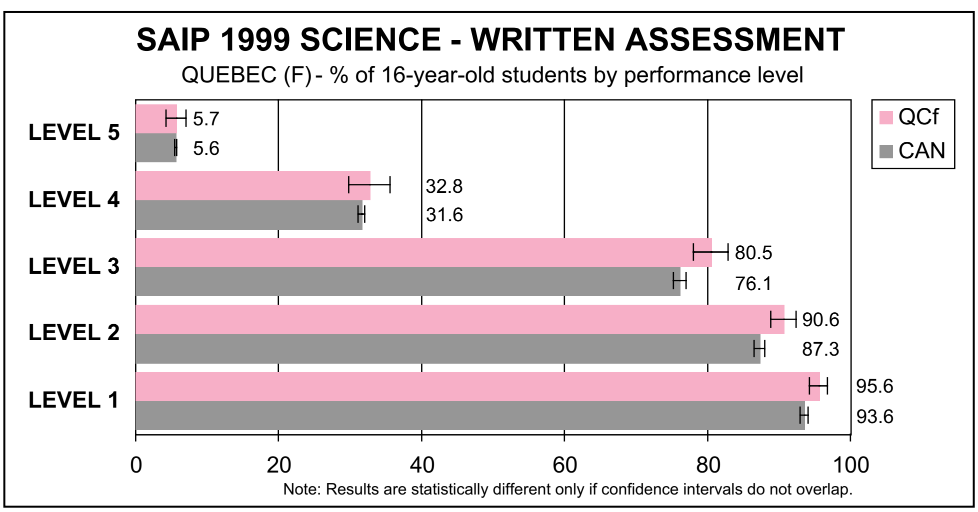


CHART 62



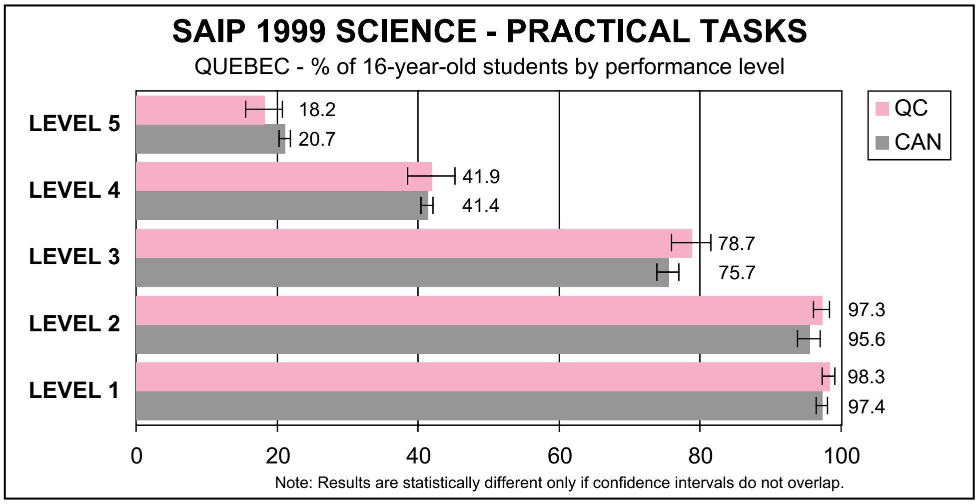
Practical Task Assessment

Quebec selected a sufficiently large sample of 16-year-olds to permit reporting at the provincial level for this population.

Quebec 16-year-olds performed as well at all levels as did students in the Canadian sample.

As Quebec did not select a large enough sample in 1996 to permit reporting at the provincial level, no direct comparison can be made between results for the two assessments.

CHART 63



Social Context

New Brunswick's population of 754,741 is 48.8% urban and 51.2% rural. The population distribution, together with a commitment to equal opportunity for all students, places a heavy demand on the Department of Education to provide an equitable level of educational programs and services throughout the province.

Over the past few years, the department has made a considerable effort to develop a school system that will meet the needs of all students. It has put in place programs to reduce school-leaving by identifying potential dropouts, to enable disabled students to attend school, and to facilitate the integration into the school system of as many students as possible. As a result, the province has high rates of retention (students who stay in school) and integration (students with special needs).

Organization of the School System

Since 1967, the provincial government has had sole responsibility for financing public schools. The Minister of Education has the authority to prescribe curriculum and assess the degree to which goals are attained by students.

In 1969, New Brunswick became officially bilingual. In 1974, in recognition of its linguistic duality, the province established two parallel but separate education systems. Each linguistic division of the Department of Education is responsible for its own curriculum and assessment. Educational programs and services are delivered in both official languages.

In 1992, New Brunswick amalgamated school districts, reducing the number from 42 to 18 (12 anglophone, 6 francophone). As well, school boards were abolished, to be replaced by a parent-driven structure at the school, district, and provincial levels.

The *Education Act* of 1997 decreed that school attendance be made compulsory to age eighteen, or until graduation from high school. This provision came into effect July 1, 1999.

In the 1998–99 school year, enrolment for kindergarten through grade 12 totalled 129,131. This includes 88,256 in anglophone and 40,875 in francophone districts. The starting age for school is five, and students attend classes for 187 days per year.

Science Teaching

New Brunswick's science curriculum for the anglophone sector, as defined in *Foundation for the Atlantic Canada Science Curriculum*, is aimed at enabling students to become scientifically literate. To achieve scientific literacy for all students, science programs are expected to address the three basic scientific fields of study — physical, earth, and life sciences. Attempts are made to develop the connections among the basic sciences and expose students to the various cognitive, scientific, and technical skills. These include the processes of science such as predicting and formulating hypotheses, as well as higher- level skills such as critical thinking and evaluating, and manipulative skills such as the use of a microscope, a balance, and various forms of data collection. Every effort is made to present science in connection with students' own lives and interests, using hands-on experiences that are integral to the instructional sequence.

The science curriculum contributes to the achievement of the general science curriculum outcomes found in the *Foundation for the Atlantic Canada Science Curriculum*. As a result of achieving the science outcomes, students should understand the nature of science and scientific knowledge, the nature of technology, and the fact that science, technology, the environment, and society are interrelated. They should also be able to use scientific knowledge and cognitive and technical skills to investigate the natural world, to solve problems, to make informed decisions, and to learn and apply safe laboratory techniques. In addition, they should be able to communicate an understanding of the major concepts and principles of science and related technology, and understand the interdependence of global social, economic, and ecological systems. Finally, students should demonstrate positive attitudes toward science and technology, be aware of careers in science and technology, and develop the habits of lifelong learning.

Areas of ongoing development within the province's science curriculum include the following:

- cooperation among four Atlantic Provinces at all grade levels in science; a common science curriculum is in final pilot phase
- emphasis on Canadian content via Canadian resources where possible
- relevance of science to the everyday world being emphasized at all grade levels
- recent implementation of new resources for grades 1-6 and 10-12, with current pilots for grades 7-9
- encouragement of the use of technology within science programs
- enhancement of student learning through hands-on experiences
- development of curriculum that strongly emphasizes science–technology–society connections

Science Testing

The Department of Education administers a comprehensive provincial evaluation program to monitor overall student achievement at particular points in the system. This provides important feedback at provincial and local levels about the knowledge and skills students are expected to learn.

For the anglophone sector, assessments at the grade 3 and 5 levels are specific to learning outcomes identified in the provincial mathematics, science, and language arts curriculum documents. For science, they constitute an evaluation of the system with a focus both on reporting group data and individual results for some components.

The science component in each of these assessments contains a series of questions to determine students' general knowledge and skill level in science. Reflected in the assessments is a balance between process skills and content as articulated in the science curriculum document. Skills are not restricted to those of the grade 3 or 5 curricula, but also may reflect those taught in earlier grades.

Currently, provincially developed exams are administered in anglophone high schools in grade 12 biology and chemistry.

Written Assessment

There is no significant difference between the performance of New Brunswick English 13-year-olds and Canadian students overall at levels 1, 2, and 3 in the written assessment. There were significantly fewer New Brunswick students in levels 4 and 5. New Brunswick English 16-year-olds performed as well as the Canadian sample at levels 1, 3, and 4. Significantly fewer New Brunswick English 16-year-olds reached levels 2 and 5.

The performance of New Brunswick English 13-year-olds and 16-year-olds each showed significant improvement between 1996 and 1999 at level 4.

CHART 64

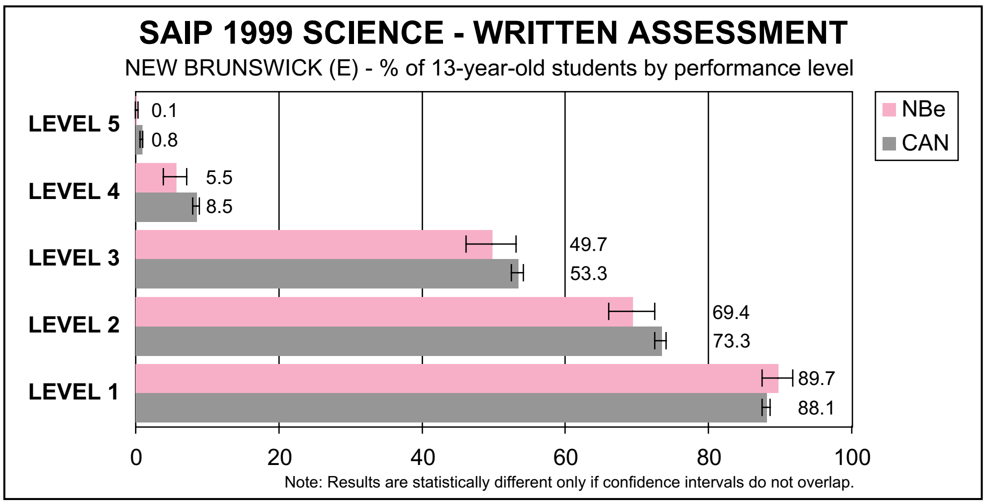
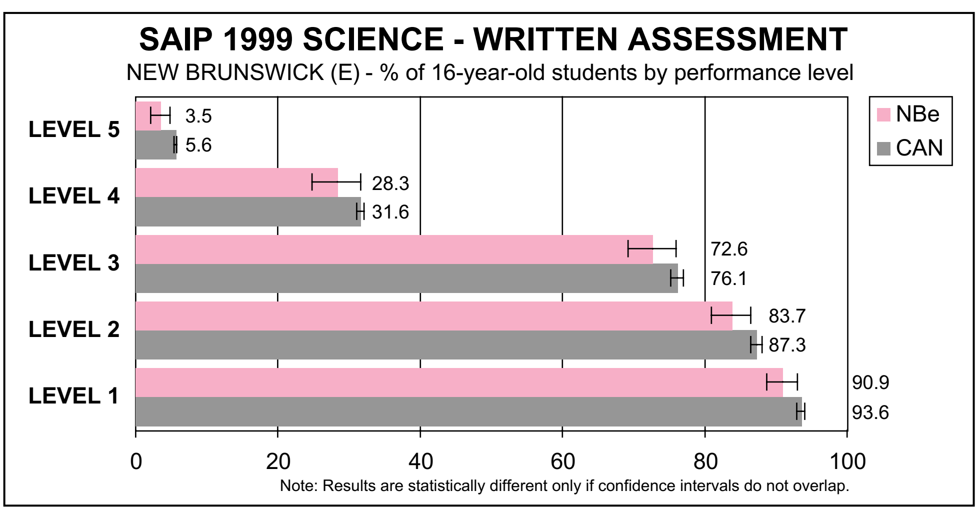


CHART 65



Social Context

For several years now, New Brunswick has experienced significant socioeconomic growth. Nevertheless, its unemployment rate is still higher than the Canadian average, especially in the francophone regions of the province. As of July 1, 1999, New Brunswick's population was 754,741. The average unemployment rate for 1998 was 12.1%, versus a Canadian rate of 8.3%. Among residents 15 years old and over, the labour force participation rate in 1998 was 60.9%, as was the employment-to-population ratio. Rural residents make up 51.2% of the population and urban residents, 48.8%.

New Brunswick has been officially bilingual since 1969. The native language of more than a third of its population is French. School enrolment is 129,131 students, of whom 30.4% attend francophone schools.

Almost half of students enrolled in francophone schools live in a majority anglophone environment.

Organization of the School System

The New Brunswick school system begins in kindergarten and continues to grade 12. Children are enrolled in kindergarten in the calendar year in which they reach the age of 5.

School attendance is compulsory until the end of secondary schooling or age 18.

In 1974, the province created an educational system composed of two parallel and distinct divisions, one for each linguistic community. The francophone section of the Department of Education is responsible for providing curriculum and assessment that responds to the needs of the francophone population. The province is divided into six francophone school districts (administered by three general administrative units) with 40,875 students and 12 anglophone school districts (administered by five general administrative units) with 88,256 students.

In recent years considerable efforts have been made to respond to the particular needs of students and to make school accessible to all. In accordance with the New Brunswick *Education Act* and regulations, school administrators are required to place students with special needs in regular classrooms, providing that the educational requirements of all students is considered. This has led to a high level of school integration; from kindergarten to grade 8, almost 100% of special-needs students are integrated into regular classrooms, while the rate is almost 80% from grades 9 to 12. Moreover, early detection programs have been put in place to discourage school-leaving. This has resulted in one of the lowest school dropout rates in Canada: for the 1996-97 school year, francophone schools recorded a dropout rate of 3.2%.

There is no provincial directive covering achievement levels from grades 1 to 8. However, in the majority of school districts, the overall average passing grade is 60% or 65%. In grades 9, 10, 11, and 12, the minimum passing grade for credit is 55%. Since 1991, provincial secondary school examinations are given to all students at the end of their studies and count for 40% of their final grade in seven required subjects, including physics in grade 10 and chemistry in grade 11. In addition, a provincial science assessment program is currently being implemented at the elementary level.

Science Teaching

The science curriculum in the francophone sector aims to develop scientific literacy in students from kindergarten to grade 12. Building on students' knowledge, their natural environment, and the various social, economic, political, and environmental contexts, the science curriculum allows students to develop notions and concepts highlighting the interdependency between living beings and their environment. Students will develop the necessary understanding to take on their responsibilities as beings integrated in nature. Students are also expected to demonstrate their scientific literacy through attitudes characterized by an understanding of life, the environment, and society as a whole.

From kindergarten to grade 8, major themes studied include concepts related to the life sciences, the physical sciences, and earth and space sciences. Expectations are progressive over the years of study. As part of the regular program, science makes up at least 4% of teaching time in grade 1, rising to a minimum of 12% 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 115 hours per semester. Biology in grade 9, physics in grade 10, and chemistry in grade 11 are the three science courses required for graduation. Optional courses are also offered in these subjects, including an environmental science course. The aspects covered in the SAIP assessments are included in the science curriculum, except for the earth sciences dimension, which is covered in social sciences (geography).

Assessment of Science Skills

At the provincial level, the francophone sector of the Department of Education has administered since 1991 a grade 10 physics and grade 11 chemistry examination, i.e. at the end of the required course in these subjects at the secondary level. Results of these examinations, which make up 40% of the students' final mark, are provided to the school within five days following administration. The examinations include multiple-choice, short-answer, and essay questions and cover the essential dimensions of the curriculum, including the nature of science, which is a component of all science programs. A detailed statistical report is later provided to school districts and schools.

The participation of teachers is essential at every stage of development, administration, and marking of the examinations. Such participation is very helpful to teachers in their own science assessment practices.

Written Assessment

There are significant differences between the performance of both New Brunswick French 13-year-olds and 16-year-olds and Canadian students overall at all levels in the written assessment. Significantly fewer New Brunswick French students of both age groups reached each level.

The performance of New Brunswick French 13-year-olds was not significantly different between 1996 and 1999. The performance of 16-year-olds each showed significant improvement between 1996 and 1999 at levels 3 and 4.

