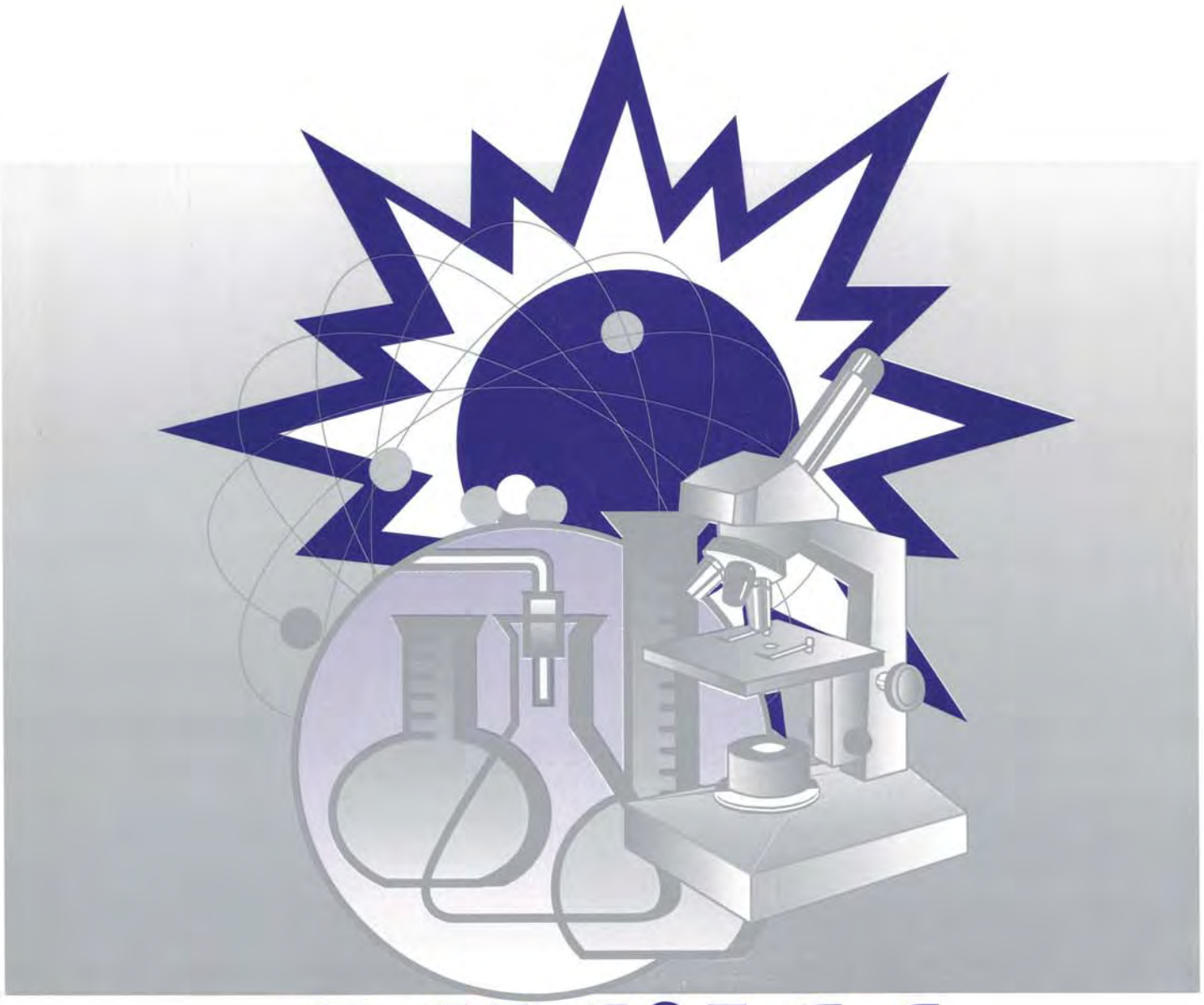
Council of Ministers of Education, Canada

Conseil des ministres de l'Éducation (Canada)

SAIP



SCIENCE

COUNCIL OF MINISTERS OF EDUCATION, CANADA

SAIP

SCHOOL ACHIEVEMENT INDICATORS PROGRAM

1996

REPORT ON SCIENCE ASSESSMENT

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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INTRODUCTION

SCHOOL ACHIEVEMENT INDICATORS PROGRAM (SAIP)

In the past few years, in Canada as well as in many other countries, increasing attention has been given to education systems and their performance. Parents, members of the business and industrial communities, concerned taxpayers, and others have asked the question: "How well are our schools preparing students for a global economy and for lifelong learning?"

Attempting to answer this question, ministries[1] of education participated in a variety of studies. At the international level, through the Council of Ministers of Education, Canada (CMEC), they took part in the Indicators of Education Systems (INES) project of the Organisation for Economic Co-operation and Development (OECD); individually they 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). In addition, in most provinces, ministries undertook measures to assess students at different stages in their schooling.

Since the ministers of education all wished to bring the highest degree of effectiveness and quality to their systems, they recognized a need for collective action to assess these systems. Achievement in school subjects is generally considered a worthwhile indicator of an education system's performance. The ministers wanted to answer as clearly as possible the following question: "How well are our students doing in mathematics, language, and science?"

In 1989, CMEC initiated the School Achievement Indicators Program (SAIP), the first-ever attempt to arrive at a consensus on the elements of a pan-Canadian assessment. In December 1991, in a memorandum of understanding, the ministers agreed to assess the achievement of 13-year-olds and 16-year-olds in reading, writing, and mathematics. In September 1993, the ministers further agreed to include the assessment of achievement in 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 is being used by each province to set educational priorities and plan program improvements.

It was decided that the assessments would be administered in April of each year according to the following schedule:

Mathematics	Reading and Writing	Science
1993	1994	1996
1997	1998	1999

The assessments in mathematics and in reading and writing took place as scheduled, and the results were published in December 1993 and 1994 respectively. No test was planned for 1995 so that thorough field testing of the science assessment instruments could be done.

The specific questions posed by the SAIP science assessment are: "How well do students in Canada do in science?" "Does the achievement of Canadian students in science change over several years?"

1. In this report, the words "province" and "ministry" and their variations should be taken to include "territory" and "department" respectively.

Since school programs differ from one part of the country to another, comparing results from these programs is a complex and delicate task. Young Canadians in different provinces and territories, however, do learn many similar skills in reading, 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, 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 is essentially a measure of how well each province's education system is doing: it does not replace individual student assessment, which is the responsibility of teachers, schools, boards, and ministries of education. Similarly, no attempt is made to compare schools or school districts. The results are reported for Canada as a whole and for provinces only.

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 the world around them. The report endorsed the concept of a science education program for each of Canada's students, 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

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 the special aptitudes and interest in these fields, opportunities to grow in a challenging learning environment.

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 it 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

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

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."[3]

IMPORTANT ASSUMPTIONS FOR THIS ASSESSMENT

Not all students continue in formal science programs throughout their secondary school career. Since the sample was drawn from all 13-year-olds and 16-year-olds, many participants, particularly in the older population, may not have taken science courses for two years or more. The sequence of science courses is also not the same for all students in all jurisdictions. The number of required courses, their degree of specialization in the traditional areas of science, and the stress on particular topics, vary from province to province. For example, more time is devoted to Earth Science in some provinces, and courses in some provinces emphasize Environmental Science to a greater degree than others.

A FRAMEWORK FOR SCIENCE ASSESSMENT

Since science education programs offered to Canadian students are so varied from jurisdiction to jurisdiction, the SAIP Science Assessment Framework and Criteria was developed to reflect the breadth of what students should know and be able to do in four areas of the science curriculum:

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

The domains identified for SAIP science are also found in the framework for science presented in the *Third International Mathematics and Science Study (TIMSS)* 1993.[4] The areas of science represented by the criteria are consistent with the recommendations set out in Project 2061's first report, *Science for All Americans*, and their basic concept of scientific literacy as found in *Benchmarks for Science Literacy*, 1993.[5]

Performance was described over five levels, representing a continuum of science literacy acquired by students over the entire elementary and secondary school experience. Level one describes the very early stages of science literacy and awareness of the world around the individual. Level five describes the functional literacy acquired by one who has completed a full range of integrated and specialized science courses. Examples of assessment criteria at each level are found on pages 12-16, for the written assessment, and page 18, for the practical tasks.

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

4. Robitaille, David F. (ed.), *Curriculum Frameworks for Mathematics and Science*, The Third International Mathematics and Science Study, Monograph #1. Vancouver: Pacific Educational Press, 1993.

5. op. cit.

OVERVIEW OF THE 1996 SCIENCE ASSESSMENT

In April and May 1996, the science assessment was administered to a random sample of students drawn from all provinces and territories. Approximately 37,500 students made up the total sample — 19,500 thirteen-year-olds and 18,000 sixteen-year-olds. About 26,500 completed the science assessment in English, and 11,000 in French. For some provinces and territories, where the total number of students was small, the whole age group population was assessed. Detailed breakdowns of the numbers of students assessed in each jurisdiction are presented in the appendices. For the purpose of this assessment, age was as of August 31, 1995.

Students' understanding of science concepts and their ability in science inquiry skills were assessed. Participating students were asked to complete only one assessment, focussing on either a) their knowledge of science concepts, the nature of science, and the relationship of science to technology and societal issues (written assessment) or b) their science inquiry skills (practical tasks). A Canadian sample was drawn by CMEC for the science inquiry skills assessment, but Saskatchewan, Ontario (E) and (F), New Brunswick (F) and Nova Scotia (E) and (F), took the option of over-sampling in order to obtain a provincial sample as well.

DEVELOPMENT OF THE ASSESSMENT MATERIALS

The development of the components of the SAIP science assessment began in the fall of 1993 when CMEC asked the ministries of education in Alberta, Saskatchewan, Ontario, and New Brunswick (F) 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 provincial and territorial ministries of education.

As the criteria and the assessment framework 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. The criteria were also reviewed by student evaluation and curriculum specialists from the universities and by science experts, as well as by representatives from nongovernmental organizations. Questions and tasks for the assessment were developed by teachers from across Canada during the summer of 1994. Each ministry was then asked to carry out a curriculum and bias review on this material.

A first informal field test of the questions was conducted in the fall of 1994 in a limited number of classrooms in the four consortium provinces, i.e. Alberta, Saskatchewan, Ontario, and New Brunswick (F). 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. During July 1995, the written assessment was scored by Ontario Faculty of Education graduates, and the practical task field test was scored in Ontario by representatives from all jurisdictions. Most of the practical tasks scorers were then asked to participate as head markers in the scoring of the final practical tasks instruments in Moncton, in July 1996. The comments by these scorers, as experienced science educators, were particularly valuable to the development team. A complete analysis of the data followed, which allowed the development team to adjust the framework, revise the criteria, select the questions and tasks, and fine tune other technical considerations. A very limited field test of the revised material was conducted in the fall of 1995, again in the four consortium provinces. The main purpose of this field test was to validate the administrative procedures and the student questionnaire.