CHART 66

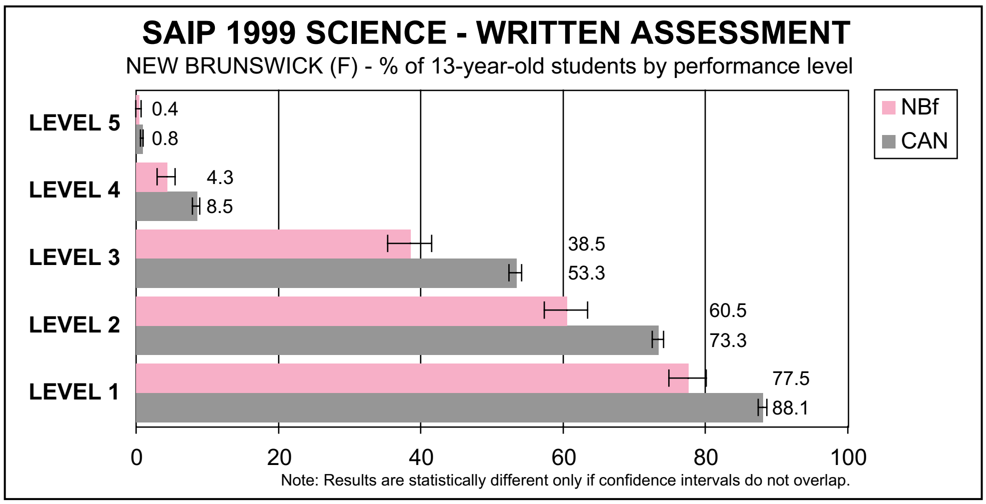
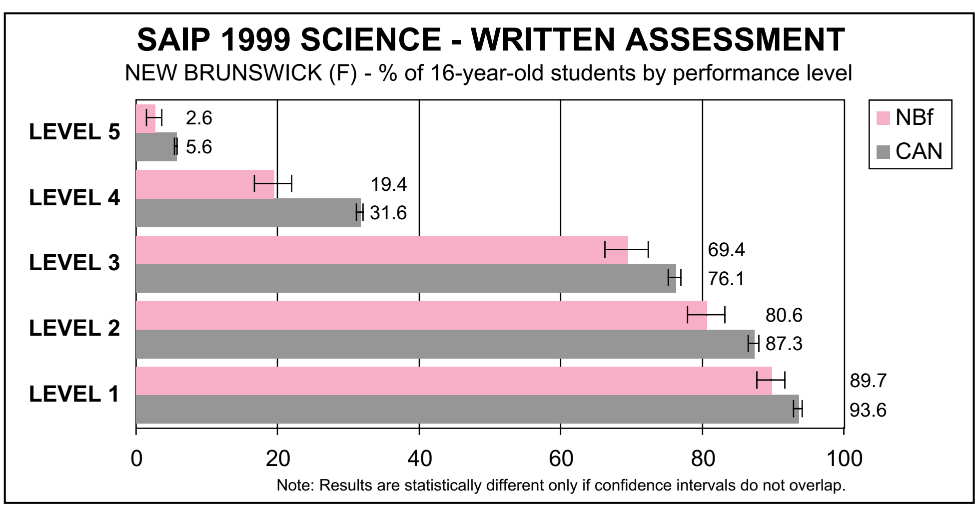


CHART 67



Social Context

Nova Scotia is a small province with a population of 940,825 and a higher rural population than the Canadian average. Population growth is currently about one-half of one per cent annually. Immigration is low both in absolute numbers and when compared to immigration in Canada as a whole. About nine and one-half per cent of the population speaks both English and French (9.3%), or French only (0.2%). Among the total population, about 2 per cent is African Canadian, 1.4% is Aboriginal, and 1.5% consists of other visible minorities. Unemployment rates in Nova Scotia are typically above the Canadian average.

Organization of School System

Nova Scotia's total school population is 160,011 in grades primary to 12. The province has a teaching force of 9,913 and is divided into seven school boards. About 97% of the students are enrolled in anglophone school boards, and about 3% in the Conseil scolaire acadien provincial. School enrolment is expected to decrease over the next few years.

Children who are five years old before October 1 are admitted to school. Students must attend school until they are 16 years old. For the most part, 13-year-old students are in grades 7 and 8, and 16-year-olds are in grades 10 and 11.

Science Teaching

Foundation for the Atlantic Canada Science Curriculum (Atlantic Provinces Education Foundation, 1998) is the framework for the development of a common science curriculum for the Atlantic Provinces. Currently, the departments of education, through the Atlantic Provinces Education Foundation (APEF), are developing new science curriculum guidelines for grades entry - 12. The science curriculum is based on an outcomes framework that includes statements of essential graduation learnings, general curriculum outcomes, key-stage curriculum outcomes, and specific curriculum outcomes. General, key-stage, and specific curriculum outcomes have been adapted from the pan-Canadian *Common Framework of Science Learning Outcomes K-12.*

Teachers and school boards are in the process of piloting and implementing the new grades 11 and 12 chemistry, physics, and biology curricula. Development and piloting of science curriculum for grades P-10 and grade 12 geology are ongoing. Teachers work closely with the department to develop curriculum and related assessments.

The aim of science education, as defined in *Foundation for the Atlantic Canada Science Curriculum*, is to develop scientific literacy.

Scientific literacy is an evolving combination of the science-related knowledge, skills, and attitudes students need to develop inquiry, problem-solving, and decision-making abilities; to become lifelong learners; and to maintain a sense of wonder about the world around them. To develop scientific literacy, students require diverse learning experiences that provide opportunities to explore, analyse, evaluate, and synthesize. Through these experiences, students will come to appreciate and understand the interrelationships among science, technology, society, and the environment that will affect their personal lives, their careers, and their future. The development of students' science literacy is shaped by many factors including gender, social and cultural backgrounds, and the extent to which individual needs are met. In designing learning experiences for students, teachers are expected to consider the learning needs, experiences, interests, and values of all students.

The curriculum gives students opportunities to construct the important ideas of science and develop these ideas in depth through inquiry and investigation. The curriculum is inclusive and is designed to help all learners reach their potential through a wide variety of learning experiences. The curriculum seeks to provide equally for all learners and to ensure, insofar as possible, equal entitlement to learning opportunities.

Hands-on experiences are integral to student learning. The curriculum emphasizes interactive, resource-based learning that engages students in group work as a basis for the social organization of the classroom.

Assessment

The province continues to work with the other Atlantic provinces to develop regional examinations. In science, Nova Scotia leads in developing instruments for Chemistry 12 and Physics 12. During the 1999– 2000 school year, all grade 12 chemistry students write APEF examinations. The exams are written on common dates for all four provinces. Three new forms are available each year. In Nova Scotia, teachers mark their own students' papers based on a scoring key provided by the APEF. A random representative sample of student papers is selected and scored centrally to yield data at provincial and school board levels.

All teachers of Chemistry 12 participated in an information session pertaining to the administration of the chemistry exam. Teachers were also given a workshop on finding, constructing, and scoring STSE questions. Physics 12 and Biology 12 examinations are to be administered in 1999–2000 on a trial basis.

At the classroom level, the assessment program involves a broad range of strategies that help students to monitor their progress in various scientific skills: initiating and planning, performing and recording, analysing and interpreting, communicating, and teamwork. The program incorporates tasks similar to those used on a regular basis during classroom/laboratory activities. The use of journals, projects, performance assessments, and portfolios is encouraged.

Written Assessment

There is no significant difference between the performance of Nova Scotia English 13-year-olds and Canadian students overall at levels 1, 2, and 4 in the written assessment. Slightly fewer Nova Scotia students in this category reached levels 3 and 5. Nova Scotia 16-year-olds performed as well as the Canadian sample at levels 1, 2, 3, and 4. Slightly fewer Nova Scotia 16-year-olds reached level 5.

The performance of Nova Scotia English 13-year-olds and 16-year-olds each showed significant improvement between 1996 and 1999 at levels 3 and 4. Sixteen-year-olds also showed significant improvement at level 2.

CHART 68

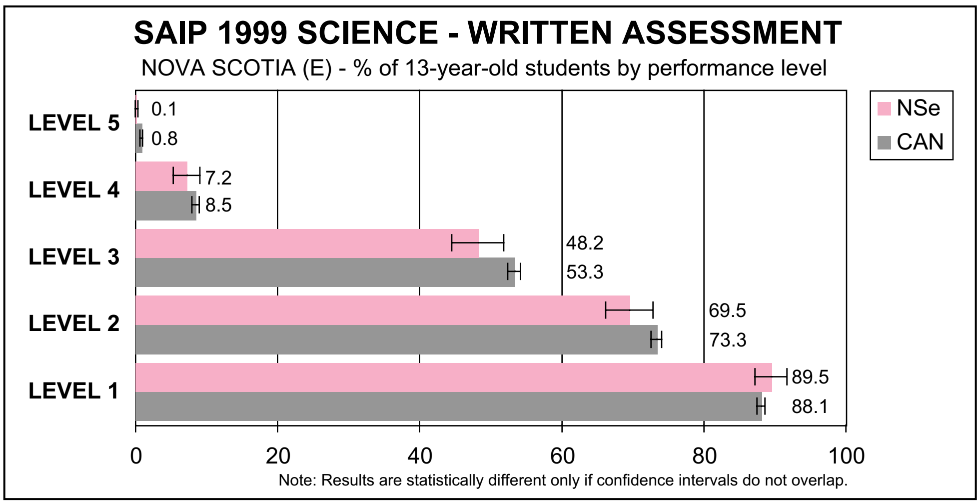
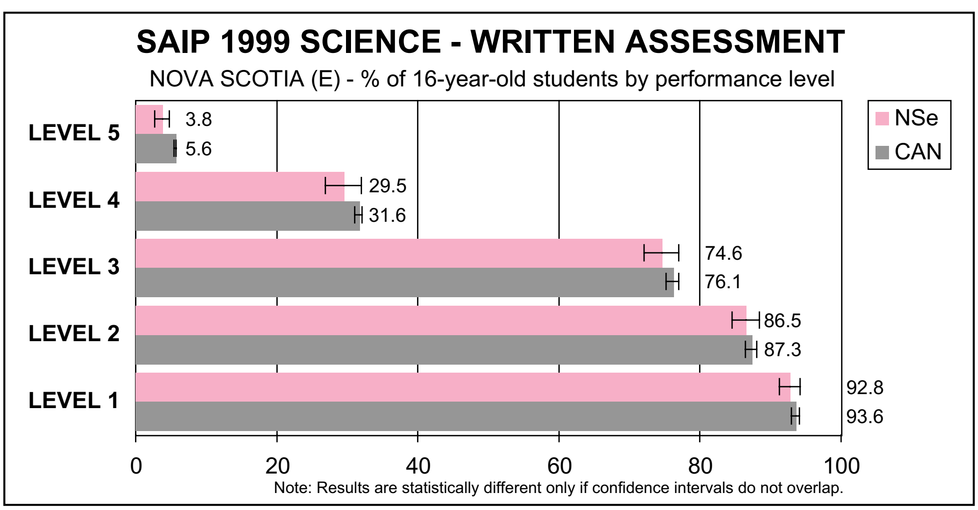


CHART 69



Social Context

Nova Scotia is a small province of 940,825, with a higher rural population than the national average. Population growth is currently about 0.5% annually. Immigration is low both in absolute numbers and when compared to immigration in Canada as a whole. About 9.5% of the population speaks both French and English, or French only. About 2% of the population is African-Canadian, 1.4% is Aboriginal, and 1.5% consists of other visible minorities. The unemployment rate in Nova Scotia is typically above the national average.

Organization of the School System

Nova Scotia's total enrolment from primary to grade 12 is 160,011 students. The province employs 9,913 teachers and is divided into seven school boards. Approximately 97% of students are enrolled in anglophone school boards and 3% in the Conseil scolaire acadien provincial. School enrolment is expected to decrease slightly over the next few years.

In Nova Scotia children who are five years old on or before October 1 are admitted to elementary school. Students must attend school up to the age of 16. Most 13-year-old students are in grades 7 or 8, while 16-year-old students are in grades 10 or 11.

Science Teaching

Science curricula at the elementary level and in junior high school (grades 7, 8, and 9) is being harmonized with the pan-Canadian common framework of learning outcomes. Harmonization of senior high school science curricula will begin in January 2000. These curricula provide for an STSE approach, to allow students to acquire knowledge and to develop skills and attitudes for citizenship and scientific literacy. Nova Scotia seeks to attain this objective based on the following principles:

- science is an effective way to know the world;
- technology is a social process through which society draws on its natural and human resources to resolve practical problems;
- there are links between science, its application in the form of technology, and its consequences for the environment and society;
- diverse methodologies and assessment strategies need to be available to take into account the diversity of learners;
- learning science is an active process, involving creativity, problem-solving, informed decision-making, communication, and drawing connections;
- learners are not passive but goal-driven and are ultimately responsible for their own learning; they bring their own experiences and perceptions to bear on learning situations;
- language, social, and media skills need to be emphasized;
- we must draw on a broad range of resources (text-based and other) from diverse levels and genres and having a multicultural character;
- assessment is an integral part of learning.

Assessment of Science Skills

In Nova Scotia, assessment of students' science learning is based on a solid foundation supported by continuing teacher education. Teachers apply assessment strategies that match the philosophy of the curriculum and take into account the role students must play at that level.

Written Assessment

Significantly fewer Nova Scotia French 13-year-olds reached all levels in the written assessment than Canadian students overall. There were no significant differences between Nova Scotia French 16-year-old students and Canadian students overall at levels 1 to 4.

The performance of Nova Scotia French 13-year-olds showed significant improvement between 1996 and 1999 at level 4.

CHART 70

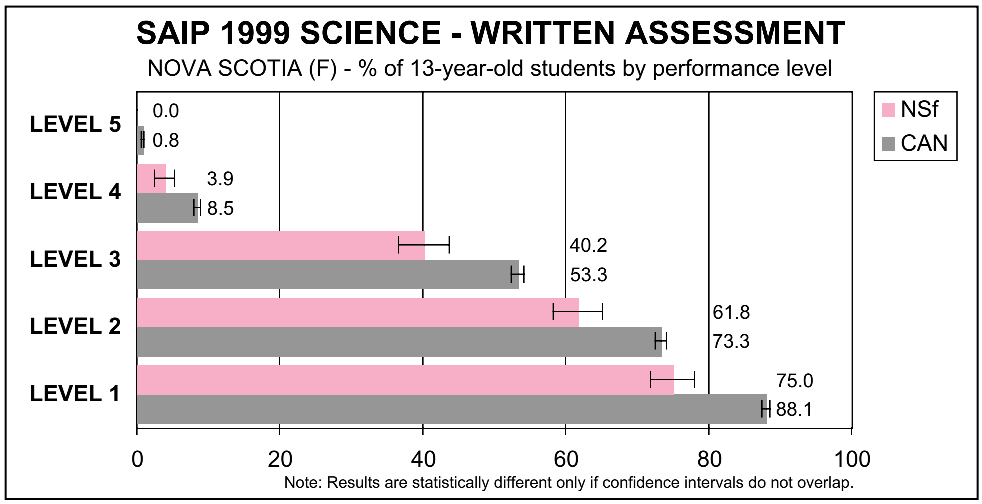
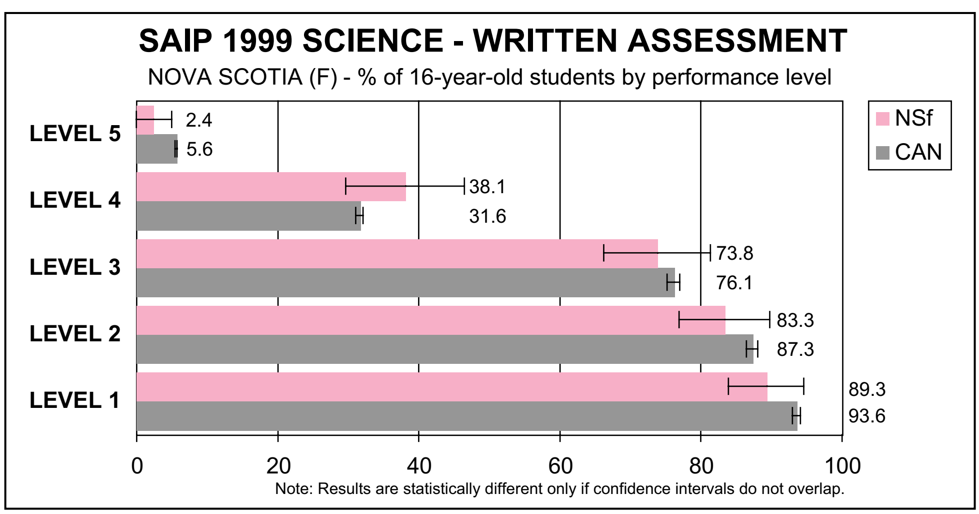


CHART 71



Social Context

Prince Edward Island (PEI) is the smallest province both in terms of land — 5,660 square kilometers and population — 137,800. The setting is predominantly rural; agriculture, tourism and fisheries are the major industries. The unemployment rate is above the Canadian average, and per capita income is below the Canadian average.

Organization of the School System

At the time of administration of the SAIP Science Assessment, PEI had three school boards and 24,400 students enrolled in 66 public schools. In addition, there were three private schools with 200 students and one band-operated school.

The school system consists of grades 1 to 12. Students entering grade 1 must be six years of age by the end of January of their first school year. Kindergarten is not part of the public system.

Prince Edward Island students are accommodated within facilities that contain a number of grade configurations including grades 1-3, 1-4, 1-6, 5-8, 4-6, 1-8, 1-9, 7-9, 9-12, and 10-12. In addition there are two francophone schools, grades 1-12. This diversity results from demands placed on the school by the local community, the student enrolment, and existing facilities.

In grades 10 to 12, students have a choice of enrolling in academic science courses for those preparing for university, in general science courses for those not planning to attend university but who may choose to attend a community college, or in practical science courses for students with special needs.

Science Teaching

PEI is working with the other Atlantic provinces to develop a common science curriculum for grades 1 to 12, described in the *Foundation for the Atlantic Canada Science Curriculum*, which parallels the pan-Canadian outcomes. This framework includes statements for essential graduation learnings, general curriculum outcomes for science, and corresponding outcomes at the end of key stages (entry to grade 3, grades 4-6, grades 7-9, and grades 10-12).

Science Testing

PEI does not have large-scale provincial assessment programs. Teachers are encouraged to use a multi-faceted approach within their classrooms, to integrate assessment with instruction, and to use the collected information to inform students, parents, and other school personnel about student progress.

Written Assessment

These charts show that Prince Edward Island students of both age groups compare favourably in levels of performance to those of Canada as a whole. The percentage of 16-year olds performing at levels 2, 3, and 4 is statistically higher than that of Canada. The percentage of 13-year-old students performing at level 5 is slightly lower than the Canadian average.

The performance of Prince Edward Island 13-year-olds and 16-year-olds each showed significant improvement between 1996 and 1999 at levels 3 and 4. Sixteen-year-olds also showed significant improvement at level 5.

CHART 72

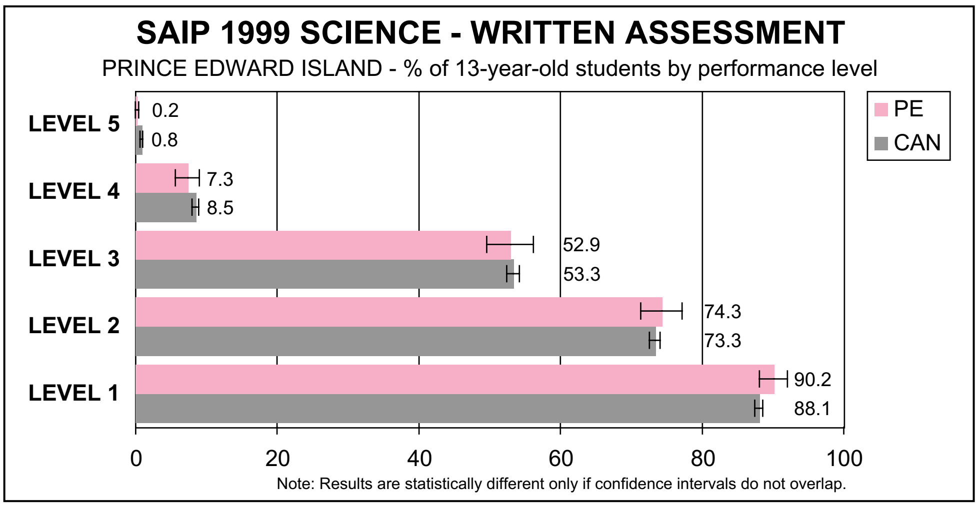
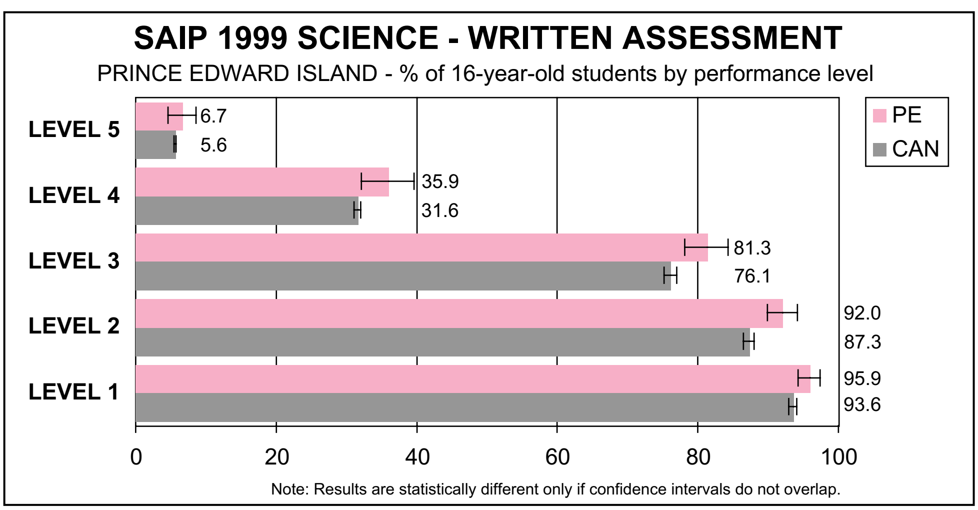


CHART 73



Social Context

In Newfoundland and Labrador, there are approximately half a million people spread over an area of about 150,000 square kilometres. Newfoundland's large size and small population provide many challenges to the delivery of education. In addition, enrolments have declined by more than 60,000 since 1972.

Though the province's economy has been negatively affected by the closure of the cod fishery in recent years, alternative fisheries have expanded, and there has been a growth in the province's economy as a result of the mining sector, tourism, and increased fisheries output.

Organization of the School System

The province's education system has changed from a church-based system to a fully public one. This has resulted in the consolidation of school boards, a reduction in the amount of duplication in the system, and the closure of many schools. As of September 1998 there were 11 publicly elected school boards, which includes one francophone board, 365 schools with a total student enrolment of 97,401, and 6,453 school-based educators.

Even though compulsory school entry age is six years old by December 31, most students enter kindergarten where they must be five by that date. Typically 13-year-olds are in grade 8, and 16-year-olds are in grade 11.

Science Teaching

Major changes have occurred in the science curriculum as a result of its alignment with the *Common Framework of Science Learning Outcomes K - 12*. This framework is guided by the vision that all Canadian students will have the opportunity to develop scientific literacy. Scientific literacy is an evoking combination of science-related attitudes, skills, and knowledge students need to develop inquiry, problem- solving, and decision-making abilities, to become lifelong learners, and to maintain a sense of wonder about the world around them.

Currently, all courses from kindergarten to grade 9, as well as high school courses, are under review or have been revised based on a framework described in the *Foundation for the Atlantic Canada Science Curriculum* which parallels the pan-Canadian outcomes. This framework includes statements of essential graduation learnings, general curriculum outcomes for science, and corresponding outcomes at the end of key stages (entry-grade 3, grades 4-6, grades 7-9, and grades 10-12). Future curriculum developments in science will use this framework to describe specific outcomes for science programs at various grade levels up to grade 9 and for courses at the high school level.

Science Testing

In Newfoundland there has been an increased emphasis on the implementation of criterion-referenced testing. Over the past ten years, provincial criterion-referenced tests in science were administered on three occasions to grade 6 students and twice to grade 9 students. Until the 1995-96 school year, at the high school level, students wrote provincial examinations in all 3000-level courses, which include biology, chemistry, physics, geology, and environmental science. Under the auspices of the APEF and in collaboration with the other Atlantic provinces, Newfoundland is currently involved with the development of senior high school tests in biology, physics, and chemistry. At present this province is administering the APEF chemistry examinations to 3000-level chemistry students in all schools within its jurisdiction.

Written Assessment

There are significant differences between the performance of Newfoundland and Labrador 13-year-olds and Canadian students overall at levels 1, 2, 3, and 4 in the written assessment. Newfoundland and Labrador 13-year-old students performed as well as students in the Canadian sample at level 5.

Newfoundland and Labrador 16-year-old students performed as well as students in the Canadian sample at levels 3, 4, and 5. There are significant differences between the performance of Newfoundland and Labrador 16-year-olds and Canadian students overall at levels 1 and 2 in the written assessment.

The performance of Newfoundland and Labrador 13-year-olds and 16-year-olds each showed significant improvement between 1996 and 1999 at level 3. Sixteen-year-olds also showed significant improvement at level 5.

CHART 74

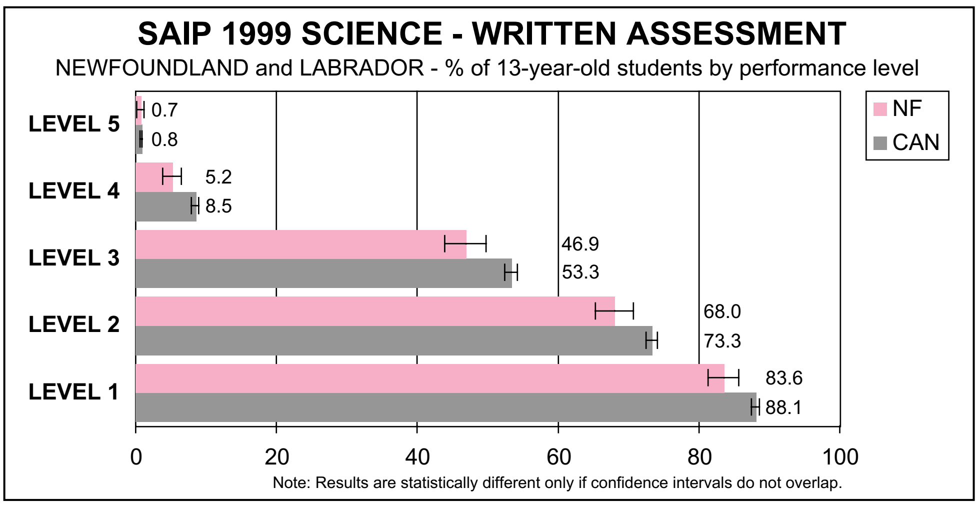
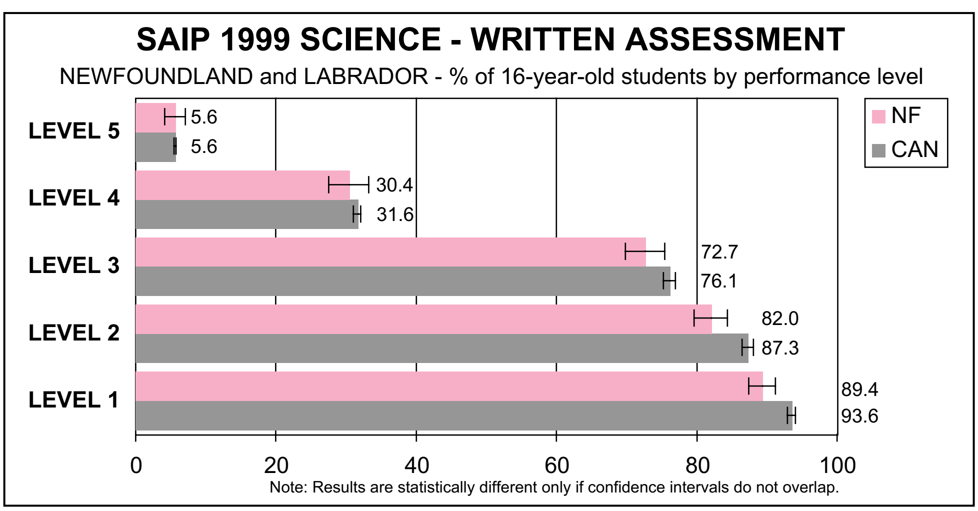


CHART 75



Social Context

Yukon has a total land area of 483,450 square kilometres and a population of 31,305. The population of Whitehorse, the capital city, is 22,984, and the remaining population is divided among the 19 rural communities.

Organization of the School System

There are 28 schools with a total enrollment from kindergarten to grade 12 of 5,921. Half of the schools are designated as rural schools. These schools typically have low student populations, several multi-level classes, and low pupil-to-teacher ratios. Many rural schools do not offer grades 11 and 12 and may have fewer optional programs offered in the secondary grades.

Unlike most jurisdictions in Canada, there are no school taxes in Yukon and only one school board, that being for École Émilie-Tremblay, the territory's only French school. School superintendents work for the Department of Education, which is responsible for most aspects of school operations. Almost every school has a school council, a body which has some but not all the powers of a school board, including the responsibility for schools rules, school plans, and dispute resolution, to name a few.

Yukon follows the British Columbia curriculum in all subject areas. This curriculum is sometimes modified — with departmental approval — to reflect local needs and conditions. As well, up to 20% of a student's educational program may be locally developed. Schools are organized into two segments: elementary (K to 7), and secondary (8 to 12). There are three Catholic schools within the Yukon public school system. Instructional time allotments for each subject vary in the elementary grades but are standardized to 120 hours per course for grades 8 to 12.

Approximately 25% of Yukon students are of First Nation Ancestry. These students often participate in Native language programs and/or in various locally developed courses aimed at developing awareness, appreciation, and knowledge of First Nations culture and traditions. The remainder of the student population is predominantly of European or British ancestry. Approximately 7% of Yukon students are enrolled in a French Immersion program, while nearly 1.8% attend French school.

Science Teaching

Major changes in the science curriculum in the past 10 years include the following:
- increased number of girls taking senior science courses
- increased emphasis on demonstration of science activities such as "science fairs"
- increased number of science options available at both the junior high and senior high levels
- integrated experiential science programming

As noted above, Yukon follows, with appropriate adaptations and modifications, the BC curriculum. Most modifications involve the selection and use of materials that are relevant to Yukon's biology, chemistry, and geology.

Science Testing

Classroom teachers are encouraged to use a variety of testing measures — performance, projects, teacher-made tests, and student self-evaluation. Typically both practical and/or content end of chapter or unit tests are developed and administered by teachers. Marks are criterion-referenced (i.e., compared to an absolute standard) and are based on goals and objectives outlined in the curriculum guide.

Written Assessment

Yukon 13-year-old students performed as well in this category as students in the Canadian sample at levels 2, 3, 4, and 5.There is a significant difference between the performance of Yukon 13-year-olds and Canadian students overall at level 1 in the written assessment. Yukon 16-year-old students performed as well in this category as students in the Canadian sample at levels 1, 2, 3, and 5. There is a significant difference between the performance of Yukon 16-year-olds and Canadian students overall at level 4 in the written assessment.

Yukon students of both age groups showed significant improvement in performance between 1996 and 1999 at levels 3 and 5. In addition, 16-year-olds showed significant improvement at level 4.