Comments by teachers whose students had field-tested the instruments were very useful in the revision process. These comprehensive critiques included comments on the instructions, administrative procedures, time allotments, scoring criteria, and student questionnaire. The developers also considered students' comments about the questions, the tasks, and the administrative procedure.

Scorers' comments and test results attested to the appropriateness and range of difficulty of the questions, tasks, instructions, and administrative procedures. Particularly in the case of the practical tasks 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.

In the end, educators, students, and members of the public in every participating jurisdiction contributed to the evolution of the science assessment materials. The result was a uniquely Canadian science assessment in both official languages.

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 participated in an assessment that asked them to relate their understanding of science to real-life situations that were familiar to them.

For the purpose of this assessment, students' knowledge of science concepts and their application to society around them, as well as the understanding of the nature of science, were measured by responses to multiple-choice and constructed-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. The SAIP Science Assessment attempted to achieve this goal by conducting a hands-on, practical task assessment that challenged students to apply the science inquiry and problem-solving skills found in the Science Assessment Framework and Criteria to simple hands-on tasks. For each of the seven tasks, students were asked to respond to a series of questions that assessed their level of understanding of specific science skills.

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 item was based. For the written assessment, responses to constructed-response questions were scored by trained faculty of education graduates against a template of acceptable responses. 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. The written assessment was scored in Toronto, in June 1996, and the practical tasks assessment was scored in Moncton, in July and August 1996. Data processing and analysis took place in Quebec City, and a consultant prepared drafts of the report for approval by CMEC Secretariat, in cooperation with the Science Assessment Administration Management Team and the Report Development Group.

LIMITATIONS OF THE ASSESSMENT

Although the content of this assessment was consistent with that of science programs across Canada, it could not be comprehensive enough to include everything that appears in every science program. It is in fact an assessment of scientific literacy rather than 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. 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.

HARMONIZATION OF ENGLISH AND FRENCH INSTRUMENTS

From the outset, the instruments used in the science assessment were developed by English speaking 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. Scoring procedures were the same for both languages. Consequently, the statistical results presented for each language group in this report can be compared with reasonable confidence.

ASSESSMENT FRAMEWORKS AND CRITERIA

FRAMEWORK FOR THE WRITTEN ASSESSMENT

All students writing this assessment started by doing 12 questions at level 3. On the basis of their scores on those 12 questions, students were given one of two booklets. Each booklet contained 66 questions that covered a different combination of achievement levels. One booklet covered levels 1, 2, and 3. The other booklet covered levels 3, 4, and 5, level 5 being the highest. The 66 questions in each booklet were a combination of multiple-choice and constructed-response questions. Questions dealing with science concepts assessed student understanding in the areas of:

- **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**
- **relationship of science to technology and societal issues**

Questions 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

SUMMARY CRITERIA AND EXEMPLARS FOR THE WRITTEN ASSESSMENT

Samples of the criteria for students in the written assessment are given below. It is important to realize that these are only samples taken from each strand from the more detailed Science Assessment Framework and Criteria. These criteria may be used to gain a general impression of their difficulty, but are by no means a complete list.

At level one, the student can:

- describe physical properties of objects
- distinguish living things from non-living things and their respective environments
- 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

Field Trip

A science class goes on an overnight trip to the Canadian Rockies.

Maria and Raphael 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 on 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 tilt of Earth affects 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:

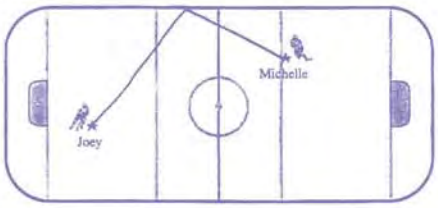
- use chemical properties to compare and classify substances
- know that some life forms are unicellular and others are multicellular, and that life forms are involved in the transfer of energy
- compare gravitational and electrical forces
- compare changes in Earth's surface and their causes
- analyse 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

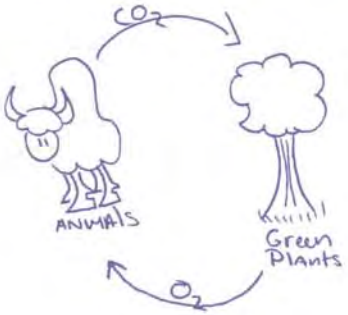
Farm

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.

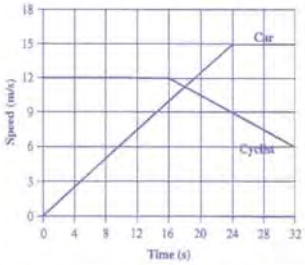
Answer: oxygen is used in respiration by Animals. CO_2 a waste of respiration, is used by Green Plants in Photosyntysis. Photosyntisis also Produces oxygen, wich Animals breath compleating the cycle.



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

At level five, the student can:

- 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 the bottom of the food chain is destroyed, all other lifeforms, including humans, are effected.

FRAMEWORK FOR THE PRACTICAL TASKS

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.

Students participating in the science inquiry skills assessment were asked to perform seven tasks that required them to collect and analyse their own data and apply inquiry skills to practical, hands-on problems using real materials.

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
- organize, interpret, and communicate data
- design experiments

SUMMARY CRITERIA AND EXEMPLAR FOR THE PRACTICAL TASKS

Samples of the criteria for students in the practical tasks assessment are given below. It is important to realize that these are only samples taken from the more detailed Science Assessment Framework and Criteria. These may be used to gain a general impression of the task difficulty, but are by no means a complete list.

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 correctly completed questions at all five levels.

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.

Height (cm)	Crater Width (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.

In this report, performance by level charts are based on **cumulative results** and actually show percentages of students at or above each level. The inference here is that students performing, for example, at level 5 have also satisfied the criteria for levels 1, 2, 3, and 4.

NOTES ON STATISTICAL INFORMATION

CONFIDENCE INTERVALS

In this study, the percentages calculated by the researchers were based on samples of students and are only estimates of the actual achievement students would have demonstrated had they all 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 level might fall. This range of percentage values is called a confidence interval and represents the high- and low-end points between which the actual achievement level should fall 95 per cent of the time.

In simple terms, 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 a different sample.

In the charts in this report, confidence intervals are represented by ⊢⊣ . If the confidence intervals overlap, the differences are not statistically significant. It should be noted that no confidence interval is shown for Nova Scotia (F) since all students in both age groups were assessed.

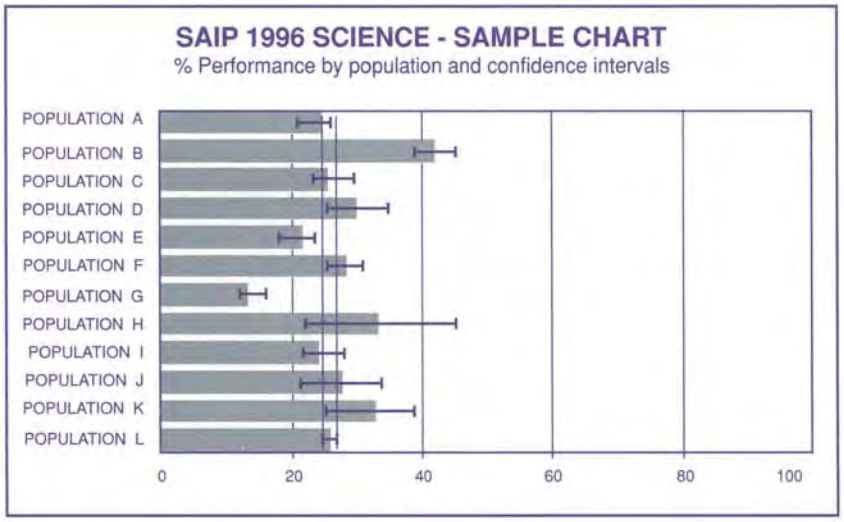
DIFFERENCES

In this report the terms "different" or "real difference" refer to a difference that is not due to chance. In a technical sense, they mean statistically different.

PERCENTAGES

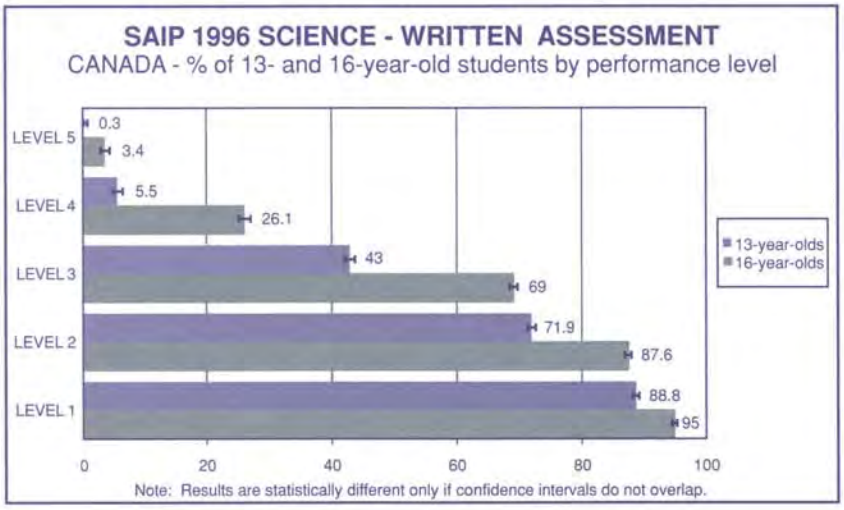
Percentages in this report are rounded to the nearest whole number except where more precise figures are needed to make a point.

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, D, F, H, I, J, and K, but there is a significant difference between Population L and Populations B, E, G because their confidence intervals do not overlap.



There is a significant difference between the performances of the 13-year-old group and the 16-year-old group at each of the five levels. Data show that a greater percentage of older students is at the higher levels (3 to 5) and a smaller percentage of these students is at the lower levels (1 and 2).* It was anticipated that older students would attain higher levels. However, the SAIP results, which are based on the administration of a validated science assessment instrument to the largest sample of Canadian students ever, indicate with some precision the difference in knowledge of science concepts and applications between the two age groups.

CHART 1



* Frequency tables on which the various charts are based and which contain actual percentages and confidence intervals are included in the appendices.

Overview of Achievement by Level

The following charts present the **cumulative achievement levels** for all provinces, together with a set of aggregated overall Canadian results. The data shown are an overview and display 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.

As one can see, results do vary from jurisdiction to jurisdiction. In some cases, achievement in one province is significantly different from another province or from Canada as a whole.

CHART 2

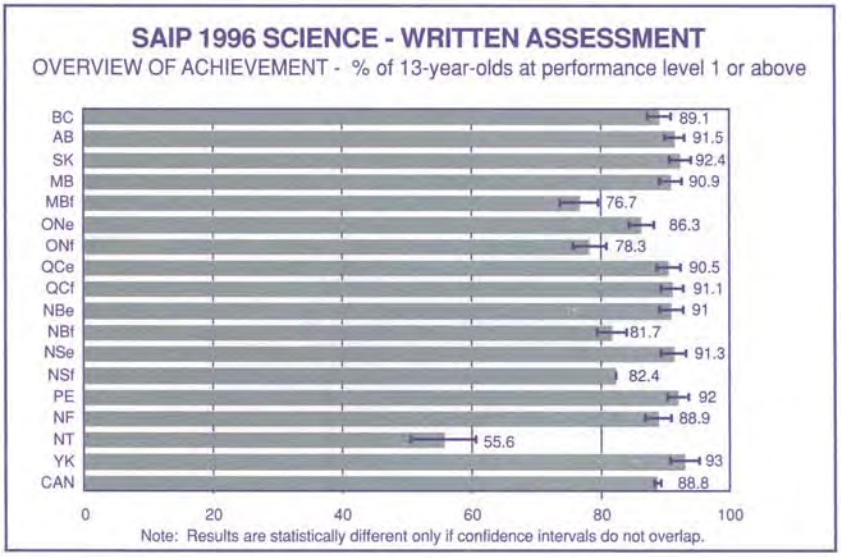


CHART 3

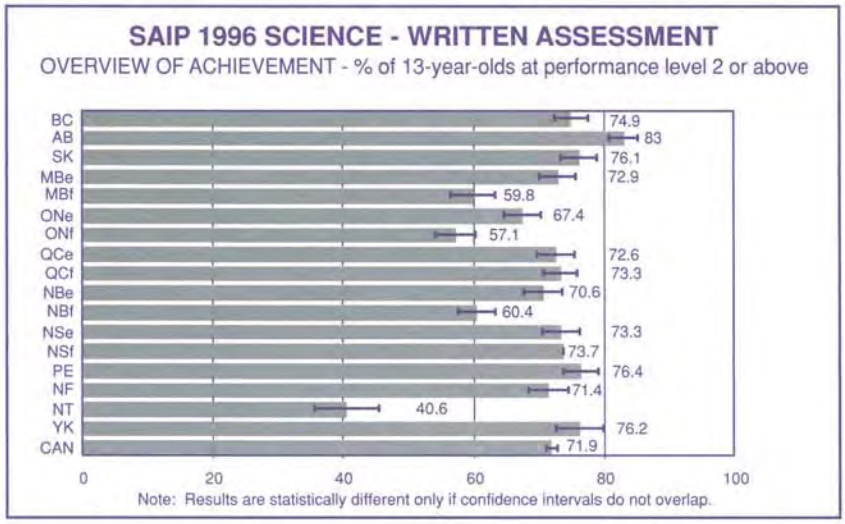


CHART 4

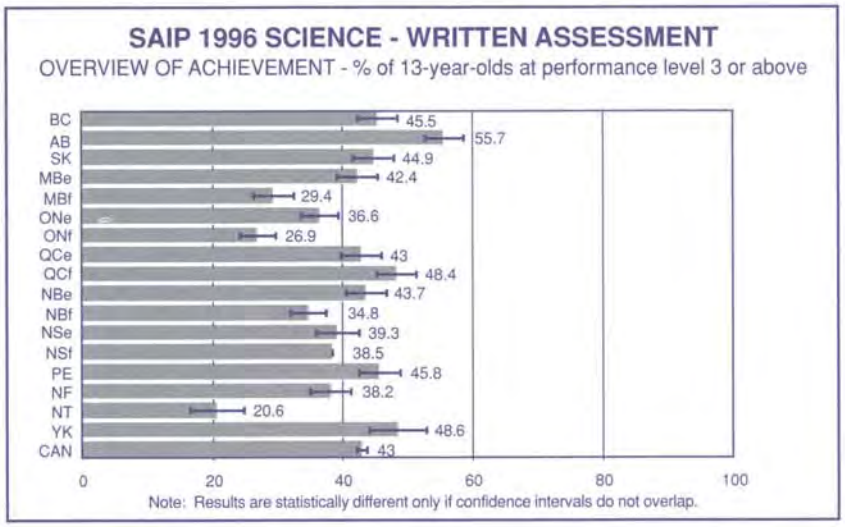


CHART 5

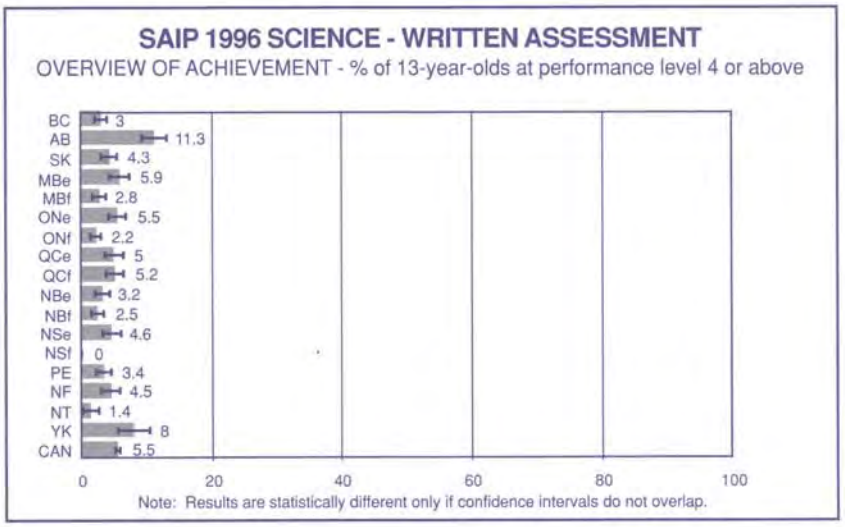


CHART 6

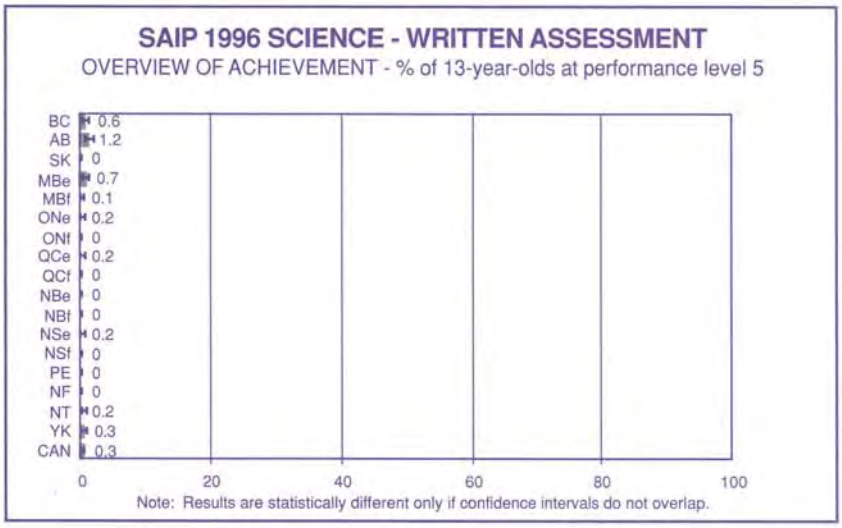


CHART 7

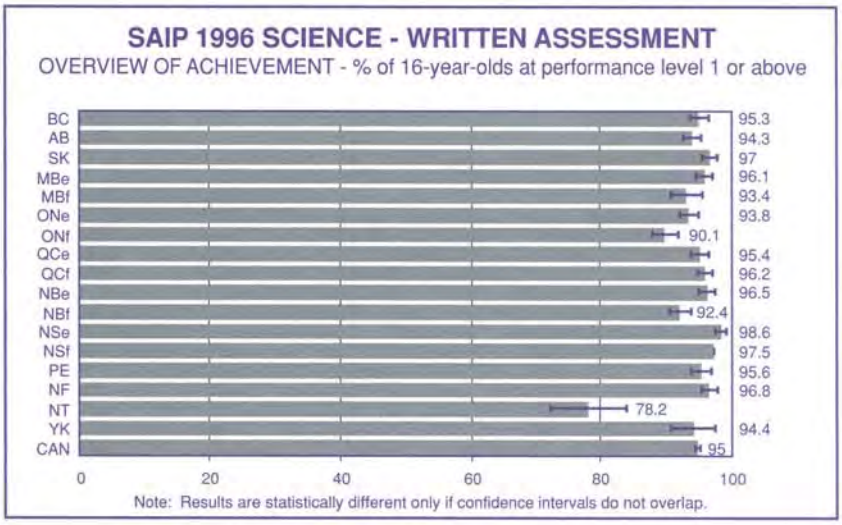


CHART 8

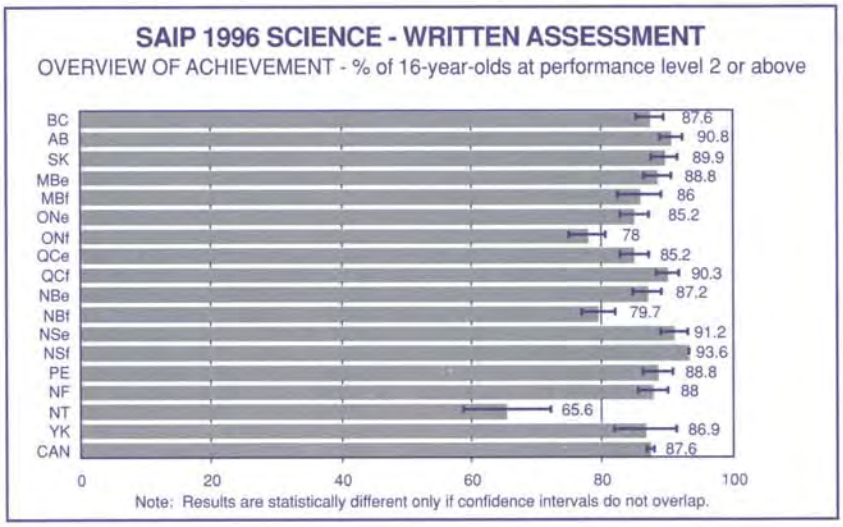


CHART 9

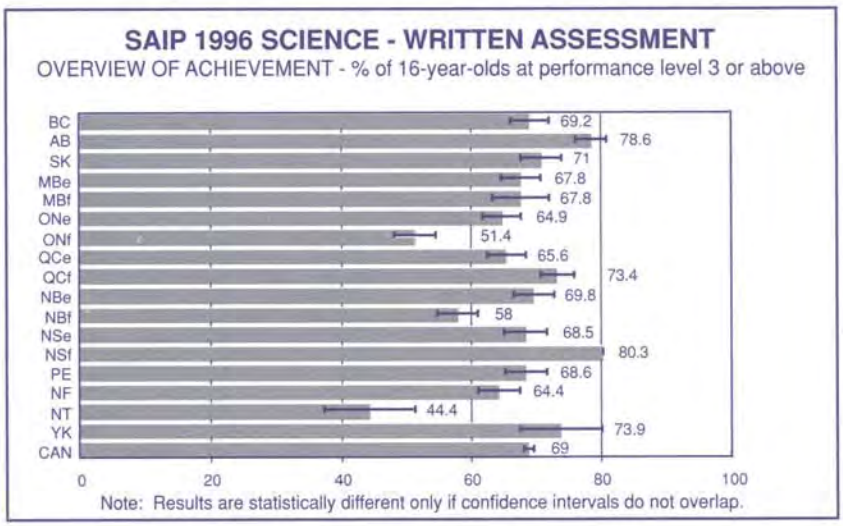


CHART 10

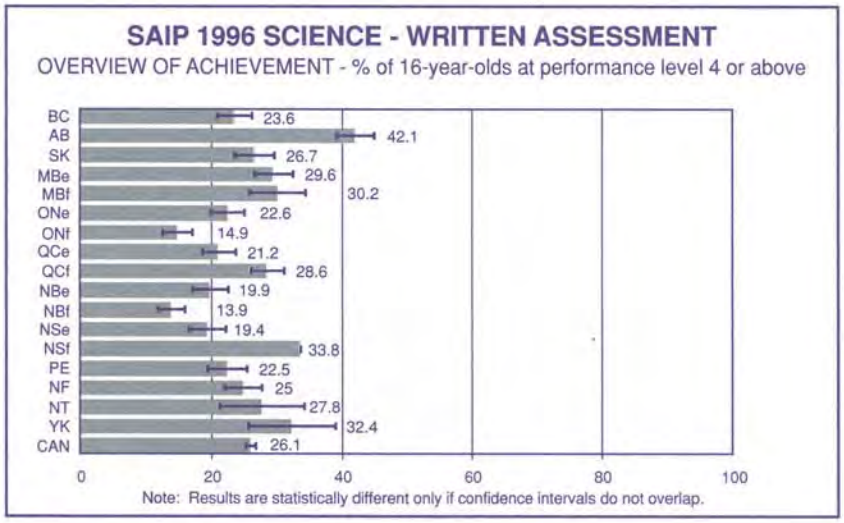
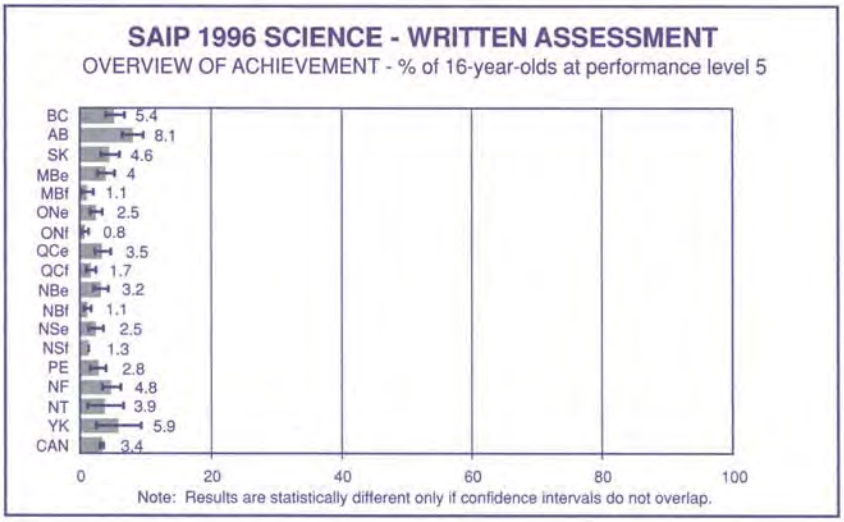


CHART 11



The following charts show that 13-year-old girls performed as well as boys at all levels in the written assessment. However, there is a slight but significant difference in performance at levels 3 to 5 in favour of 16-year-old boys.

CHART 12

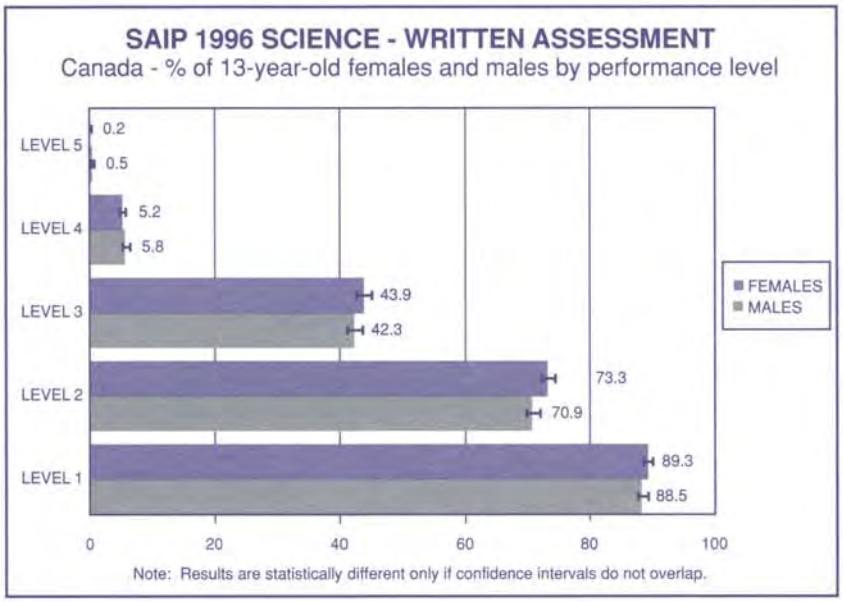
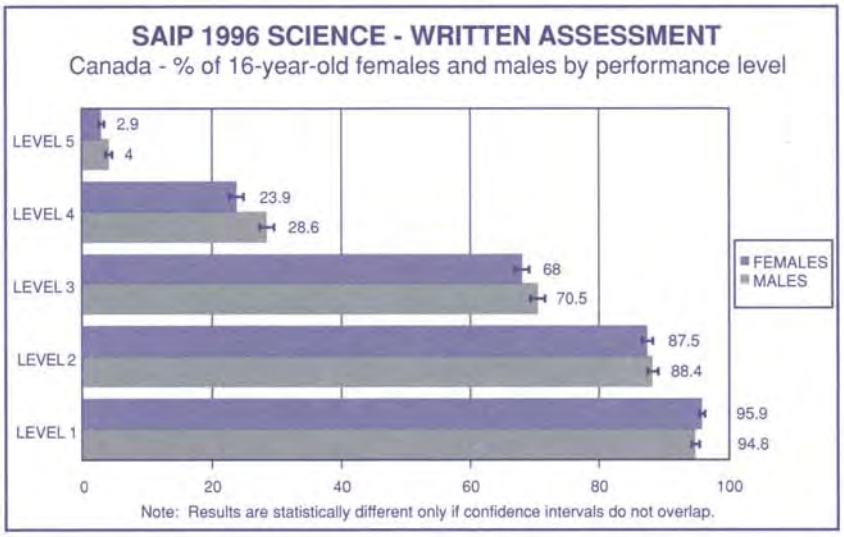


CHART 13



Achievement Differences by Language