CHART 76

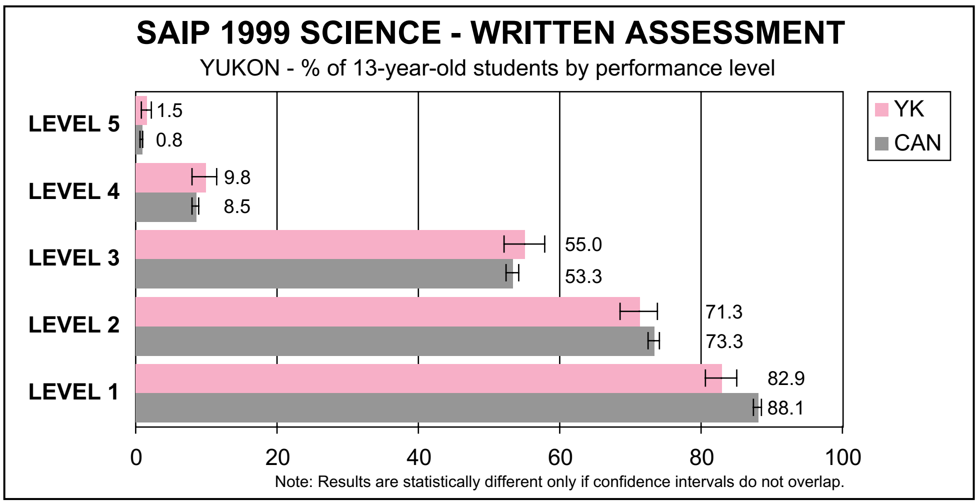
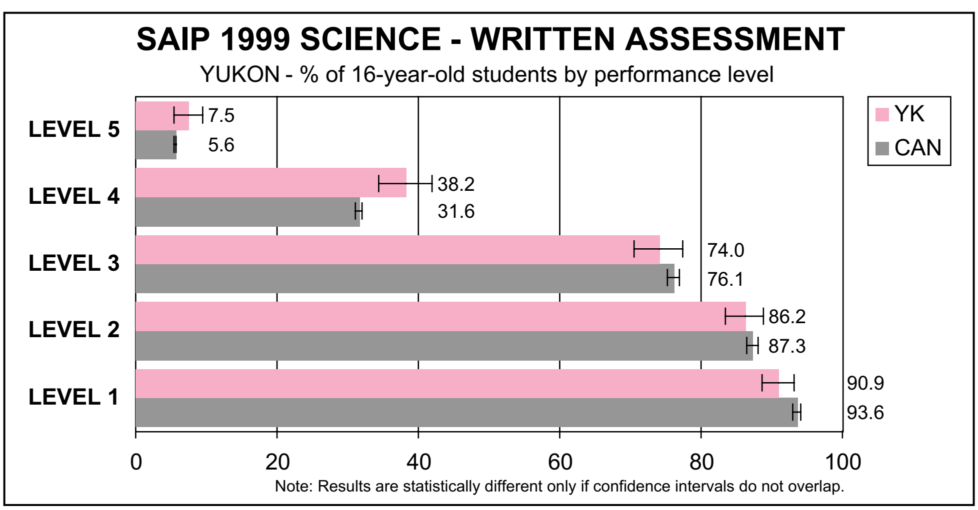


CHART 77



Introduction

On April 1, 1999, two new territories were created. The Department of Education, Culture and Employment administered the 1999 SAIP Science Assessment in the Northwest Territories and in Nunavut, on behalf of the Department of Education, Government of Nunavut. Data were collected separately, in order to report baseline results for each territory.

Social Context

The Northwest Territories has a landmass of 1,200,000 square kilometres. The total population of 41,000 is equally distributed between Aboriginal and non-Aboriginal residents. There are 33 communities, ranging in size from 17,500 people to a population of 36. In Yellowknife, 78% of residents are non-Aboriginal. In smaller communities, Dene, Métis, and Inuit constitute 84% of the population. An estimated 2% of the total population are francophone. Languages spoken in the Northwest Territories are Chipewyan, Cree, Dogrib, English, French, Gwich'in, Inuinnaqtun, Inuktitut, Inuvialktun, North Slavey, and South Slavey. About half of the Aboriginal people in the NWT speak an Aboriginal language. While English is primarily the language of instruction in schools, Aboriginal languages and cultures are integral to the culture-based education system of the NWT.

Nunavut has a land mass of 1,900,000 square kilometres. Of the estimated 28,000 residents of Nunavut, 85% are Inuit. There are 28 communities, ranging in size from 4,300 to 18. Languages spoken in Nunavut are Inuktitut, Inuinnaqtun, English, and French. Most Inuit (90%) living in Nunavut speak a dialect of Inuktitut. Inuktitut is the language of instruction from kindergarten to grade 6 in most schools. At the time SAIP tests are being administered, most 13-year-olds in Nunavut are completing their second year of formal instruction in English.

Organization of the School System

In 1998-99, the Northwest Territories enrolled 9,800 students in kindergarten through grade 12 and employed 642 teachers in 47 schools. The Department of Education, Culture and Employment provides policy and curriculum direction to five divisional education councils and to the two district education authorities in Yellowknife. The education councils and education authorities implement and adapt curriculum and develop programs to meet the needs of students in their jurisdiction.

The Department of Education, Government of Nunavut, is responsible for three divisional education councils. In 1998-99, the department enrolled 8,000 students and employed 568 teachers in 42 schools.

In recent years, both territories have implemented grade extensions in small schools. In 1990, only 60% of students could complete their high school education in their home community. By 1998–99, that proportion had increased to 92% in the Northwest Territories and to 95% in Nunavut. As a result, more students are staying in school, and more young people who left school before earning a grade 12 diploma are returning to school. The challenge is to provide a choice of quality programs in schools where as few as 1 or 2 students are enrolled in a grade. Innovative program development, use of computer technology, and distance education support many courses offered in small communities.

Science Teaching

Northern parents want their children to have the skills that are required for continuing education and for entering the work force. But they also expect schools to do their part in helping ensure children and young adults learn their culture and speak their own language.

The territorial vision for developing scientific literacy allows students to experience diverse learning from an Aboriginal, culture-based perspective as well as from the traditional Western viewpoint. Students are encouraged to develop a sense of wonder and curiosity through experiencing the interrelationships among science, technology, society, the environment, and traditional beliefs.

The science curriculum provides students with the opportunity to explore, analyse and evaluate, synthesize, and appreciate the diversity of scientific thought. Student learning is enhanced by encouraging students to express personal, cultural, and prior knowledge of science through concrete learning experiences that are conceptualized and applicable to students' lives. Students acquire the skills for gaining new knowledge, they learn to solve problems, and they gain an appreciation of the complexity and impact of science and technology in their lives.

Schools are responsible to provide programs that will generate interest in science and the environment and will encourage students to pursue higher levels of study, leading to science-related occupations.

The Northwest Territories and Alberta are in the process of re-writing a kindergarten to grade 12 science curriculum, based on the pan-Canadian framework.

Science Assessment

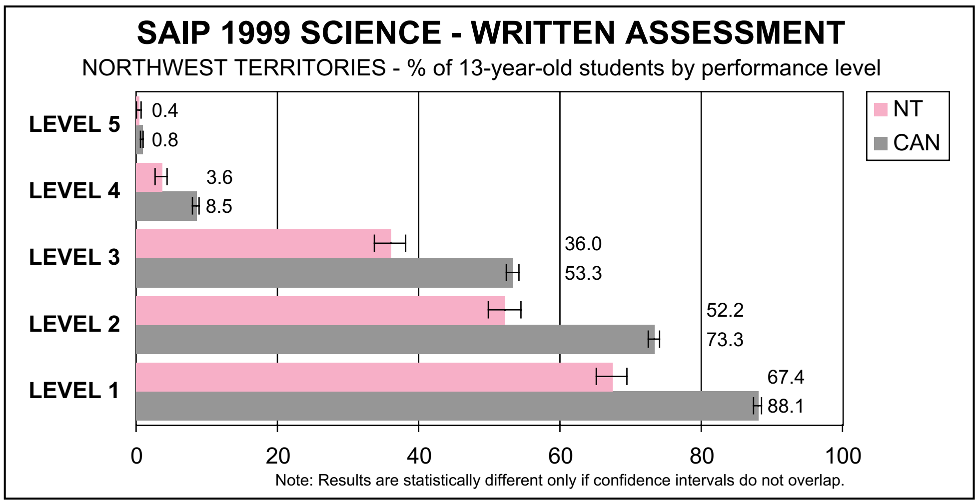
There is currently no territorial-wide assessment done, other than Alberta Education's grade 12 diploma examinations and SAIP. A *Student Evaluation Handbook* was developed in 1993 to assist teachers in developing a variety of assessment approaches and instruments.

Over the next year, the department will develop a directive on assessment and evaluation for the NWT. The challenge will be to establish culturally appropriate ways of measuring the success of students and programs in relation to high standards of achievement in a multilingual and multicultural environment.

Written Assessment

There are significant differences between the performance of Northwest Territories 13-year-olds and Canadian students overall at levels 1, 2, 3, and 4 in the written assessment. Northwest Territories 13-year-old students performed as well in this category as students in the Canadian sample at level 5. There are significant differences between the performance of Northwest Territories 16-year-olds and Canadian students overall at levels 1, 2, and 3 in the written assessment. Northwest Territories 16-year-old students performed as well in this category as students in the Canadian sample at levels 4 and 5.

CHART 78



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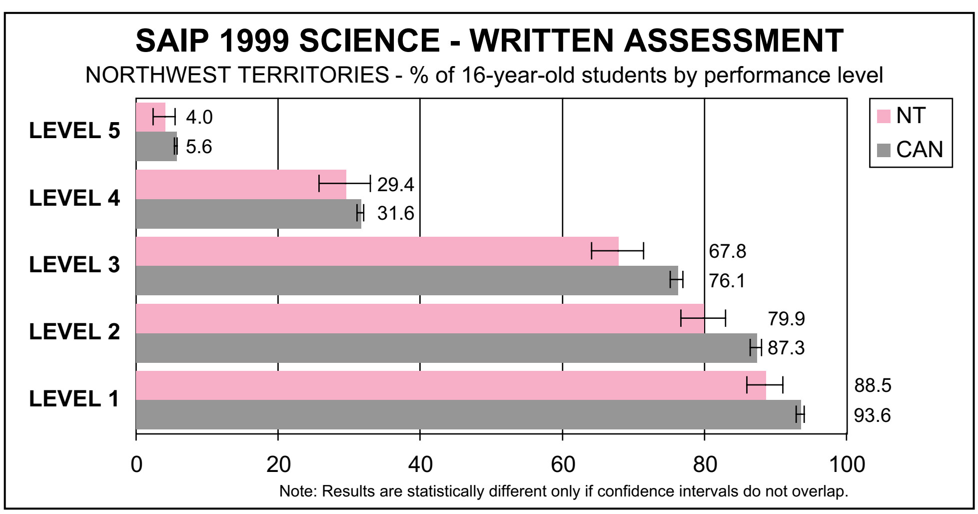


Written Assessment

There are significant differences between the performance of Nunavut 13-year-olds and Canadian students overall at levels 1, 2, 3, and 4 in the written assessment. Nunavut students performed as well in this category as students in the Canadian sample at level 5. There are significant differences between the performance of Nunavut 16-year-olds and Canadian students overall at all levels in the written assessment.

CHART 80

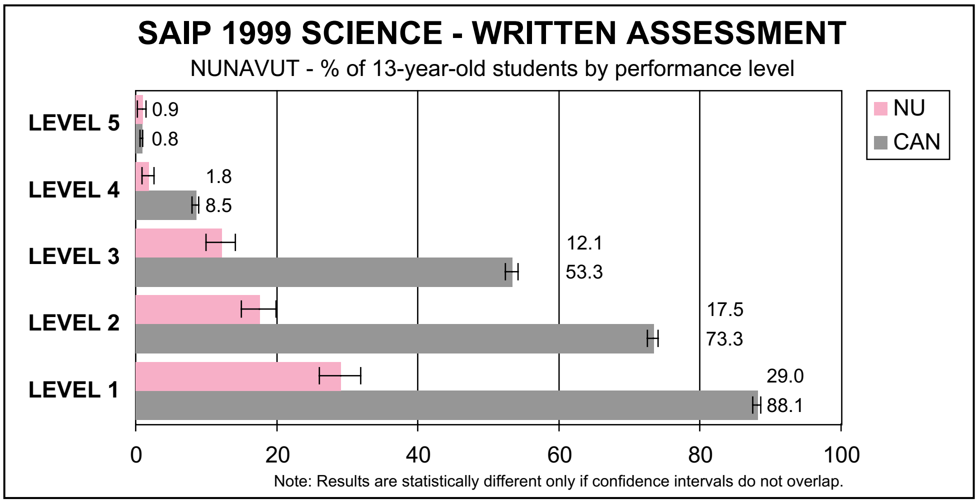
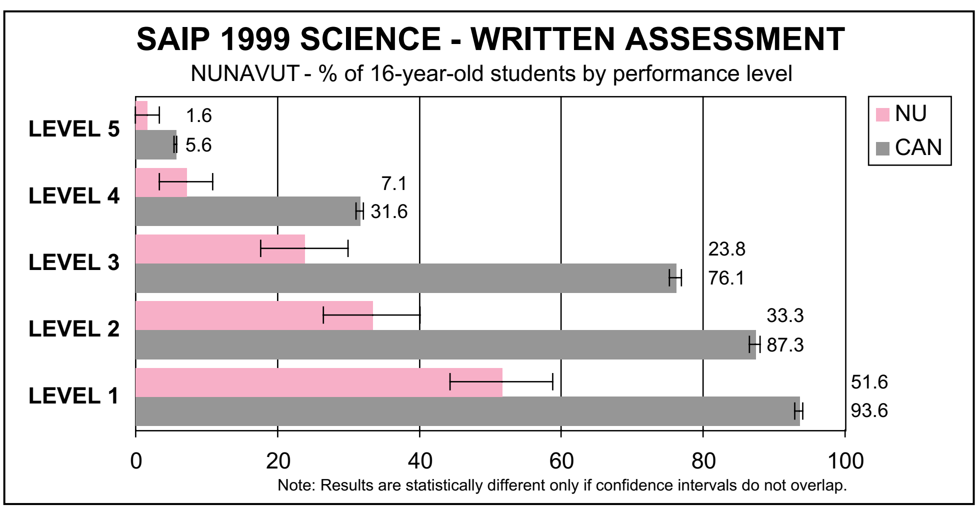


CHART 81



CONTEXT QUESTIONNAIRES

INTRODUCTION

The value of student achievement information is greatly enhanced by linking it, as much as possible, to the context within which students live and learn. Social, educational, and personal environment all contribute to student learning and therefore to the performance on such assessments as those administered by SAIP.

In the past, SAIP assessments have collected such context data through questionnaires administered to the sampled students. Data so collected then is reported briefly in the public report, and in more detail in the subsequent technical reports.

For the 1999 SAIP Science Assessment, additional context information was collected through questionnaires completed by science teachers, and by school administrators describing the school environment. This is the first time in the SAIP that such extensive information has been collected.

While maintaining a commitment to the anonymity of individual students, teachers, and schools, this information will allow the careful examination by researchers of the complex linkages between student achievement and its context, as described by students, their teachers, and the schools in which they work.

The following pages highlight some of the results of these questionnaires. More complete information, including jurisdictional results, will appear in the accompanying document *Science Learning: The Canadian Context* and in the Technical Report. The data apply to Canada as a whole but not necessarily to any individual province. All figures represent percentages unless otherwise indicated. Percentages may be rounded.

Each student who participated in the 1999 Science Assessment was also asked to complete a student questionnaire with questions about science practices and attitudes.

Percentages may not always add up to 100%. This is due to the fact that, for any question, approximately 3% of the responses may be either missing or ambiguous. Complete findings will be available in *Science Learning: The Canadian Context* and in the Technical Report.

Languages

How often do you speak [the language of the test] at home? (all students)

	% of whole group	*% of these students at level 3 or above*
13-year-olds always or nearly always	89	57
13-year-olds sometimes	9	40
13-year-olds never	2	40
16-year-olds always or nearly always	89	81
16-year-olds sometimes	9	61
16-year-olds never	2	64

How often do you speak [Language of the test] at home? (by language)

	English	*French*
13-year-olds always or nearly always	90	88
13-year-olds sometimes	9	8
13-year-olds never	1	4
16-year-olds always or nearly always	90	86
16-year-olds sometimes	8	10
16-year-olds never	2	4

For all students, the language spoken at home seems to relate to achievement. As the first table shows, higher proportions of students reached level 3 or higher if they always or nearly always speak the language of the test at home.

The second table suggests that somewhat fewer students who wrote the assessment in French spoke French at home. Further research will address the question of the effect of this on student achievement of francophone students — particularly those living outside Quebec.