Between those who wrote this assessment in English and those who wrote in French, there are significant differences at level 3 and above in favour of francophones and at level 5 in favour of anglophones. This is true for both age groups.

CHART 14

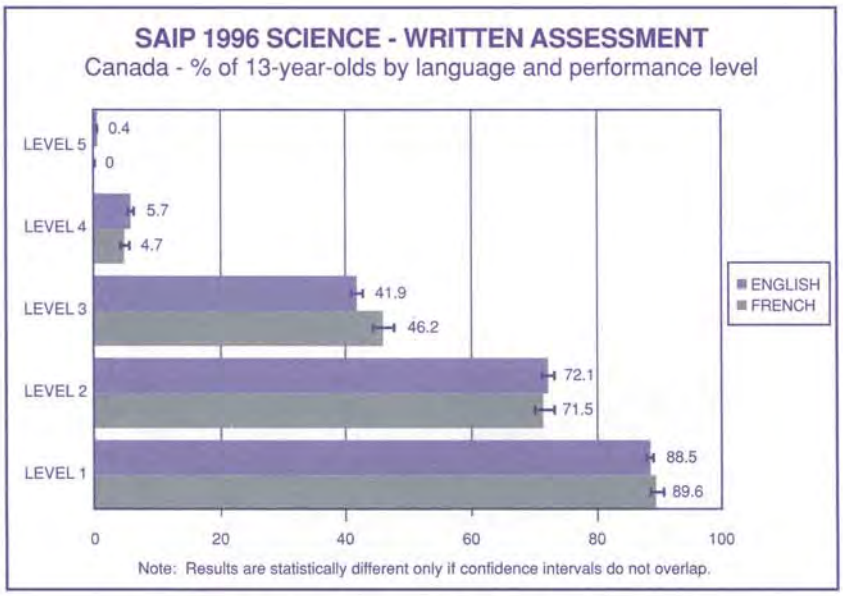
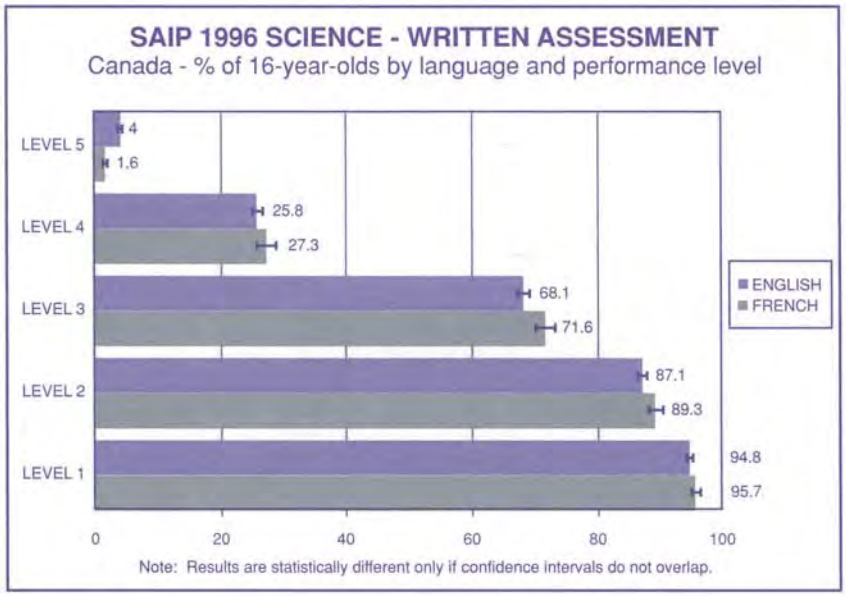
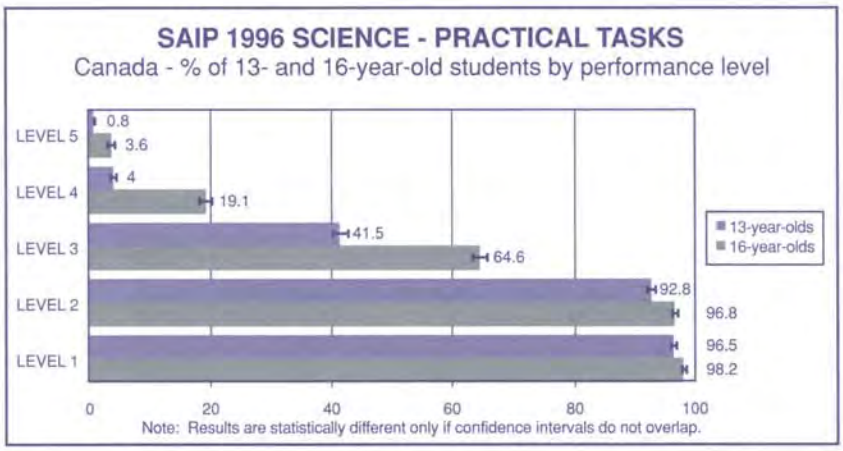


CHART 15



Because practical tasks assessment is very demanding in terms of time, effort, and cost, the SAIP had originally intended to develop a smaller sample, which would yield results that would be valid for Canada as a whole but would not allow reliable information for individual provinces. However, four provinces opted to develop larger samples so that they would obtain results representative of their whole populations: Saskatchewan, Ontario (English and French), New Brunswick (French), Nova Scotia (English and French).

CHART 16



As with the written assessment, data* show that a greater percentage of older students is at levels 3 to 5 and a smaller percentage of them is at levels 1 and 2. Again, since 16-year-olds may have had more exposure to science tasks during school and to science in general in the course of their daily lives, this result was anticipated. However, since the criteria for the tasks and the written assessment were different, the results in the two components are not strictly comparable.

* Frequency tables on which the various charts are based and which contain actual percentages and confidence intervals are included in the appendices.

Overview of Achievement by Level

The following charts present the cumulative achievement levels for the oversampling provinces, together with a set of aggregated overall Canadian results. The data shown are an overview and display 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. The results do vary from jurisdiction to jurisdiction. Achievement in some is significantly higher or lower than the Canadian results.

CHART 17

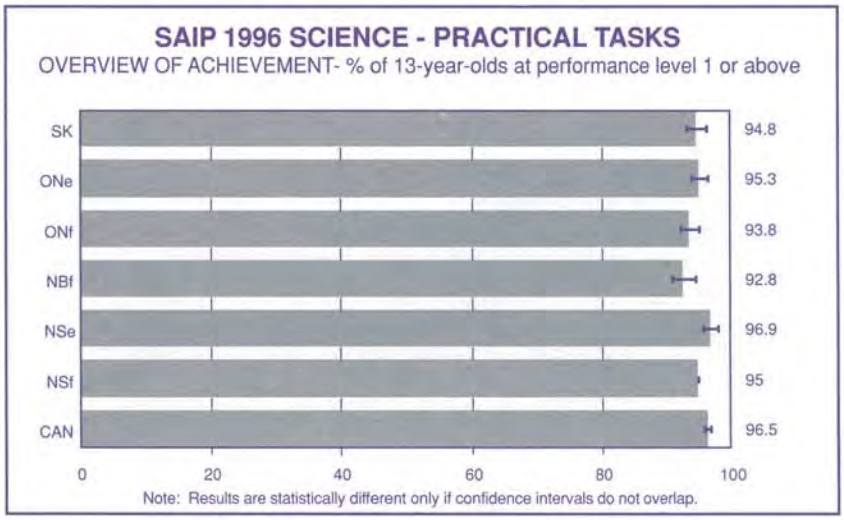


CHART 18

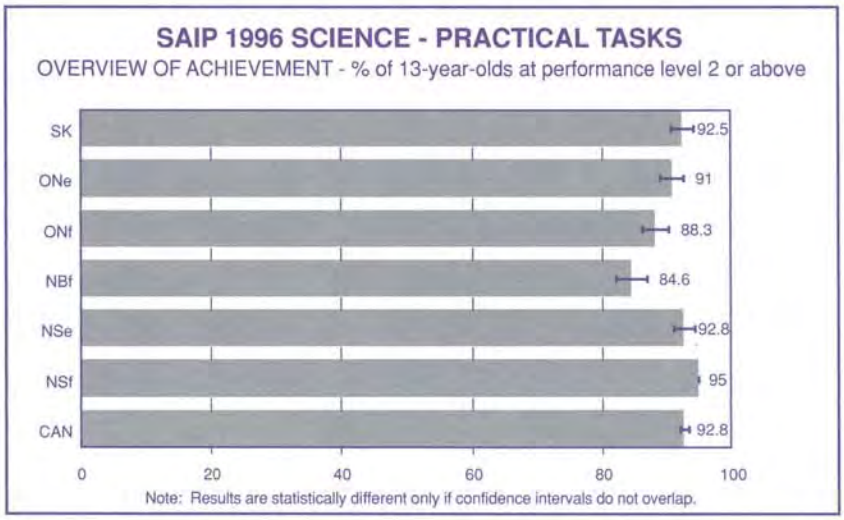


CHART 19

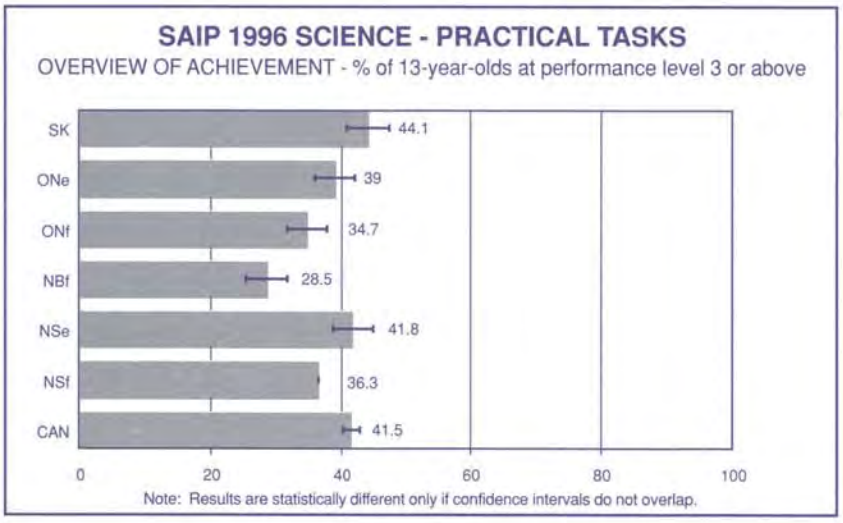


CHART 20

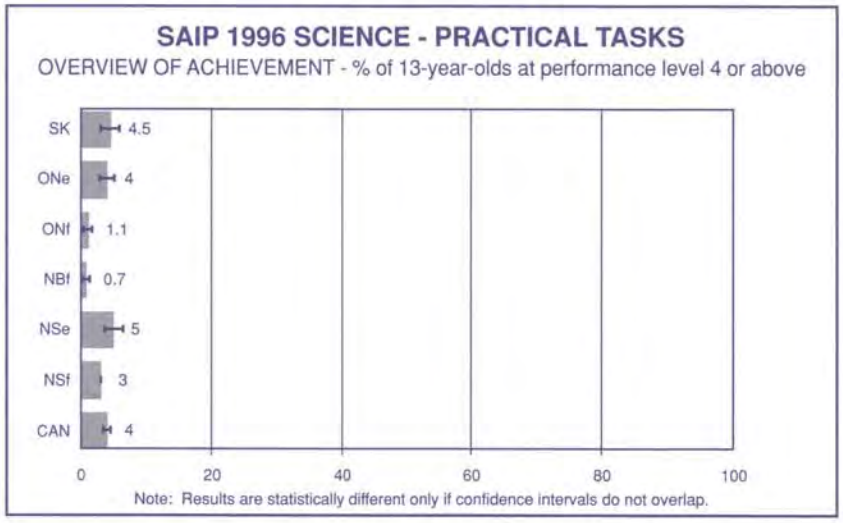


CHART 21

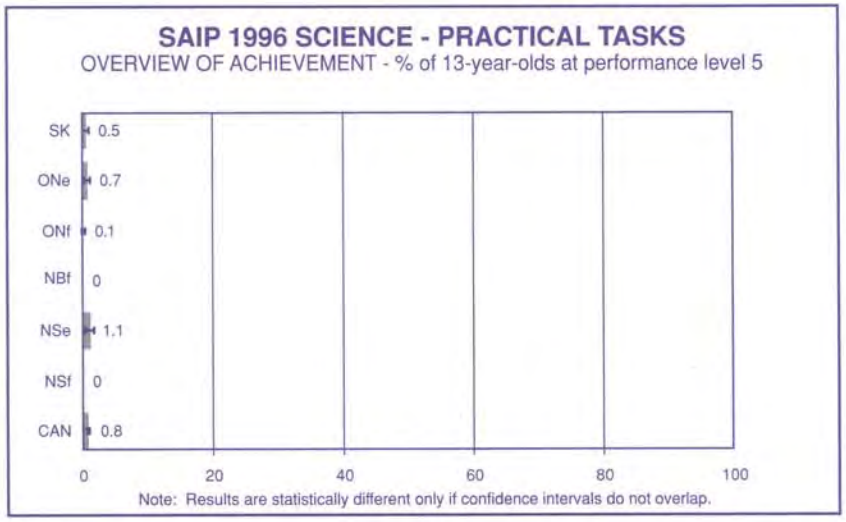


CHART 22

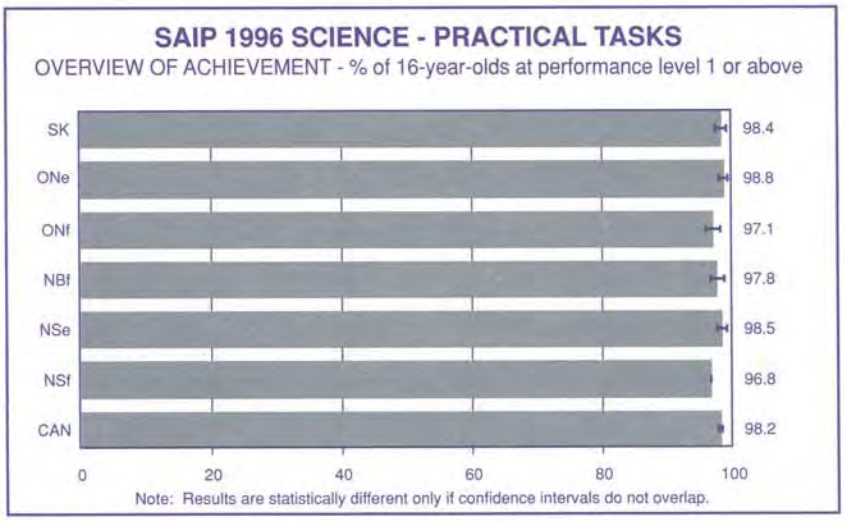


CHART 23

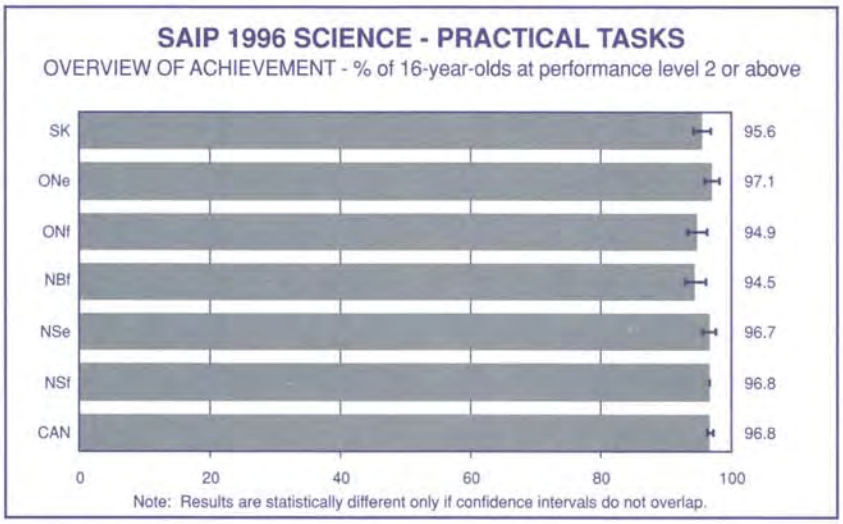


CHART 24

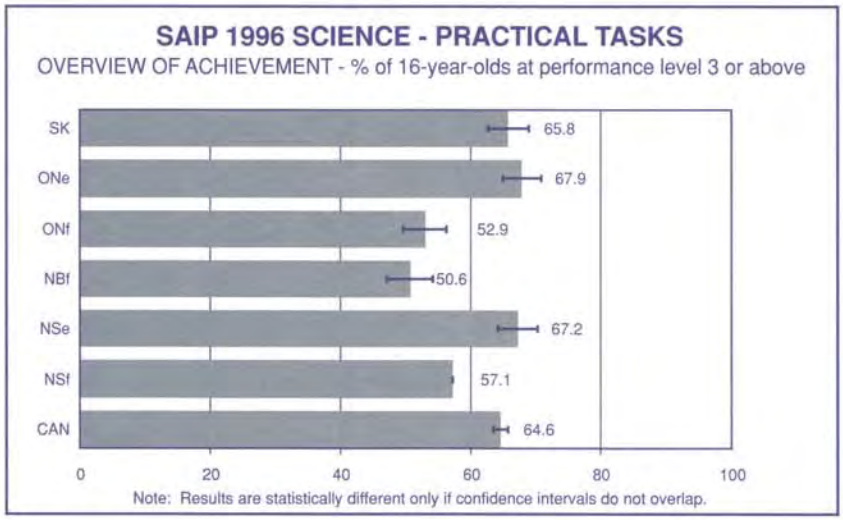


CHART 25

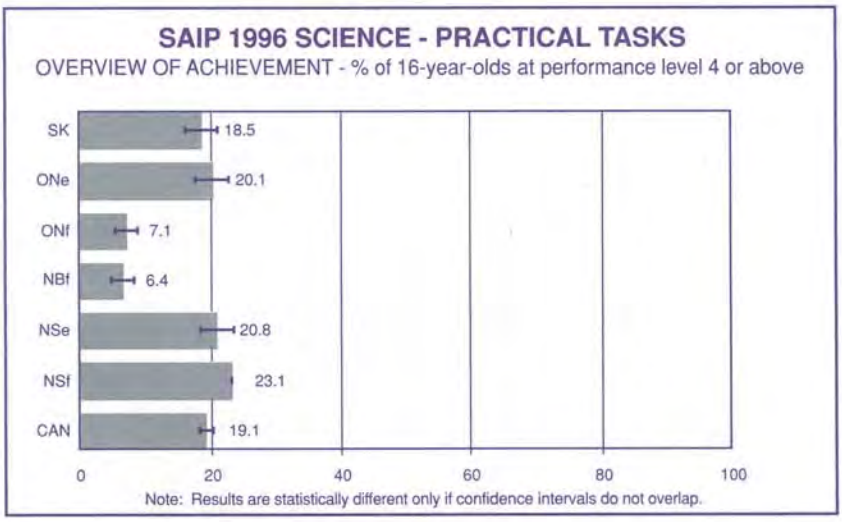