To do well in science you need

natural ability

	% of whole group	*% of these students at level 3 or above*
13-year-olds who strongly disagree	14	53
13-year-olds who disagree	47	57
13-year-olds who agree	35	56
13-year-olds who strongly agree	5	43

16-year-olds who strongly disagree	7	71
16-year-olds who disagree	36	78
16-year-olds who agree	49	82
16-year-olds who strongly agree	8	70

Only 40% of 13-year-olds agree or strongly agree with this statement, but 57% of 16-year-olds agree or strongly agree that you need natural ability to do well in science.

good luck

	% of whole group	*% of these students at level 3 or above*
13-year-olds who strongly disagree	35	54
13-year-olds who disagree	50	57
13-year-olds who agree	12	56
13-year-olds who strongly agree	3	43
16-year-olds who strongly disagree	30	82
16-year-olds who disagree	54	81
16-year-olds who agree	12	65
16-year-olds who strongly agree	2	57

Only 15% of 13-year-olds and 14% of 16-year-olds believe luck plays a major role in doing well in science. For 16-year-olds, over 80% of those who disagreed reached level 3 or higher.

hard work

	% of whole group	*% of these students at level 3 or above*
13-year-olds who strongly disagree	1	40
13-year-olds who disagree	3	53
13-year-olds who agree	42	54
13-year-olds who strongly agree	54	57
16-year-olds who strongly disagree	1	41
16-year-olds who disagree	2	76
16-year-olds who agree	41	79
16-year-olds who strongly agree	56	79

Rather more students of both age groups agreed or agreed strongly that hard work is a factor in achieving well in science. Of those who agreed or agreed strongly, a higher proportion reached level 3 or higher.

encouragement from teachers

	% of whole group	*% of these students at level 3 or above*
13-year-olds who strongly disagree	2	59
13-year-olds who disagree	8	55
13-year-olds who agree	55	56
13-year-olds who strongly agree	34	55
16-year-olds who strongly disagree	1	60
16-year-olds who disagree	7	84
16-year-olds who agree	56	78
16-year-olds who strongly agree	36	79

Encouragement from teachers is seen as quite important for students of both age groups.

encouragement from parents

	% of whole group	*% of these students at level 3 or above*
13-year-olds who strongly disagree	3	55
13-year-olds who disagree	11	55
13-year-olds who agree	52	57
13-year-olds who strongly agree	35	54
16-year-olds who strongly disagree	3	74
16-year-olds who disagree	15	83
16-year-olds who agree	53	79
16-year-olds who strongly agree	29	77

Encouragement from parents is also is seen as quite important for students of both age groups.

How often do you and your parent(s) or guardian(s)

work together on your science homework?

13-year-olds who report	*% of whole group*	*% of these students at level 3 or above*
rarely or never	57	58
a few times a month	29	57
a few times a week	13	47
almost every day	2	26
16-year-olds who report		
rarely or never	80	79
a few times a month	16	82
a few times a week	4	62
almost every day	1	67

Only 15% of 13-year-olds and 5% of 16-year-olds report working together with their parents on science homework more than a few times a month. Since somewhat fewer of these students reached level 3 or higher, this may indicate that the increased parental involvement is a result of the difficulty these students are having with science.

work together on your homework in other subjects?

13-year-olds who report	*% of whole group*	*% of these students at level 3 or above*
rarely or never	33	61
a few times a month	35	57
a few times a week	26	51
almost every day	6	33
16-year-olds who report		
rarely or never	60	81
a few times a month	30	78
a few times a week	10	68
almost every day	2	49

As might be expected, direct parental involvement decreases as students become older. However, it is interesting to note again the apparent relationship between parental involvement and achievement.

discuss your daily activities?

13-year-olds who report	*% of whole group*	*% of these students at level 3 or above*
rarely or never	10	48
a few times a month	15	48
a few times a week	32	55
almost every day	44	60

16-year-olds who report		
rarely or never	10	67
a few times a month	15	75
a few times a week	33	76
almost every day	43	84

There appears to be a much more positive relationship between discussing, or perhaps showing interest in, daily activities in general and student achievement than there does between direct involvement in homework and student achievement. Over 75% of both 13-year-olds and 16-year-olds discuss daily activities fairly frequently. These same students also appear to attain higher achievement.

Introduction

Approximately 6,500 responses were received to this questionnaire, which was addressed to teachers of the students who were selected to write the 1999 SAIP Science Assessment. The information collected deals with the work of the teachers and their approach to science teaching.

As with the other questionnaire data, detailed information will be available in the accompanying supplement to this report and in the technical report.

Selected Data

The information below was selected for inclusion in the public report to provide some indication of the types of questions asked and a range of the responses to them.

Note: The median is the value of the middle element of a set of responses, the element for which equal numbers of responses are below and above.

For example, when asked how many hours per week they were scheduled to teach biology/life science classes, the median was 5.5, in other words half of the teachers responding reported fewer than 5.5 hours, and half reported 5.5 or more hours.

Class Size

What is the AVERAGE number of students in the science classes you teach this year?

Median size is 24; 80% of teachers reported an average of 29 or fewer students.

LARGEST class size

Median size is 28; 20% of teachers reported a largest class of 33 or more students.

SMALLEST class size

Median size is 20; 75% of teachers reported a smallest class of 24 or fewer students.

Most classes appear to have between 20 and 30 students, although a few teachers reported classes as small as 10 and as large as 40.

Contact with Parents

About what percentage of parents would you say you have contact with, over a full school year, other than during regularly scheduled parent-teacher interviews?

At regularly scheduled parent-teacher interviews?

Median is 30%; with 60% of teachers reporting they had contact in this manner with 40% or fewer parents.

At times other than during regularly scheduled interviews?

Median is 9%; with 80% of teachers reporting they had contact in this manner with 28% or fewer parents.

Teachers report relatively little parental contact, which is worth noting, particularly considering comments by students and teachers about the importance of parental involvement.

Teacher Attitudes toward Science Teaching

About how often do you meet with other teachers to plan lessons, units, tests, or other program matters?

never	7.8
once or twice a year	22.6
about every other month	11.9
about once a month	18.2
about once a week	20.7
two or three times a week	10.8
almost every day	7.0

43% of teachers collaborate with colleagues less than once a month for program planning. This may reflect the fact that many teachers are the only science teacher in a small school.

To what extent do you agree or disagree with each of the following statements?

	strongly disagree	*disagree*	*agree*	*strongly agree*
Science is primarily a body of knowledge and concepts.	9.5	47.8	38.7	4.0
Science is better thought of as a process than as a body of knowledge and concepts.	0.7	9.6	59.3	30.4
Science is primarily concerned with finding theories to explain observed events.	3.3	36.6	53.6	6.5
There are limits to what a teacher can accomplish because student ability has a large influence on achievement.	3.7	29.7	54.9	11.8
Students need natural talent to do well in science courses	17.0	64.6	17.3	1.1
Students need to work hard to do well in science courses.	0.8	11.8	68.0	19.5
A student's home environment has an influence on achievement.	0.4	2.0	46.5	51.0
High school students should be streamed into different programs based on their abilities.	3.3	20.6	54.2	21.9

The preceding table provides a number of interesting sidelights on teacher attitudes toward their students and the subject of science.

- *Over 42% of teachers agree that science is primarily a body of knowledge and concepts, but nearly 90% say science is better thought of as a process.*
- *Nearly 90% agree that a student's home environment has an influence on achievement (see parental contact, above).*
- *Over 75% feel high school students should be streamed, based on abilities.*

Classroom Strategies

How often do the following things happen in your science classes?

	rarely or never	*a few times a month*	*a few times a week*	*almost every class*
I give notes.	4.3	20.6	45.3	29.9
I show students how to do problems.	2.9	19.6	48.1	29.5
Students work on long-term science projects.	41.5	52.3	5.5	0.8
Students work in pairs or small groups.	3.5	30.8	42.8	22.9
Students do laboratory experiments.	6.6	52.0	35.4	6.0
I demonstrate an experiment.	16.5	61.6	20.0	1.9
We discuss a coming quiz or test.	4.3	69.1	23.4	3.3
I give feedback to the class on assignments, tests, or other evaluations.	1.4	44.0	39.5	15.1
I attempt to diagnose and correct individual student problems or weaknesses in learning.	4.6	30.2	39.3	25.9

	rarely or never	*a few times a month*	*a few times a week*	*almost every class*
Students work alone on assigned work.	9.2	29.1	49.1	12.6
Students study the textbook.	29.1	32.4	30.5	8.0
I read from or summarize the textbook.	37.9	29.3	25.0	7.8
I help students develop general learning strategies.	3.8	34.8	37.7	23.7
We go outdoors or on a field trip.	79.4	19.2	1.3	0.2
I work with individual students.	3.6	25.6	37.8	33.0
We discuss or do things other than the topic of the lesson.	19.2	47.5	25.7	7.7

This table show that teachers use a wide variety of strategies in the classroom. Perhaps most interesting is that nearly 80% of teachers rarely or never take classes outdoors or on a field trip.

Assessment Strategies

In assessing the work of students in your science courses, how much weight do you give each of the following?

	none	*a little*	*quite a lot*	*great deal*
standardized tests produced outside the school	58.4	27.1	10.9	3.6
teacher-made short answer or essay tests that require students to explain their reasoning	2.5	25.9	57.5	14.1
teacher-made multiple-choice, true-false, or matching tests	5.4	33.8	50.1	10.7
homework assignments	6.9	51.5	36.4	5.2
projects or laboratory exercises	2.2	35.0	54.2	8.6
portfolios of student work	65.2	25.1	7.8	1.9
observations or interviews of students	47.1	40.9	10.7	1.3
attendance in class	54.2	28.6	11.1	6.1
participation of students in class activities	22.0	47.8	23.2	7.0
effort	19.1	42.7	27.7	10.5
improvement over the year or term	31.6	37.8	23.6	7.0
other	60.2	30.2	7.9	1.7
student self-assessment	57.4	35.6	5.9	1.1
peer evaluation	63.2	33.1	3.3	0.5

Again, as one would expect, this table shows that teachers use a great variety of assessment strategies. Some particularly interesting data:

- *Only about 14% of teachers give much weight to external standardized tests when assessing students.*
- *37% give little or no weight to projects or laboratory exercises.*
- *Only 12% give much weight to observations or interviews with students.*
- *Only 7% give much weight to self-assessment.*

Teacher Qualifications

Which of the following degrees or diplomas do you hold?

	(Check all that apply)
B.A. or equivalent	18.4
B.Sc. or equivalent	49.2
B.Ed. or equivalent (e.g., at least one year teacher training)	71.2
Trade or technical diploma or equivalent	3.4
Master's degree in education	9.3
Master's degree in another subject	6.5
Ph.D. or equivalent	1.1
Other degree or diploma	14.8
No degree or diploma	0.5

This table contains some rather startling data. Only half hold a science degree, and less than three-quarters have the equivalent of one year of teacher training.

Introduction

Approximately 2,000 responses were received to this questionnaire, which was addressed to the school principal. The information collected deals with the nature of the community, the school itself, and the resources available.

As with the other questionnaire data, detailed information will be available in the accompanying supplement to this report and in the technical report.

Selected Data

The information below was selected for inclusion in the public report to provide some indication of the types of questions asked, and a range of the responses to them.

Note: The median is the value of the middle element of a set of responses, the element for which equal numbers of responses are below and above.

For example, when asked how many full-time students were in their school, the median was 398 students, i.e., half of the schools reported more than 398, and half reported 398 or fewer students.

Principals were asked approximately what percentage of their students:

a) live within walking distance (about 1 km) of the school? Median = 24%

As many as 25% of schools reported that 60% or more of their students did so.

b) travel to and from school by subsidized transportation? Median = 60%

As many as 45% of schools reported that more than half their students did so.

c) have a first language other than the language of the school? Median = 1%

Yet more than 10% of schools reported that this was true for more than 80% of their students.

d) have learning problems that need special attention? Median = 9%

More than 10% of schools reported that more than 25% of their students had special needs.

e) come from single parent families? Median = 19%

More than 25% of schools reported that more than 30% of students came from such families.

f) have health or nutrition problems that inhibit learning? Median = 4%

More than 80% of the schools reported less than 10% of their students with these problems.

Principals were asked how much influence each of the following had on their overall activities and programs.

The following figures represent the percentages who reported "some" or "a lot" on a four-point scale for selected categories.

a)	provincial/territory ministry or department of education	91
b)	school board or governing body	86
c)	principal	96
d)	teachers collectively	94
e)	parent advisory committee or school council	55
f)	students (e.g. demand for particular courses)	53
g)	teacher groups external to the school	23
h)	external examinations, tests, or standards	56

Principals were asked to what degree the school's capacity to provide instruction is limited by the following:

The following figures represent the percentages who reported "some" or "a lot" on a four-point scale for selected categories.

a)	lack of parental support for the school	41
b)	range of student abilities in the school	46
c)	students' home backgrounds	58
d)	community conditions (e.g. language, migration)	34
e)	bussing of students	24

Principals were asked to what degree the school's capacity to provide instruction is limited by shortage or inadequacy of the following:

The following figures represent the percentages who reported "some" or "a lot" on a four-point scale for selected categories.

a)	teachers specialized in science	28
b)	numbers of computers for science instruction	66
c)	quality of computers for science instruction	52
d)	science laboratory space	38
e)	science laboratory equipment	45

Over half of the schools reported more than 50 working computers in their school, with over three-quarters reporting more than 100 working computers.

Principals were asked to what extent they agree with a series of statements.

The following percentages represent those who "agreed" or "agreed strongly" on a four-point scale.

There are limits to what a school can accomplish because a student's home environment has a large influence on achievement.	78
Students can achieve at high levels if they work hard.	93
High school students should be streamed into different programs based on their abilities and aptitudes.	93
Students can achieve at high levels if they are taught well.	74
Student ability has a large influence on achievement.	86
This school is supported by the community.	91
Staff morale is high in this school.	87
There is a strong school spirit in this school.	88
Students and staff take pride in this school.	94

CONCLUSION

This report describes the outcome of the 1999 Science Assessment. Science is the last of the three SAIP subjects to be assessed for the second time using essentially the same instruments. Thirty-one thousand 13- and 16-year-old students, English- and French-speaking, were administered the assessment instruments designed, developed, and enhanced by representatives of the ten provinces and the three territories, working together under the leadership of the development team. In spite of the diversity of student circumstances and education experiences across the country, this challenging exercise nevertheless produced an assessment of skills that are very difficult to address in large-scale testing. This assessment was made possible by the cooperation extended to the development teams by students, teachers, parents, and stakeholder representatives. In 1999, a pan-Canadian panel of representatives of various sectors of society developed a set of expectations to help interpret the results actually achieved by the students.

Results show that, for Canada as a whole, performance at higher levels in science knowledge and skills has improved significantly between 1996 and 1999. In 1999, for both age groups and genders, little significant difference in achievement can be observed for the written assessment. Slightly more 13-year-old females performed at higher levels in the practical task assessment.

Significant differences in performance at several levels can be observed between students who responded to the assessment in French and those who responded in English. There is little consistency in the pattern of these differences, however.

Many of the 1999 results do meet the expectations expressed by the pan-Canadian panel in science. In general, students did accomplish what is expected of them, in particular in the practical task assessment. In the written assessment, it was expected that slightly more students would be able to achieve at levels 4 and 5, demonstrating relatively more sophisticated science knowledge and skills.

In this assessment again, 16-year-olds performed much better than 13-year olds. Although this will come as no surprise, this process makes it possible to measure and document with reliable statistics the achievement gap in science between those age groups across Canada. We can at least infer that our educational systems do foster the development of science knowledge and skills between the ages of 13 and 16.

In the written assessment of science knowledge, more than three-quarters of 16-year-olds and more than half of 13-year-olds students reached level 3. In the practical task assessment of science investigative skills, more than three-quarters of 16-year-olds and nearly half of 13-year-old students reached level 3.

Given the fact that 13-year-olds and 16-year-olds are administered the same assessment, the School Achievement Indicators Program designers thought that the largest proportion of the younger group would achieve at level 2 and that the largest proportion of the older group would achieve at level 3. It is a pleasant surprise indeed that a sizeable percentage of 13-year-old students reached level 4 and above. It is heartening for Canadians to see the proportion of 16-year-old students who achieved level 5 in each component. This level of performance represents a significant attainment of science knowledge and skills for students in this age group.

For example, to be assigned level 3 in the written assessment, students were able to

- use chemical properties to compare and classify substances
- know that some life forms are unicellular and others are multicellular, and that life forms are involved in the transfer of energy

- compare gravitational and electrical forces
- compare changes in Earth's surface and their causes
- analyse experiments and judge their validity
- identify areas where science knowledge and technologies address societal problems

For example, to be assigned level 3 in the practical task assessment, a student demonstrated ability to

- select appropriate materials for use in investigations
- identify possible sources of error
- identify various types of variables
- identify patterns, trends, and simple relationships
- extrapolate or interpolate
- draw conclusions from experimental data

Although these definitions may seem technical, they were developed by science and curriculum specialists in order to set out specifically the concepts underlying the design of the tests and the evaluation of the results.