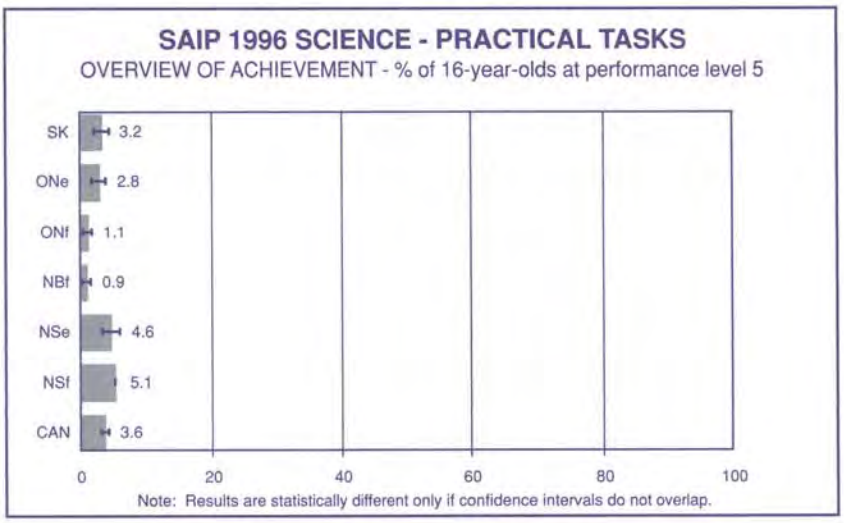


CHART 26



In both age groups, girls performed as well as boys in the practical tasks. These results reflect a significant change in achievement from data gathered in other large-scale science assessments administered over the past decade. These data often showed girls demonstrating significantly poorer science achievement than boys. Results of the SAIP Science Assessment may reflect the positive effect of the many initiatives taken across Canada to create classroom environments that encourage young women to pursue science interests.

CHART 27

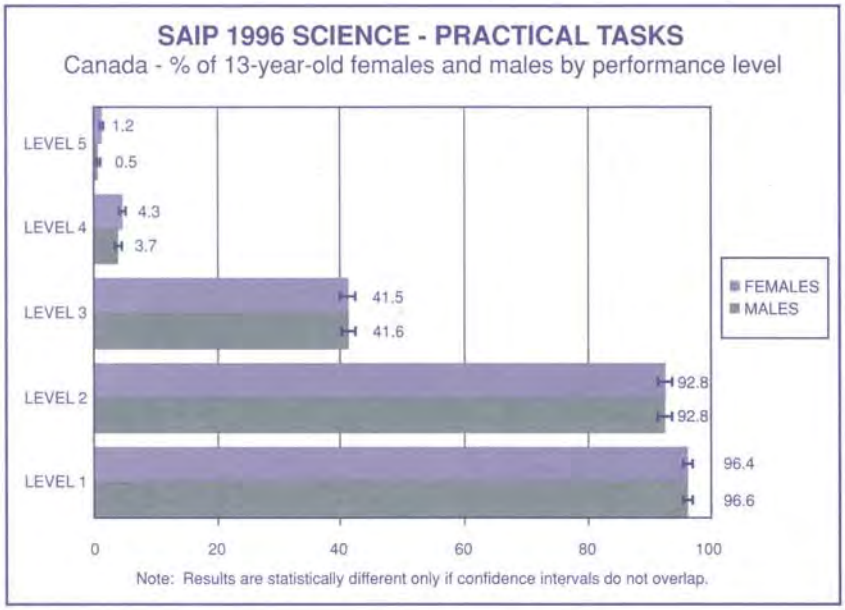
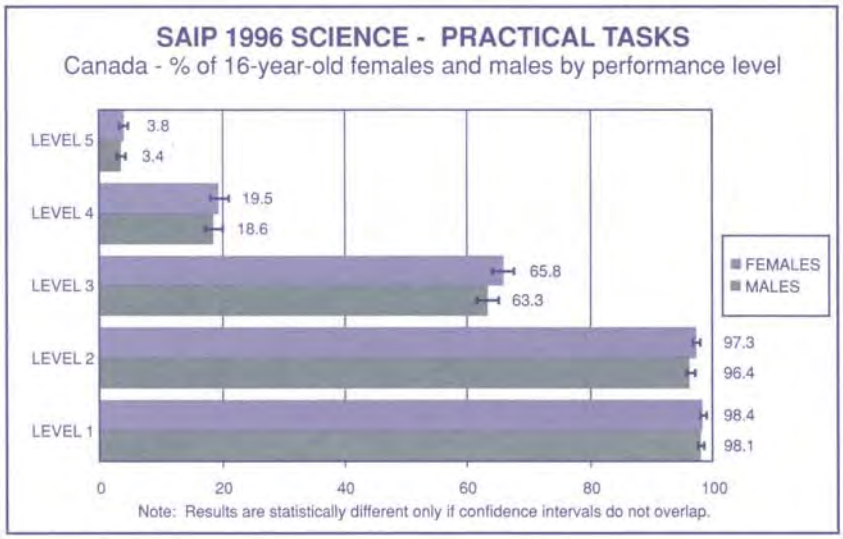


CHART 28



Except for level 4, there is no significant difference in achievement between 13-year-olds who completed the assessment in French and those who completed it in English. The cumulative percentage of 16-year-old anglophones performing at levels 3 and above is significantly higher.

CHART 29

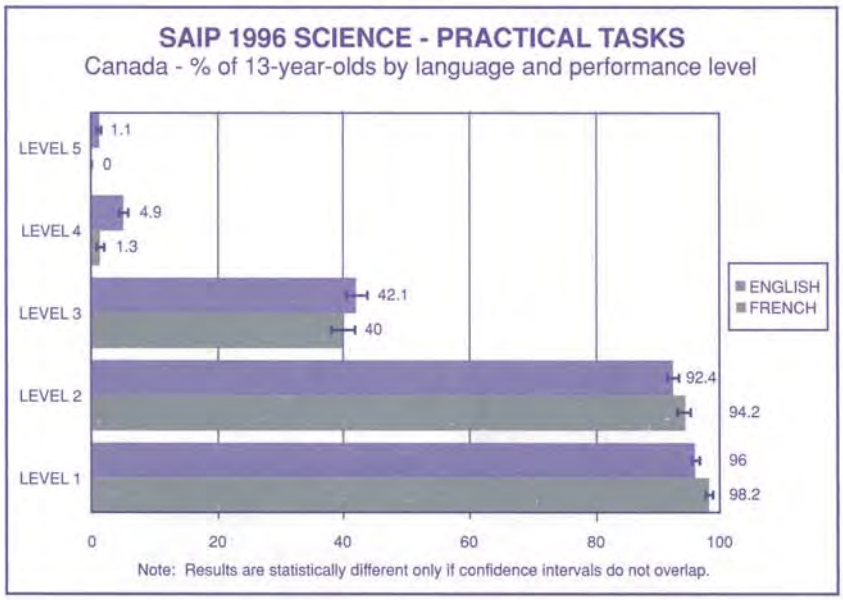
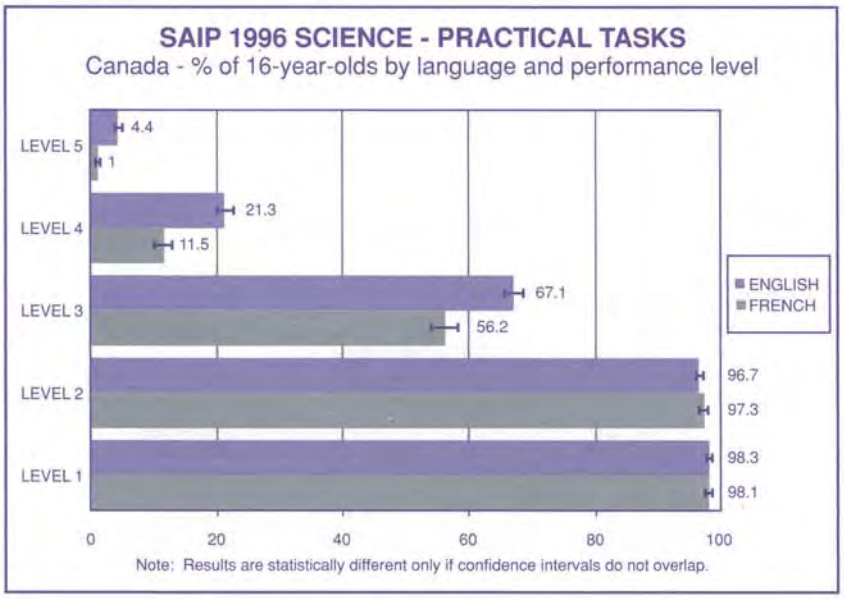


CHART 30



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 four sessions held in Western, Central, and Atlantic Canada in September-October 1996. The anonymous panel consisted of classroom science teachers, parents, university academics and science specialists, aboriginal teacher trainers, business and industry representatives, community leaders, and members of national science organizations. The panel featured representatives from every province in Canada.

The 84-member panel reviewed all assessment procedures, materials, and actual student results to determine the percentage of 13- and 16-year-old Canadian students who should achieve at each of the five performance levels used for scoring student work. 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. Further information about the procedure can be found in Appendix I.

These realistic expectations will be used in the next three years as guidelines by ministries of education when enhancing science programs across Canada. The range of expectations (the inter-quartile range) identified for each level of achievement, along with the confidence intervals for the actual results, will inform curricular and instructional improvements.

As charts 31-34 generally show, both educators and non-educators believe that sufficient or more than expected numbers of students achieved acceptable mid-range performance. However, insufficient numbers of Canadian students reached the top levels of excellence.

For the written component of the assessment, 53 per cent of 13 year-old Canadian students are expected to reach level 3 or above, whereas 43 per cent actually achieved these upper performance levels. For 16-year-old students, 73 per cent of students are expected to achieve level 3 or above, whereas 69 per cent actually achieved these upper performance levels.

For the practical component of the assessment, 51 per cent of 13 year-old Canadian students are expected to reach level 3 or above, whereas 42 per cent actually achieved these upper performance levels. For 16-year-old students, 69 per cent of students are expected to achieve level 3 or above, whereas 65 per cent actually achieved these upper performance levels.

In both the written and practical components, the mismatch between expectations and results was particularly evident for level 5 performance.

CHART 31

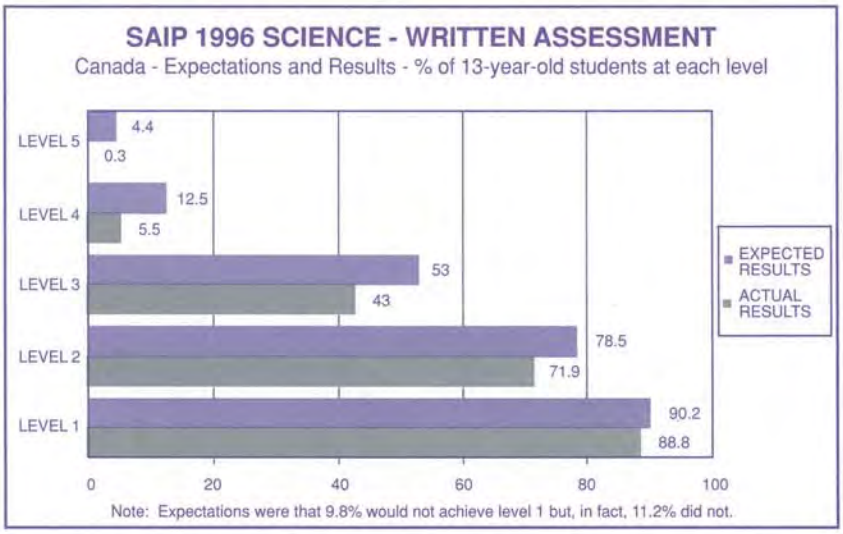


CHART 32

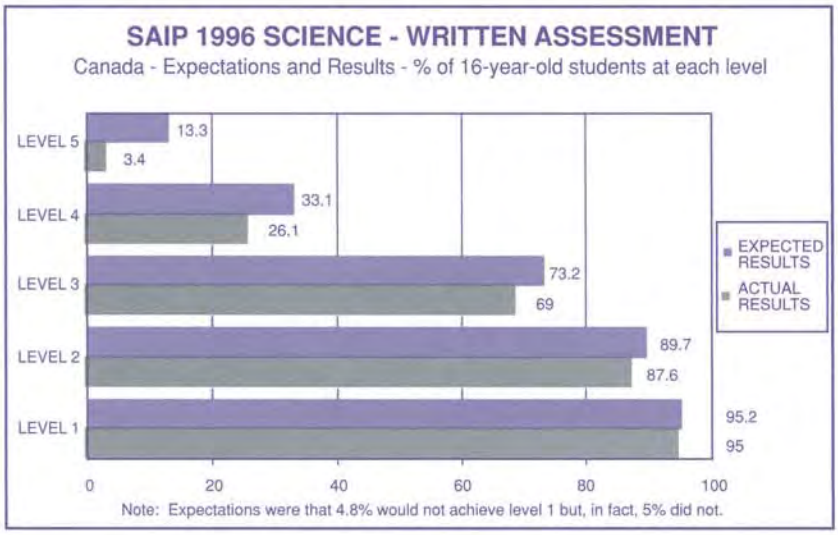


CHART 33

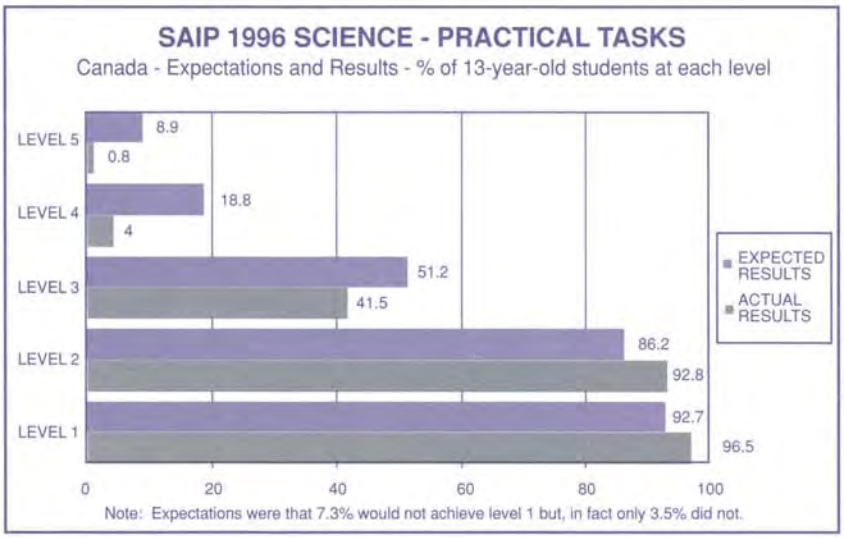
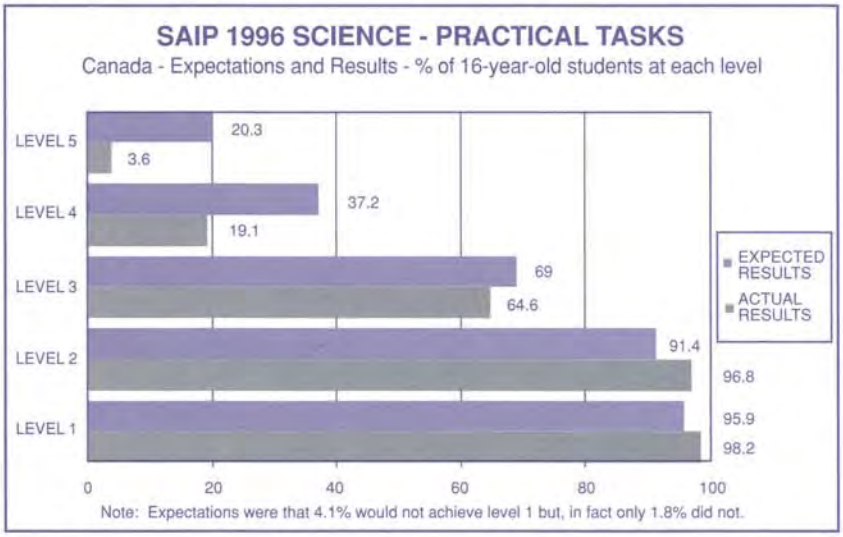


CHART 34



BRITISH COLUMBIA

CONTEXT STATEMENT

British Columbia has a multicultural student population with large-enrolment urban districts and small-enrolment rural districts. An issue of current interest is the provision of educational services to an increasing number of students from immigrant families. This influx has placed heavy demands on schools to provide English-as-a-Second-Language (ESL) instruction.

Organization of the School System

The public school system enrols almost 600,000 students and employs almost 34,000 educators. At the time of this assessment, the public school system was organized into 75 school districts. An initiative to reduce the number of school districts from 75 to 59 was undertaken in April 1996, to be implemented by December 1996. School districts in BC are highly diverse in terms of 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. At these upper levels science is presented as specific disciplines such as biology, chemistry, and physics. While students are required to take at least one grade 11 level science course, they are not required to take an academic specialty.

Science Teaching

British Columbia has recently reviewed its science curriculum, and revisions have been incorporated into Integrated Resource Packages (IRPs) that are being implemented in schools across the province. These packages have been developed jointly by ministry staff and education partners. The IRPs consist of provincially required curriculum (learning outcomes), suggested instructional and assessment strategies, a list of recommended learning resources (books, videos, electronic resources, etc.), and possible methods for teachers to use in evaluating students' progress. 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, Skills and Training.

The science curriculum of BC 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 a 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 the last ten years, there has been a greater emphasis on criterion- or outcome-referenced evaluation. Teachers determine the best assessment methods for their students. However, the IRPs contain suggested assessment strategies for gathering evidence of student performance.

In addition to participating in national and international assessments, the Provincial Learning Assessment Program assesses what BC students in grades 4, 7, and 10 know about science. This assessment takes place approximately every four years.

All students taking Chemistry, Physics or Biology at the grade 12 level are required to write Provincial Examinations, which count for 40 per cent of their final grade.

BRITISH COLUMBIA

In this province, 13-year-olds performed as well as Canadians as a whole. This is also true for 16-year-olds, and the percentage of students at level 5 (5.4 per cent) is higher than for Canada. In its context statement, British Columbia notes that it has a large ESL population. A preliminary analysis indicates that the lower levels of achievement reached by ESL students in this assessment did influence negatively the performance levels of the whole population of both age groups.