Comparisons between the science written component and the practical task component results should only be attempted with caution. While students may appear to have achieved higher or lower scores in practical tasks than in the written assessment, this may not be significant since different criteria were used in the two assessments, and it is impossible to equate the degree of difficulty of the questions contained in each component.

Results from, and expectations established for, the 1999 assessment will serve as points of comparison for the next science assessment.

WRITTEN ASSESSMENT: DATA TABLES

1999 SAIP Science Written Assessment — Distribution of Frequencies

13-year-olds

Population	Below 1	Level 1	Level 2	Level 3	Level 4	Level 5	
	Performance						
BC	8.9	14.9	18.2	47.5	9.1	1.3	%
	2.0	2.4	2.6	3.4	2.0	0.8	Error
		91.1	76.1	57.9	10.4	1.3	Cum. %
		2.0	2.9	3.4	2.1	0.8	Error
AB	9.3	8.2	17.6	50.2	12.0	2.7	%
	1.8	1.7	2.4	3.2	2.1	1.0	Error
		90.7	82.5	64.9	14.7	2.7	Cum. %
		1.8	2.4	3.0	2.3	1.0	Error
SK	9.2	15.3	23.4	44.3	6.7	1.2	%
	1.9	2.4	2.8	3.3	1.7	0.7	Error
		90.8	75.5	52.1	7.8	1.2	Cum. %
		1.9	2.9	3.3	1.8	0.7	Error
MBe	13.4	13.9	19.1	45.2	8.0	0.5	%
	2.3	2.4	2.7	3.4	1.9	0.5	Error
		86.6	72.8	53.7	8.5	0.5	Cum. %
		2.3	3.0	3.4	1.9	0.5	Error
MBf	29.3	9.5	20.9	37.7	2.4	0.2	%
	3.5	2.2	3.1	3.7	1.2	0.4	Error
		70.7	61.2	40.3	2.6	0.2	Cum. %
		3.5	3.7	3.7	1.2	0.4	Error
ONe	11.6	16.3	23.7	41.1	6.8	0.5	%
	2.2	2.6	3.0	3.5	1.8	0.5	Error
		88.4	72.1	48.4	7.3	0.5	Cum. %
		2.2	3.1	3.5	1.8	0.5	Error
ONf	25.3	17.5	21.8	32.0	3.4	0.0	%
	2.9	2.5	2.7	3.1	1.2	0.0	Error
		74.7	57.2	35.4	3.4	0.0	Cum. %
		2.9	3.3	3.2	1.2	0.0	Error
QCe	14.1	16.2	19.1	42.4	7.3	0.8	%
	2.3	2.4	2.6	3.2	1.7	0.6	Error
		85.9	69.6	50.5	8.1	0.8	Cum. %
		2.3	3.0	3.3	1.8	0.6	Error
QCf	13.5	13.7	15.4	49.7	7.3	0.3	%
	2.1	2.1	2.3	3.1	1.6	0.3	Error
		86.5	72.8	57.3	7.6	0.3	Cum. %
		2.1	2.8	3.1	1.7	0.3	Error

Population	Below 1	Level 1	Level 2	Level 3	Level 4	Level 5	
				Performance			
NBe	10.3	20.3	19.7	44.1	5.4	0.1	%
	2.1	2.8	2.8	3.5	1.6	0.2	Error
		89.7	69.4	49.7	5.5	0.1	Cum. %
		2.1	3.2	3.5	1.6	0.2	Error
NBf	22.5	17.0	22.0	34.2	3.9	0.4	%
	2.6	2.4	2.6	3.0	1.2	0.4	Error
		77.5	60.5	38.5	4.3	0.4	Cum. %
		2.6	3.1	3.1	1.3	0.4	Error
NSe	10.5	19.9	21.3	41.0	7.1	0.1	%
	2.2	2.9	3.0	3.6	1.9	0.3	Error
		89.5	69.5	48.2	7.2	0.1	Cum. %
		2.2	3.3	3.6	1.9	0.3	Error
NSf	25.0	13.2	21.6	36.3	3.9	0.0	%
	3.1	2.4	2.9	3.4	1.4	0.0	Error
		75.0	61.8	40.2	3.9	0.0	Cum. %
		3.1	3.5	3.5	1.4	0.0	Error
PE	9.8	15.9	21.4	45.6	7.2	0.2	%
	2.0	2.4	2.7	3.3	1.7	0.3	Error
		90.2	74.3	52.9	7.3	0.2	Cum. %
		2.0	2.9	3.3	1.7	0.3	Error
NF	16.4	15.5	21.1	41.7	4.5	0.7	%
	2.1	2.0	2.3	2.7	1.2	0.5	Error
		83.6	68.0	46.9	5.2	0.7	Cum. %
		2.1	2.6	2.8	1.2	0.5	Error
YK	17.1	11.6	16.2	45.3	8.3	1.5	%
	2.2	1.9	2.2	2.9	1.6	0.7	Error
		82.9	71.3	55.0	9.8	1.5	Cum. %
		2.2	2.6	2.9	1.7	0.7	Error
NT	32.6	15.2	16.2	32.4	3.2	0.4	%
	2.2	1.7	1.7	2.2	0.8	0.3	Error
		67.4	52.2	36.0	3.6	0.4	Cum. %
		2.2	2.3	2.2	0.9	0.3	Error
NU	71.0	11.5	5.4	10.3	0.9	0.9	%
	2.9	2.1	1.5	2.0	0.6	0.6	Error
		29.0	17.5	12.1	1.8	0.9	Cum. %
		2.9	2.5	2.1	0.9	0.6	Error
CAN	11.9	14.7	20.0	44.9	7.7	0.8	%
	0.6	0.6	0.7	0.9	0.5	0.2	Error
		88.1	73.3	53.3	8.5	0.8	Cum. %
		0.6	0.8	0.9	0.5	0.2	Error

16-year-olds

Population	Below 1	Level 1	Level 2	Level 3	Level 4	Level 5	
				Performance			
BC	6.8	5.6	11.7	46.3	25.6	3.9	%
	1.9	1.7	2.4	3.7	3.3	1.4	Error
		93.2	87.6	75.8	29.5	3.9	Cum. %
		1.9	2.5	3.2	3.4	1.4	Error
AB	3.1	3.6	7.5	36.0	38.0	11.8	%
	1.1	1.2	1.7	3.1	3.1	2.1	Error
		96.9	93.3	85.8	49.8	11.8	Cum. %
		1.1	1.6	2.3	3.2	2.1	Error
SK	5.7	6.5	10.4	48.7	23.9	4.9	%
	1.6	1.7	2.1	3.4	2.9	1.5	Error
		94.3	87.8	77.4	28.8	4.9	Cum. %
		1.6	2.2	2.9	3.1	1.5	Error
MBe	4.8	4.9	10.4	44.3	29.1	6.4	%
	1.4	1.4	2.0	3.3	3.0	1.6	Error
		95.2	90.2	79.8	35.5	6.4	Cum. %
		1.4	1.9	2.6	3.1	1.6	Error
MBf	7.5	3.1	13.2	54.3	19.2	2.6	%
	2.0	1.3	2.6	3.8	3.0	1.2	Error
		92.5	89.4	76.2	21.9	2.6	Cum. %
		2.0	2.4	3.3	3.2	1.2	Error
ONe	7.5	7.7	12.6	44.2	23.1	4.9	%
	2.0	2.0	2.6	3.8	3.2	1.7	Error
		92.5	84.8	72.2	28.0	4.9	Cum. %
		2.0	2.8	3.4	3.5	1.7	Error
ONf	13.4	10.6	15.9	42.0	15.5	2.6	%
	2.8	2.5	3.0	4.0	2.9	1.3	Error
		86.6	76.0	60.1	18.1	2.6	Cum. %
		2.8	3.5	4.0	3.1	1.3	Error
QCe	7.3	6.4	9.6	44.3	25.4	7.0	%
	1.7	1.6	1.9	3.2	2.8	1.6	Error
		92.7	86.3	76.7	32.4	7.0	Cum. %
		1.7	2.2	2.7	3.0	1.6	Error
QCf	4.4	4.9	10.1	47.7	27.1	5.7	%
	1.3	1.3	1.9	3.1	2.7	1.4	Error
		95.6	90.6	80.5	32.8	5.7	Cum. %
		1.3	1.8	2.4	2.9	1.4	Error

Population	Below 1	Level 1	Level 2	Level 3	Level 4	Level 5	
				Performance			
NBe	9.1	7.2	11.1	44.4	24.7	3.5	%
	2.2	1.9	2.4	3.7	3.2	1.4	Error
		90.9	83.7	72.6	28.3	3.5	Cum. %
		2.2	2.8	3.3	3.4	1.4	Error
NBf	10.3	9.1	11.3	50.0	16.8	2.6	%
	2.0	1.9	2.1	3.3	2.5	1.1	Error
		89.7	80.6	69.4	19.4	2.6	Cum. %
		2.0	2.6	3.1	2.6	1.1	Error
NSe	7.2	6.2	12.0	45.1	25.7	3.8	%
	1.5	1.4	1.8	2.8	2.5	1.1	Error
		92.8	86.5	74.6	29.5	3.8	Cum. %
		1.5	1.9	2.4	2.6	1.1	Error
NSf	10.7	6.0	9.5	35.7	35.7	2.4	%
	5.3	4.1	5.1	8.3	8.3	2.6	Error
		89.3	83.3	73.8	38.1	2.4	Cum. %
		5.3	6.4	7.6	8.4	2.6	Error
PE	4.1	3.9	10.8	45.4	29.2	6.7	%
	1.6	1.5	2.4	3.9	3.6	2.0	Error
		95.9	92.0	81.3	35.9	6.7	Cum. %
		1.6	2.1	3.1	3.8	2.0	Error
NF	10.6	7.3	9.4	42.3	24.7	5.6	%
	1.9	1.6	1.8	3.1	2.7	1.4	Error
		89.4	82.0	72.7	30.4	5.6	Cum. %
		1.9	2.4	2.8	2.9	1.4	Error
YK	9.1	4.7	12.2	35.8	30.7	7.5	%
	2.2	1.7	2.6	3.7	3.6	2.1	Error
		90.9	86.2	74.0	38.2	7.5	Cum. %
		2.2	2.7	3.4	3.8	2.1	Error
NT	11.5	8.7	12.1	38.4	25.4	4.0	%
	2.5	2.2	2.6	3.8	3.4	1.5	Error
		88.5	79.9	67.8	29.4	4.0	Cum. %
		2.5	3.1	3.7	3.6	1.5	Error
NU	48.4	18.3	9.5	16.7	5.6	1.6	%
	7.2	5.6	4.2	5.4	3.3	1.8	Error
		51.6	33.3	23.8	7.1	1.6	Cum. %
		7.2	6.8	6.2	3.7	1.8	Error
CAN	6.4	6.3	11.2	44.5	26.0	5.6	%
	0.4	0.4	0.6	0.9	0.8	0.4	Error
		93.6	87.3	76.1	31.6	5.6	Cum. %
		0.4	0.6	0.8	0.8	0.4	Error

1999 SAIP Science Written Assessment — Distribution of Frequencies

13-year-olds

	Gender Female	Male	Other*	Total	
Below 1	10.3	13.0	15.2	11.9	%
	0.8	0.8	3.3	0.6	Error
LEVEL 1	16.0	13.4	15.4	14.7	%
	0.9	0.8	3.3	0.6	Error
	89.7	87.0	84.8	88.1	Cum. %
	0.8	0.8	3.3	0.6	Error
LEVEL 2	20.5	19.0	23.0	20.0	%
	1.0	1.0	3.9	0.7	Error
	73.8	73.6	69.5	73.3	Cum. %
	1.1	1.1	4.3	0.8	Error
LEVEL 3	44.7	45.5	41.8	44.9	%
	1.3	1.2	4.6	0.9	Error
	53.2	54.6	46.4	53.3	Cum. %
	1.3	1.2	4.6	0.9	Error
LEVEL 4	7.7	8.2	3.8	7.7	%
	0.7	0.7	1.8	0.5	Error
	8.5	9.1	4.6	8.5	Cum. %
	0.7	0.7	1.9	0.5	Error
LEVEL 5	0.8	0.9	0.7	0.8	%
	0.2	0.2	0.8	0.2	Error
	0.8	0.9	0.7	0.8	Cum. %
	0.2	0.2	0.8	0.2	Error

*Not specified.

16-year-olds

	Gender Female	Male	Other*	Total	
Below 1	4.9	6.8	15.0	6.4	%
	0.6	0.7	3.9	0.4	Error
LEVEL 1	7.2	5.5	4.6	6.3	%
	0.7	0.6	2.3	0.4	Error
	95.1	93.2	85.0	93.6	Cum. %
	0.8	0.9	3.9	0.6	Error
LEVEL 2	11.4	10.1	16.8	11.2	%
	0.8	0.8	4.1	0.6	Error
	87.9	87.6	80.4	87.3	Cum. %
	0.8	0.9	4.4	0.6	Error
LEVEL 3	46.7	43.4	36.7	44.5	%
	1.3	1.3	5.3	0.9	Error
	76.5	77.5	63.6	76.1	Cum. %
	1.1	1.1	5.3	0.8	Error
LEVEL 4	24.3	28.4	21.2	26.0	%
	1.1	1.2	4.5	0.8	Error
	29.8	34.1	26.9	31.6	Cum. %
	1.2	1.3	4.9	0.8	Error
LEVEL 5	5.6	5.7	5.7	5.6	%
	0.6	0.6	2.5	0.4	Error
	5.6	5.7	5.7	5.6	Cum. %
	0.6	0.6	2.5	0.4	Error

*Not specified.

1999 SAIP Science Written Assessment — Distribution of Frequencies

13-year-olds

	Language English	*French*	*Total*	
Below 1	11.0	14.8	11.9	%
	0.6	1.2	0.6	Error
LEVEL 1	15.0	14.0	14.7	%
	0.7	1.2	0.6	Error
	89.0	85.2	88.1	Cum. %
	0.6	1.2	0.6	Error
LEVEL 2	21.2	16.2	20.0	%
	0.8	1.3	0.7	Error
	74.0	71.2	73.3	Cum. %
	0.9	1.6	0.8	Error
LEVEL 3	43.9	47.7	44.9	%
	1.0	1.7	0.9	Error
	52.8	55.0	53.3	Cum. %
	1.0	1.7	0.9	Error
LEVEL 4	7.9	6.9	7.7	%
	0.5	0.9	0.5	Error
	8.9	7.3	8.5	Cum. %
	0.6	0.9	0.5	Error
LEVEL 5	1.0	0.3	0.8	%
	0.2	0.2	0.2	Error
	1.0	0.3	0.8	Cum. %
	0.2	0.2	0.2	Error

16-year-olds

	Language			
	English	*French*	*Total*	
Below 1	6.8	5.3	6.4	%
	0.5	0.8	0.4	Error
LEVEL 1	6.5	5.4	6.3	%
	0.5	0.8	0.4	Error
	93.2	94.7	93.6	Cum. %
	0.5	0.8	0.4	Error
LEVEL 2	11.3	10.6	11.2	%
	0.7	1.1	0.6	Error
	86.7	89.2	87.3	Cum. %
	0.7	1.1	0.6	Error
LEVEL 3	43.7	47.3	44.5	%
	1.0	1.8	0.9	Error
	75.3	78.6	76.1	Cum. %
	0.9	1.4	0.8	Error
LEVEL 4	26.0	25.9	26.0	%
	0.9	1.5	0.8	Error
	31.7	31.4	31.6	Cum. %
	1.0	1.6	0.8	Error
LEVEL 5	5.7	5.5	5.6	%
	0.5	0.8	0.4	Error
	5.7	5.5	5.6	Cum. %
	0.5	0.8	0.4	Error

1999 SAIP Science Practical Tasks — Distribution of Frequencies

13-year-olds

Population	Below 1	Level 1	Level 2	Level 3	Level 4	Level 5	
SK	4.0	7.4	41.8	37.8	5.2	3.8	%
	1.4	1.8	3.4	3.3	1.5	1.3	Error
		96.0	88.6	46.7	9.0	3.8	Cum. %
		1.4	2.2	3.4	2.0	1.3	Error
ONe	3.8	9.4	43.8	31.8	5.4	5.8	%
	1.4	2.2	3.7	3.4	1.7	1.7	Error
		96.2	86.8	43.0	11.2	5.8	Cum. %
		1.4	2.5	3.7	2.3	1.7	Error
ONf	5.2	7.0	44.1	31.1	8.1	4.5	%
	2.0	2.3	4.4	4.1	2.4	1.9	Error
		94.8	87.8	43.7	12.6	4.5	Cum. %
		2.0	2.9	4.4	3.0	1.9	Error
OTHERS	3.2	4.4	40.5	37.4	7.9	6.3	%
	0.8	1.0	2.4	2.3	1.3	1.2	Error
		96.5	92.1	51.6	14.2	6.3	Cum. %
		0.9	1.3	2.4	1.7	1.2	Error
CAN	3.7	6.3	41.7	35.4	6.9	6.0	%
	0.6	0.8	1.6	1.6	0.8	0.8	Error
		96.3	90.0	48.3	13.0	6.0	Cum. %
		0.6	1.0	1.6	1.1	0.8	Error

16-year-olds

Population	Below 1	Level 1	Level 2	Level 3	Level 4	Level 5	
	Performance						
SK	1.6	2.5	21.4	39.5	17.3	17.7	%
	0.9	1.1	2.9	3.5	2.7	2.7	Error
		98.4	96.0	74.6	35.1	17.7	Cum. %
		0.9	1.4	3.1	3.4	2.7	Error
ONe	3.1	2.6	22.1	32.8	18.8	20.6	%
	1.4	1.3	3.4	3.8	3.2	3.3	Error
		96.9	94.3	72.2	39.4	20.6	Cum. %
		1.4	1.9	3.6	4.0	3.3	Error
ONf	3.0	2.7	29.6	35.3	15.4	13.9	%
	1.6	1.5	4.3	4.5	3.4	3.3	Error
		97.0	94.3	64.7	29.4	13.9	Cum. %
		1.6	2.2	4.5	4.3	3.3	Error
QC	1.7	1.0	18.5	36.8	23.7	18.2	%
	0.9	0.7	2.7	3.3	2.9	2.6	Error
		98.3	97.3	78.7	41.9	18.2	Cum. %
		0.9	1.1	2.8	3.4	2.6	Error
OTHERS	2.7	1.2	17.8	33.7	21.2	23.3	%
	0.9	0.6	2.2	2.7	2.4	2.4	Error
		97.2	96.0	78.1	44.5	23.3	Cum. %
		1.0	1.1	2.4	2.9	2.4	Error
CAN	2.6	1.8	19.9	34.4	20.7	20.7	%
	0.5	0.4	1.3	1.5	1.3	1.3	Error
		97.4	95.6	75.7	41.4	20.7	Cum. %
		0.5	0.7	1.4	1.6	1.3	Error

1999 SAIP Science Practical Tasks — Distribution of Frequencies

13-year-olds

	Gender				
	Male	*Female*	*Other**	*Total*	
Below 1	4.7	2.7	0.0	3.7	%
	1.0	0.7	0.0	0.6	Error
LEVEL 1	6.8	5.8	0.0	6.3	%
	1.2	1.1	0.0	0.8	Error
	95.3	97.3	100.0	96.3	Cum. %
	1.0	0.7	0.0	0.6	Error
LEVEL 2	42.5	41.0	29.2	41.7	%
	2.3	2.2	62.7	1.6	Error
	88.5	91.5	100.0	90.0	Cum. %
	1.5	1.3	0.0	1.0	Error
LEVEL 3	34.9	35.7	70.8	35.4	%
	2.2	2.2	62.7	1.5	Error
	46.1	50.5	70.8	48.3	Cum. %
	2.3	2.3	62.7	1.6	Error
LEVEL 4	6.4	7.5	0.0	6.9	%
	1.1	1.2	0.0	0.8	Error
	11.1	14.8	0.0	13.0	Cum. %
	1.5	1.6	0.0	1.1	Error
LEVEL 5	4.7	7.2	0.0	6.0	%
	1.0	1.2	0.0	0.8	Error
	4.7	7.2	0.0	6.0	Cum. %
	1.0	1.2	0.0	0.8	Error

16-year-olds

		Gender				
		Male	*Female*	*Other**	*Total*	
Below 1		3.2	1.7	12.3	2.6	%
		0.8	0.6	11.0	0.5	Error
LEVEL 1		2.4	1.0	3.8	1.8	%
		0.7	0.5	6.4	0.4	Error
		96.8	98.3	87.7	97.4	Cum. %
		0.8	0.6	11.0	0.5	Error
LEVEL 2		20.1	19.5	25.2	19.9	%
		1.8	1.8	14.5	1.3	Error
		94.4	97.3	83.9	95.6	Cum. %
		1.0	0.7	12.3	0.7	Error
LEVEL 3		33.3	35.1	43.2	34.4	%
		2.1	2.2	16.6	1.5	Error
		74.3	77.7	58.7	75.7	Cum. %
		2.0	1.9	16.5	1.4	Error
LEVEL 4		20.0	21.5	15.2	20.7	%
		1.8	1.9	12.0	1.3	Error
		41.0	42.7	15.5	41.4	Cum. %
		2.2	2.2	12.1	1.6	Error
LEVEL 5		21.0	21.2	0.3	20.7	%
		1.9	1.8	1.9	1.3	Error
		21.0	21.2	0.3	20.7	Cum. %
		1.9	1.8	1.9	1.3	Error

1999 SAIP Science Practical Tasks — Distribution of Frequencies

13-year-olds

	Language			
	English	*French*	*Total*	
Below 1	3.1	5.5	3.7	%
	0.7	1.3	0.6	Error
LEVEL 1	6.8	4.4	6.3	%
	1.0	1.2	0.8	Error
	96.9	94.5	96.3	Cum. %
	0.7	1.3	0.6	Error
LEVEL 2	40.3	46.4	41.7	%
	1.9	2.9	1.6	Error
	90.0	90.1	90.0	Cum. %
	1.2	1.7	1.0	Error
LEVEL 3	35.9	33.7	35.4	%
	1.9	2.7	1.5	Error
	49.8	43.8	48.3	Cum. %
	2.0	2.9	1.6	Error
LEVEL 4	6.9	7.2	6.9	%
	1.0	1.5	0.8	Error
	13.9	10.0	13.0	Cum. %
	1.3	1.7	1.1	Error
LEVEL 5	7.0	2.8	6.0	%
	1.0	1.0	0.8	Error
	7.0	2.8	6.0	Cum. %
	1.0	1.0	0.8	Error

16-year-olds

		Language			
		English	*French*	*Total*	
Below 1		2.9	1.5	2.6	%
		0.7	0.7	0.5	Error
LEVEL 1		2.0	0.9	1.8	%
		0.6	0.5	0.4	Error
		97.1	98.5	97.4	Cum. %
		0.7	0.7	0.5	Error
LEVEL 2		20.0	19.5	19.9	%
		1.6	2.1	1.3	Error
		95.1	97.5	95.6	Cum. %
		0.9	0.8	0.7	Error
LEVEL 3		33.7	36.8	34.4	%
		1.9	2.6	1.5	Error
		75.1	78.0	75.7	Cum. %
		1.7	2.2	1.4	Error
LEVEL 4		19.9	23.1	20.7	%
		1.6	2.3	1.3	Error
		41.4	41.2	41.4	Cum. %
		2.0	2.6	1.6	Error
LEVEL 5		21.5	18.1	20.7	%
		1.6	2.1	1.3	Error
		21.5	18.1	41.4	Cum. %
		1.6	2.1	1.6	Error

1999 SAIP Science Written Assessment — Sample Size

		13-Year-Olds		*16-Year-Olds*		*Total*	
		Number	*(%)*	*Number*	*(%)*	*Number*	*(%)*
BC	Female	402	(49.2%)	334	(48.3%)	736	(48.8%)
	Male	409	(50.1%)	353	(51.1%)	762	(50.5%)
	No info	6	(0.7%)	4	(0.6%)	10	(0.7%)
	Total	817	(100.0%)	691	(100.0%)	1508	(100.0%)
AB	Female	473	(49.8%)	458	(49.7%)	931	(49.7%)
	Male	468	(49.3%)	447	(48.5%)	915	(48.9%)
	No info	9	(0.9%)	17	(1.8%)	26	(1.4%)
	Total	950	(100.0%)	922	(100.0%)	1872	(100.0%)
SK	Female	407	(47.5%)	429	(52.3%)	836	(49.9%)
	Male	438	(51.2%)	379	(46.2%)	817	(48.7%)
	No info	11	(1.3%)	12	(1.5%)	23	(1.4%)
	Total	856	(100.0%)	820	(100.0%)	1676	(100.0%)
MBe	Female	382	(46.4%)	434	(48.7%)	816	(47.6%)
	Male	427	(51.9%)	455	(51.0%)	882	(51.4%)
	No info	14	(1.7%)	3	(0.3%)	17	(1.0%)
	Total	823	(100.0%)	892	(100.0%)	1715	(100.0%)
MBf	Female	261	(57.5%)	258	(62.0%)	519	(59.7%)
	Male	192	(42.3%)	155	(37.3%)	347	(39.9%)
	No info	1	(0.2%)	3	(0.7%)	4	(0.5%)
	Total	454	(100.0%)	416	(100.0%)	870	(100.0%)
ONe	Female	296	(38.0%)	267	(41.1%)	563	(39.4%)
	Male	324	(41.6%)	285	(43.8%)	609	(42.6%)
	No info	159	(20.4%)	98	(15.1%)	257	(18.0%)
	Total	779	(100.0%)	650	(100.0%)	1429	(100.0%)
ONf	Female	319	(42.0%)	224	(42.3%)	543	(42.1%)
	Male	310	(40.8%)	212	(40.1%)	522	(40.5%)
	No info	131	(17.2%)	93	(17.6%)	224	(17.4%)
	Total	760	(100.0%)	529	(100.0%)	1289	(100.0%)
QCe	Female	434	(48.0%)	467	(50.3%)	901	(49.2%)
	Male	468	(51.7%)	449	(48.4%)	917	(50.0%)
	No info	3	(0.3%)	12	(1.3%)	15	(0.8%)
	Total	905	(100.0%)	928	(100.0%)	1833	(100.0%)
QCf	Female	470	(47.8%)	561	(55.2%)	1031	(51.6%)
	Male	511	(51.9%)	442	(43.5%)	953	(47.7%)
	No info	3	(0.3%)	13	(1.3%)	16	(0.8%)
	Total	984	(100.0%)	1016	(100.0%)	2000	(100.0%)
NBe	Female	356	(44.9%)	321	(47.0%)	677	(45.9%)
	Male	414	(52.2%)	341	(49.9%)	755	(51.2%)
	No info	23	(2.9%)	21	(3.1%)	44	(3.0%)
	Total	793	(100.0%)	683	(100.0%)	1476	(100.0%)

NBf	Female	362	(48.2%)	338	(48.8%)	700	(48.5%)
	Male	388	(51.7%)	352	(50.9%)	740	(51.3%)
	No info	1	(0.1%)	2	(0.3%)	3	(0.2%)
	Total	751	(100.0%)	692	(100.0%)	1443	(100.0%)
NSe	Female	349	(47.7%)	648	(53.1%)	997	(51.1%)
	Male	370	(50.5%)	559	(45.8%)	929	(47.6%)
	No info	13	(1.8%)	13	(1.1%)	26	(1.3%)
	Total	732	(100.0%)	1220	(100.0%)	1952	(100.0%)
NSf	Female	116	(56.9%)	53	(63.1%)	169	(58.7%)
	Male	87	(42.6%)	31	(36.9%)	118	(41.0%)
	No info	1	(0.5%)		(0.0%)	1	(0.3%)
	Total	204	(100.0%)	84	(100.0%)	288	(100.0%)
PE	Female	252	(42.1%)	235	(50.5%)	487	(45.8%)
	Male	307	(51.3%)	222	(47.7%)	529	(49.7%)
	No info	40	(6.7%)	8	(1.7%)	48	(4.5%)
	Total	599	(100.0%)	465	(100.0%)	1064	(100.0%)
NF	Female	471	(48.1%)	452	(51.1%)	923	(49.5%)
	Male	483	(49.3%)	420	(47.5%)	903	(48.4%)
	No info	25	(2.6%)	13	(1.5%)	38	(2.0%)
	Total	979	(100.0%)	885	(100.0%)	1864	(100.0%)
YK	Female	161	(49.2%)	113	(44.5%)	274	(47.2%)
	Male	165	(50.5%)	140	(55.1%)	305	(52.5%)
	No info	1	(0.3%)	1	(0.4%)	2	(0.3%)
	Total	327	(100.0%)	254	(100.0%)	581	(100.0%)
NT	Female	222	(46.7%)	138	(42.7%)	360	(45.1%)
	Male	249	(52.4%)	183	(56.7%)	432	(54.1%)
	No info	4	(0.8%)	2	(0.6%)	6	(0.8%)
	Total	475	(100.0%)	323	(100.0%)	798	(100.0%)
NU	Female	134	(40.5%)	50	(39.7%)	184	(40.3%)
	Male	193	(58.3%)	71	(56.3%)	264	(57.8%)
	No info	4	(1.2%)	5	(4.0%)	9	(2.0%)
	Total	331	(100.0%)	126	(100.0%)	457	(100.0%)
CANADA	Female	5867	(46.9%)	5780	(49.8%)	11647	(48.3%)
	Male	6203	(49.5%)	5496	(47.4%)	11699	(48.5%)
	No info	449	(3.6%)	320	(2.8%)	769	(3.2%)
	Total	12519	(100.0%)	11596	(100.0%)	24115	(100.0%)

1999 SAIP Science Practical Tasks Assessment — Sample Size

		13-Year-Olds		*16-Year-Olds*		*Total*	
		Number	*(%)*	*Number*	*(%)*	*Number*	*(%)*
BC	Male	73	52.1%	61	52.1%	134	52.1%
	Female	67	47.9%	56	47.9%	123	47.9%
	No info	0	0.0%	0	0.0%	0	0.0%
	Total	140	100.0%	117	100.0%	257	100.0%
AB	Male	69	46.6%	67	44.7%	136	45.6%
	Female	79	53.4%	83	55.3%	162	54.4%
	No info	0	0.0%	0	0.0%	0	0.0%
	Total	148	100.0%	150	100.0%	298	100.0%
SK	Male	413	50.7%	377	49.2%	790	49.9%
	Female	402	49.3%	386	50.3%	788	49.8%
	No info	0	0.0%	4	0.5%	4	0.3%
	Total	815	100.0%	767	100.0%	1582	100.0%
MBe	Male	53	53.0%	49	56.3%	102	54.5%
	Female	47	47.0%	34	39.1%	81	43.3%
	No info	0	0.0%	4	4.6%	4	2.1%
	Total	100	100.0%	87	100.0%	187	100.0%
MBf	Male	26	43.3%	40	48.2%	66	46.2%
	Female	34	56.7%	43	51.8%	77	53.8%
	No info	0	0.0%	0	0.0%	0	0.0%
	Total	60	100.0%	83	100.0%	143	100.0%
ONe	Male	329	46.7%	281	48.5%	610	47.5%
	Female	374	53.1%	276	47.7%	650	50.7%
	No info	1	0.1%	22	3.8%	23	1.8%
	Total	704	100.0%	579	100.0%	1283	100.0%
ONf	Male	189	42.6%	195	48.5%	384	45.4%
	Female	255	57.4%	207	51.5%	462	54.6%
	No info	0	0.0%	0	0.0%	0	0.0%
	Total	444	100.0%	402	100.0%	846	100.0%
QCe	Male	58	55.8%	55	37.4%	113	45.0%
	Female	46	44.2%	92	62.6%	138	55.0%
	No info	0	0.0%	0	0.0%	0	0.0%
	Total	104	100.0%	147	100.0%	251	100.0%
QCf	Male	195	51.2%	335	49.5%	530	50.1%
	Female	186	48.8%	342	50.5%	528	49.9%
	No info	0	0.0%	0	0.0%	0	0.0%
	Total	381	100.0%	677	100.0%	1058	100.0%
NBe	Male	48	45.7%	56	56.6%	104	51.0%
	Female	57	54.3%	43	43.4%	100	49.0%
	No info	0	0.0%	0	0.0%	0	0.0%
	Total	105	100.0%	99	100.0%	204	100.0%

NBf	Male	86	45.5%	91	47.4%	177	46.5%
	Female	103	54.5%	101	52.6%	204	53.5%
	No info	0	0.0%	0	0.0%	0	0.0%
	Total	189	100.0%	192	100.0%	381	100.0%
NSe	Male	50	48.5%	47	48.0%	97	48.3%
	Female	53	51.5%	49	50.0%	102	50.7%
	No info	0	0.0%	2	2.0%	2	1.0%
	Total	103	100.0%	98	100.0%	201	100.0%
NSf	Male	26	57.8%	35	79.5%	61	68.5%
	Female	19	42.2%	9	20.5%	28	31.5%
	No info	0	0.0%	0	0.0%	0	0.0%
	Total	45	100.0%	44	100.0%	89	100.0%
PE	Male	57	54.3%	57	54.3%	114	54.3%
	Female	48	45.7%	48	45.7%	96	45.7%
	No info	0	0.0%	0	0.0%	0	0.0%
	Total	105	100.0%	105	100.0%	210	100.0%
NF	Male	58	57.4%	46	47.9%	104	52.8%
	Female	42	41.6%	48	50.0%	90	45.7%
	No info	1	1.0%	2	2.1%	3	1.5%
	Total	101	100.0%	96	100.0%	197	100.0%
NT	Male	23	46.0%	22	44.9%	45	45.5%
	Female	27	54.0%	27	55.1%	54	54.5%
	No info	0	0.0%	0	0.0%	0	0.0%
	Total	50	100.0%	49	100.0%	99	100.0%
NU	Male	20	50.0%	14	50.0%	34	50.0%
	Female	20	50.0%	14	50.0%	34	50.0%
	No info	0	0.0%	0	0.0%	0	0.0%
	Total	40	100.0%	28	100.0%	68	100.0%
CAN	Male	1773	48.8%	1828	49.1%	3601	49.0%
	Female	1859	51.2%	1858	49.9%	3717	50.5%
	No info	2	0.1%	34	0.9%	36	0.5%
	Total	3634	100.0%	3720	100.0%	7354	100.0%

SAIP 1996 Science Written Assessment
Percentage of 13-Year-Old Students by Performance Level

	Below 1	Level 1	Level 2	Level 3	Level 4	Level 5
BC	10.9	14.2	29.3	42.5	2.5	0.6
	1.9	2.1	2.8	3.0	0.9	0.5
	100.0	89.1	74.9	45.6	3.1	0.6
	0.0	1.9	2.6	3.0	1.0	0.5
AB	8.5	8.5	27.3	44.4	10.1	1.2
	1.6	1.6	2.6	2.9	1.8	0.7
	100.0	91.5	83.0	55.7	11.3	1.2
	0.0	1.6	2.2	2.9	1.9	0.7
SK	7.6	16.3	31.2	40.6	4.3	0.0
	1.7	2.3	2.9	3.1	1.3	0.0
	100.0	92.4	76.1	44.9	4.3	0.0
	0.0	1.7	2.7	3.1	1.3	0.0
MBe	9.1	18.0	30.5	36.5	5.2	0.7
	1.8	2.4	2.9	3.0	1.4	0.5
	100.0	90.9	72.9	42.4	5.9	0.7
	0.0	1.8	2.8	3.1	1.5	0.5
MBf	23.3	17.0	30.3	26.5	2.8	0.1
	0.2	0.2	0.2	0.2	0.1	0.0
	100.0	76.7	59.7	29.4	2.9	0.1
	0.0	0.2	0.2	0.2	0.1	0.0
ONe	13.5	19.0	31.0	31.0	5.3	0.2
	2.0	2.3	2.7	2.7	1.3	0.3
	100.0	86.5	67.5	36.5	5.5	0.2
	0.0	2.0	2.8	2.8	1.4	0.3
ONf	21.7	21.1	30.2	24.7	2.3	0.0
	2.6	2.6	2.9	2.7	0.9	0.0
	100.0	78.3	57.1	27.0	2.3	0.0
	0.0	2.6	3.1	2.8	0.9	0.0
QCe	9.5	17.9	29.6	37.9	4.8	0.2
	1.8	2.4	2.8	3.0	1.3	0.3
	100.0	90.5	72.6	43.0	5.0	0.2
	0.0	1.8	2.8	3.1	1.4	0.3
QCf	8.9	17.9	24.9	43.2	5.2	0.0
	1.7	2.3	2.6	2.9	1.3	0.0
	100.0	91.1	73.3	48.4	5.2	0.0
	0.0	1.7	2.6	3.0	1.3	0.0

NBe	9.0	20.4	26.9	40.5	3.2	0.0
	1.8	2.6	2.8	3.1	1.1	0.0
	100.0	91.0	70.6	43.7	3.2	0.0
	0.0	1.8	2.9	3.2	1.1	0.0
NBf	18.3	21.3	25.6	32.3	2.5	0.0
	2.6	2.8	2.9	3.2	1.0	0.0
	100.0	81.7	60.4	34.8	2.5	0.0
	0.0	2.6	3.3	3.2	1.0	0.0
NSe	8.7	18.0	34.0	34.7	4.5	0.2
	1.9	2.6	3.2	3.2	1.4	0.3
	100.0	91.3	73.3	39.3	4.6	0.2
	0.0	1.9	2.9	3.2	1.4	0.3
NSf	17.3	9.1	35.1	38.5	0.0	0.0
	-	-	-	-	-	-
	100.0	82.7	73.6	38.5	0.0	0.0
	-	-	-	-	-	-
PE	8.0	15.6	30.6	42.4	3.3	0.0
	1.7	2.2	2.8	3.0	1.1	0.0
	100.0	92.0	76.4	45.8	3.3	0.0
	0.0	1.7	2.6	3.1	1.1	0.0
NF	11.1	17.5	33.2	33.8	4.5	0.0
	2.1	2.5	3.1	3.1	1.4	0.0
	100.0	88.9	71.4	38.2	4.5	0.0
	0.0	2.1	3.0	3.2	1.4	0.0
NT	44.4	14.9	20.0	19.2	1.2	0.3
	4.0	2.9	3.2	3.2	0.9	0.5
	100.0	55.6	40.7	20.7	1.5	0.3
	0.0	4.0	3.9	3.3	1.0	0.5
YK	7.0	16.8	27.8	40.5	7.8	0.3
	1.7	2.4	2.9	3.2	1.7	0.3
	100.0	93.0	76.3	48.5	8.0	0.3
	0.0	1.7	2.8	3.3	1.8	0.3
CAN	11.2	16.9	29.0	37.4	5.2	0.3
	0.5	0.6	0.8	0.8	0.4	0.1
	100.0	88.8	71.8	42.9	5.5	0.3
	0.0	0.5	0.8	0.8	0.4	0.1

Note: For each jurisdiction, the first line shows the percentages of students by highest level achieved, the third line shows the cumulative percentages of students at or above each level, the second and fourth lines show the confidence intervals (1.96 times the standard errors) for the first and third lines respectively. Results are weighted to be representative of jurisdiction and school sizes.

SAIP 1996 Science Written Assessment
Percentage of 16-Year-Old Students by Performance Level

	Below 1	*Level 1*	*Level 2*	*Level 3*	*Level 4*	*Level 5*
BC	4.7	7.7	18.3	45.6	18.2	5.4
	1.4	1.7	2.5	3.2	2.5	1.4
	100.0	95.3	87.6	69.2	23.6	5.4
	0.0	1.4	2.1	2.9	2.7	1.4
AB	5.7	3.4	12.3	36.5	34.1	8.1
	1.4	1.1	1.9	2.8	2.8	1.6
	100.0	94.3	90.8	78.6	42.1	8.1
	0.0	1.4	1.7	2.4	2.9	1.6
SK	3.0	7.2	18.9	44.2	22.2	4.6
	1.1	1.7	2.6	3.4	2.8	1.4
	100.0	97.0	89.9	71.0	26.7	4.6
	0.0	1.1	2.0	3.1	3.0	1.4
MBe	3.9	7.3	21.1	38.2	25.6	4.0
	1.3	1.7	2.7	3.2	2.8	1.3
	100.0	96.1	88.8	67.8	29.6	4.0
	0.0	1.3	2.1	3.0	3.0	1.3
MBf	6.6	7.4	18.2	37.5	29.1	1.1
	0.1	0.1	0.2	0.3	0.3	0.1
	100.0	93.4	85.9	67.7	30.2	1.1
	0.0	0.1	0.2	0.3	0.3	0.1
ONe	6.2	8.7	20.4	42.1	20.1	2.5
	1.5	1.7	2.5	3.1	2.5	1.0
	100.0	93.8	85.1	64.7	22.6	2.5
	0.0	1.5	2.2	3.0	2.6	1.0
ONf	9.9	12.1	26.6	36.5	14.1	0.8
	2.0	2.1	2.9	3.2	2.3	0.6
	100.0	90.1	78.0	51.4	14.9	0.8
	0.0	2.0	2.7	3.3	2.3	0.6
QCe	4.6	10.2	19.6	44.4	17.8	3.5
	1.3	1.9	2.5	3.1	2.4	1.2
	100.0	95.4	85.2	65.6	21.3	3.5
	0.0	1.3	2.2	3.0	2.6	1.2
QCf	3.8	5.8	16.9	44.8	26.9	1.7
	1.1	1.4	2.2	2.9	2.6	0.7
	100.0	96.2	90.3	73.4	28.6	1.7
	0.0	1.1	1.7	2.6	2.6	0.7
NBe	3.4	9.3	17.5	49.9	16.7	3.2
	1.2	2.0	2.5	3.4	2.5	1.2
	100.0	96.6	87.2	69.7	19.8	3.2
	0.0	1.2	2.2	3.1	2.7	1.2

NBf	7.6	12.7	21.8	44.1	12.8	1.1
	1.9	2.3	2.9	3.5	2.3	0.7
	100.0	92.4	79.7	57.9	13.9	1.1
	0.0	1.9	2.8	3.5	2.4	0.7
NSe	1.4	7.4	22.6	48.9	17.2	2.5
	0.9	1.9	3.0	3.6	2.7	1.1
	100.0	98.6	91.2	68.6	19.7	2.5
	0.0	0.9	2.1	3.4	2.9	1.1
NSf	3.1	4.4	13.8	45.6	31.9	1.3
	-	-	-	-	-	-
	100.0	96.9	92.5	78.8	33.1	1.3
	-	-	-	-	-	-
PE	4.4	6.8	20.3	46.0	19.7	2.8
	1.4	1.8	2.8	3.5	2.8	1.2
	100.0	95.6	88.8	68.5	22.5	2.8
	0.0	1.4	2.2	3.3	2.9	1.2
NF	3.2	8.8	23.6	39.4	20.2	4.8
	1.2	1.9	2.8	3.3	2.7	1.4
	100.0	96.8	88.0	64.4	25.0	4.8
	0.0	1.2	2.2	3.2	2.9	1.4
NT	21.8	12.6	21.1	16.7	23.9	4.0
	5.4	4.3	5.3	4.9	5.6	2.5
	100.0	78.2	65.7	44.6	27.9	4.0
	0.0	5.4	6.2	6.5	5.8	2.5
YK	5.8	7.5	13.3	41.2	26.3	5.8
	3.1	3.4	4.4	6.4	5.8	3.1
	100.0	94.2	86.7	73.4	32.1	5.8
	0.0	3.1	4.4	5.8	6.1	3.1
CAN	5.1	7.5	18.8	42.7	22.6	3.4
	0.4	0.5	0.7	0.9	0.7	0.3
	100.0	94.9	87.5	68.7	26.0	3.4
	0.0	0.4	0.6	0.8	0.8	0.3

Note: For each jurisdiction, the first line shows the percentages of students by highest level achieved, the third line shows the cumulative percentages of students at or above each level, the second and fourth lines show the confidence intervals (1.96 times the standard errors) for the first and third lines respectively. Results are weighted to be representative of jurisdiction and school sizes.

SAIP 1996 Science Practical Tasks
Percentage of 13-Year-Old Students by Performance Level

	Below 1	*Level 1*	*Level 2*	*Level 3*	*Level 4*	*Level 5*
SK	5.2	2.3	48.5	39.6	4.0	0.5
	1.5	1.0	3.3	3.3	1.3	0.5
	100.0	94.8	92.5	44.1	4.5	0.5
	0.0	1.5	1.7	3.3	1.4	0.5
ONe	4.7	4.3	51.9	35.0	3.3	0.7
	1.3	1.3	3.2	3.0	1.1	0.5
	100.0	95.3	91.0	39.0	4.0	0.7
	0.0	1.3	1.8	3.1	1.2	0.5
ONf	6.2	5.5	53.6	33.6	1.0	0.1
	1.5	1.5	3.2	3.0	0.6	0.2
	100.0	93.8	88.3	34.7	1.1	0.1
	0.0	1.5	2.1	3.0	0.7	0.2
NBf	7.2	8.2	56.0	27.8	0.7	0.0
	1.8	1.9	3.4	3.1	0.6	0.0
	100.0	92.8	84.5	28.5	0.7	0.0
	0.0	1.8	2.5	3.1	0.6	0.0
NSe	3.1	4.1	51.1	36.8	3.9	1.1
	1.1	1.3	3.2	3.1	1.2	0.7
	100.0	96.9	92.8	41.8	5.0	1.1
	0.0	1.1	1.6	3.1	1.4	0.7
NSf	5.4	0.0	58.3	33.3	2.9	0.0
	-	-	-	-	-	-
	100.0	94.6	94.6	36.3	2.9	0.0
	-	-	-	-	-	-
CAN	3.5	3.7	51.3	37.6	3.1	0.8
	0.5	0.5	1.3	1.2	0.4	0.2
	100.0	96.5	92.8	41.5	4.0	0.8
	0.0	0.5	0.7	1.3	0.5	0.2

Note: For each jurisdiction, the first line shows the percentages of students by highest level achieved, the third line shows the cumulative percentages of students at or above each level, the second and fourth lines show the confidence intervals (1.96 times the standard errors) for the first and third lines respectively. Results are weighted to be representative of jurisdiction and school sizes.

SAIP 1996 Science Practical Tasks
Percentage of 16-Year-Old Students by Performance Level

	Below 1	*Level 1*	*Level 2*	*Level 3*	*Level 4*	*Level 5*
SK	1.6	2.8	29.9	47.3	15.3	3.2
	0.8	1.1	2.9	3.2	2.3	1.1
	100.0	98.4	95.6	65.8	18.5	3.2
	0.0	0.8	1.3	3.1	2.5	1.1
ONe	1.2	1.6	29.2	47.8	17.3	2.8
	0.7	0.8	2.9	3.2	2.4	1.1
	100.0	98.8	97.1	67.9	20.1	2.8
	0.0	0.7	1.1	3.0	2.6	1.1
ONf	2.9	2.2	42.0	45.8	6.0	1.1
	1.1	1.0	3.3	3.3	1.6	0.7
	100.0	97.1	94.8	52.9	7.1	1.1
	0.0	1.1	1.5	3.3	1.7	0.7
NBf	2.2	3.3	43.9	44.1	5.5	0.9
	1.0	1.3	3.5	3.5	1.6	0.7
	100.0	97.8	94.5	50.6	6.4	0.9
	0.0	1.0	1.6	3.5	1.7	0.7
NSe	1.5	1.8	29.5	46.4	16.2	4.6
	0.8	0.9	2.9	3.2	2.4	1.3
	100.0	98.5	96.7	67.2	20.8	4.6
	0.0	0.8	1.1	3.0	2.6	1.3
NSf	3.2	0.0	39.5	33.8	18.5	5.1
	-	-	-	-	-	-
	100.0	96.8	96.8	57.3	23.6	5.1
	-	-	-	-	-	-
CAN	1.8	1.4	32.2	45.5	15.5	3.6
	0.3	0.3	1.2	1.3	0.9	0.5
	100.0	98.2	96.8	64.6	19.1	3.6
	0.0	0.3	0.5	1.2	1.0	0.5

Note: For each jurisdiction, the first line shows the percentages of students by highest level achieved, the third line shows the cumulative percentages of students at or above each level, the second and fourth lines show the confidence intervals (1.96 times the standard errors) for the first and third lines respectively. Results are weighted to be representative of jurisdiction and school sizes.