CHART 35

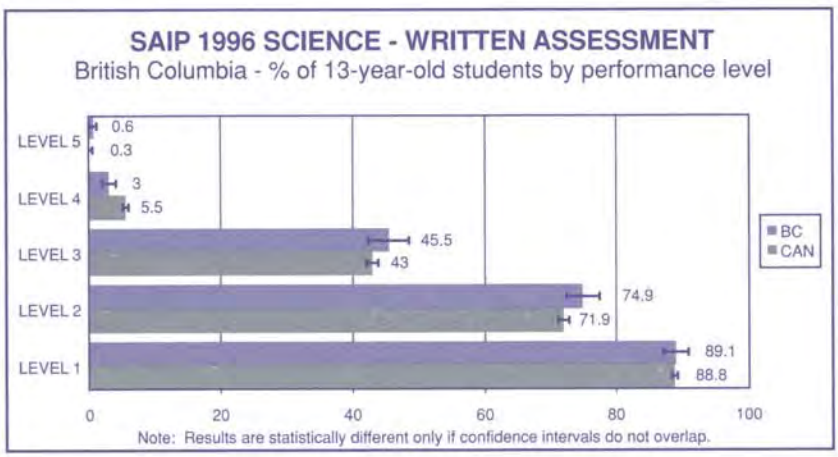
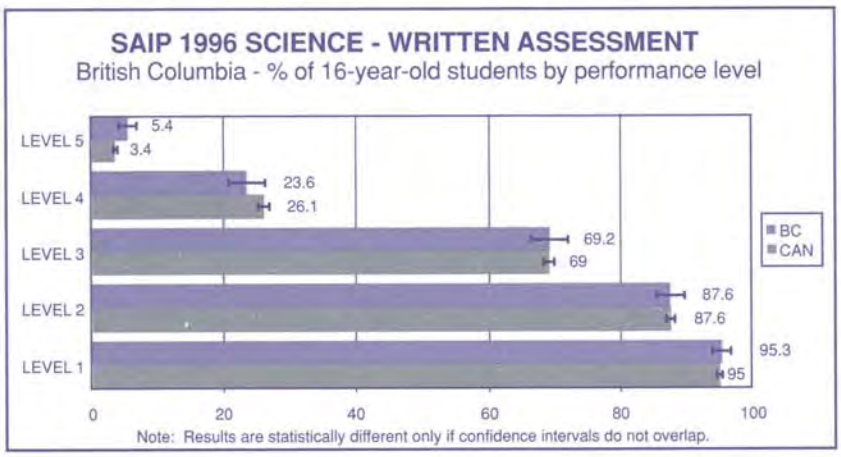


CHART 36



CONTEXT STATEMENT

Social Context

Alberta has a multicultural population of approximately 2.8 million. All children are required to attend school from the ages of six to 16. The provincial government has the primary responsibility for education and curriculum, but shares this responsibility with local boards.

Organization of School System

Nearly all 13-year-old students (97.3%) are enrolled in junior high school. About 9.6 per cent are in grade 7, 63.2 per cent in grade 8, and 24.6 per cent in grade 9. About 5.7 per cent are enrolled in French immersion programs, and about 0.6 per cent are enrolled in the francophone program. All students, regardless of program, are enrolled in Science in each grade.

Nearly all 16-year-old students (97.4%) 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 sequence is designed for students in academic programs; the 14-24 sequence for general program students, some of whom are not planning postsecondary studies; and the 16-26 sequence for students enrolled in the Integrated Occupational Program.

For the 1995-96 school year, 16-year-old students were enrolled in the following Science courses (the bracketed figure is enrolment as a percentage of the 16-year-old student population):

Science 10	(11%)	Science 20	(3%)	Science 30	(1%)
Science 14	(9%)	Biology 20	(29%)	Biology 30	(15%)
Science 16	(1%)	Chemistry 20	(29%)	Chemistry 30	(14%)
		Physics 20	(18%)	Physics 30	(7%)
		Science 24	(22%)		
		Science 26	(0.5%)		

There are also International Baccalaureate courses as listed below with a small percentage of 16-year-old students enrolled in these courses:

Biology 15 IB	(0.02%)	Biology 25 IB	(0.04%)	Biology 35 IB	(0.16%)
		Chemistry 25 IB	(0.17%)	Chemistry 35 IB	(0.41%)
		Physics 25 IB	(0.02%)	Physics 35 IB	(0.02%)

Science Teaching

Alberta Education has done extensive and ongoing curriculum revision and new curriculum development since the mid 1980s. The goal of scientific literacy for all students, achieved through emphasis on the interactions among science, technology, and society (STS), has shaped the programs of study. Consideration of the cognitive development of students strongly influenced selection and sequencing of topics in the programs of study, development and selection of resources, and the design of activities for the classroom. All general learner expectations, including those for STS connections, are developed through the study of individual units in the programs of study, where attitudes, skills, and knowledge develop concurrently.

Alberta Education views the scientifically literate person as having the following characteristics:

- demonstrates a working knowledge and practical understanding of the sciences

- has the ability to evaluate scientific evidence
- understands the processes by which scientific knowledge is developed and can adapt these processes for personal use
- applies science concepts, theories, and processes to the investigation of everyday problems
- understands the relationship between science and technology
- demonstrates awareness of how science and technology can function responsibly in a social context
- recognizes the limitations as well as the usefulness of science and technology in advancing human welfare
- demonstrates a continuing interest in science and technology

The learner expectations for the elementary science program are linked to two main areas of skill emphasis: science inquiry and problem solving through technology.

The general learner expectations for the junior high science program are linked to three major areas of emphasis:

- Nature of Science
- Science and Technology
- Science, Technology and Society

Each area of emphasis provides an overall context for learning basic scientific concepts and principles related to students' experiences.

The major goals of the senior high science programs are to:

- develop in students an understanding of the big interconnecting ideas and principles that transcend and unify the natural science disciplines
- provide students with an enhanced understanding of the scientific world view, inquiry, and enterprise
- help students attain the level of scientific awareness that is essential for all citizens in a scientifically literate society
- help students make informed decisions about further studies and careers in science
- provide students with opportunities for acquiring knowledge, skills, and attitudes that contribute to personal development

An innovative program currently being implemented in Alberta is Career and Technology Studies (CTS). The CTS program gives students the opportunity to link theory and practice, and to apply the knowledge, skills, and attitudes developed in core courses to their daily lives and the workplace. The CTS program comprises 21 strands. In general, strands relate to selected industry sectors that offer positive occupational opportunities for students. Expectations for student achievement in CTS will be consistent with the entry-level standards set by business, industry, and postsecondary institutions.

Alberta Education sets curriculum and standards for Alberta's education system.

Science Testing

Since 1982, student learning has been monitored through a provincial assessment program for grades 3, 6, and 9. The last grade 3 science test was administered in 1993; current policy is to test annually at grades 6 and 9 only. As well, since 1984, provincial diploma examinations have counted for 50 per cent of a student's final grade in selected grade 12 courses. All of the diploma examinations include a written component. Alberta Education has developed additional instruments to collect a broader base of information about what students know and can do. These performance-based assessments are administered to a provincial sample of students in all subjects on a rotating basis. The provincial assessments and exams are based on provincial standards and provide information on the degree to which students in the province have met these standards.

ALBERTA

Alberta's 13- and 16-year-olds demonstrated levels of achievement in the written test that were significantly higher than those of Canada. The cumulative percentages of both ages groups at levels 4 and 5 are higher than those of all other jurisdictions.

CHART 37

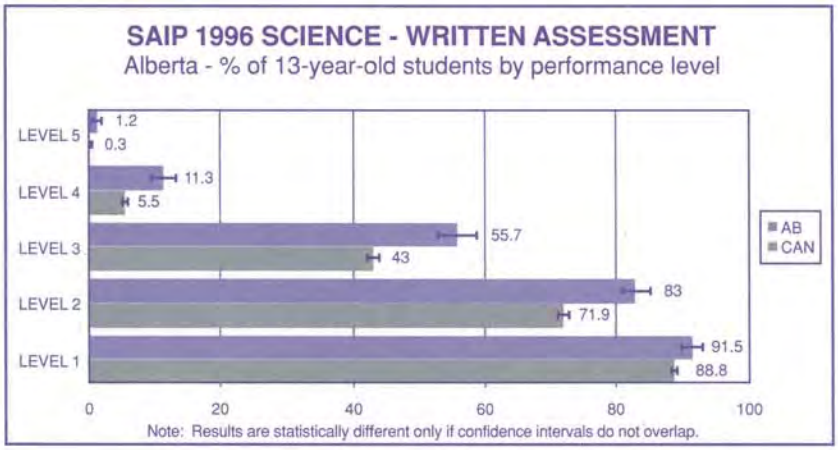
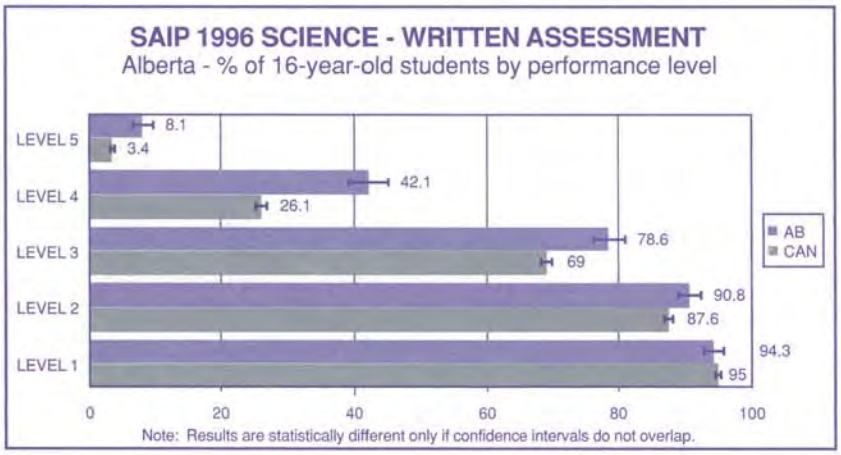


CHART 38



CONTEXT STATEMENT

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 Indian reserves. 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 Indian and Métis population.

Organization of the School System

Saskatchewan has a total population of approximately 198,000 students in kindergarten to grade 12 classrooms, and a teaching force of 11,840 educators who teach 197 days per year in 812 publicly funded schools.

Over the past decade, the province has devoted considerable effort to reforming its curricula so that by the year 2000, nearly one hundred new courses from kindergarten to grade 12 will have been designed and implemented 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 attitude throughout life

The study of science should help students make better sense of the world. Students create their own conceptual maps of what surrounds them every day. They realize 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 per cent of each student's final mark, and those who are accredited in a particular subject are responsible for assigning 100 per cent 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.

Saskatchewan's Curriculum Evaluation Program monitors curriculum effectiveness in the various areas of study according to a rotational schedule. Elementary science was evaluated in 1993. Evaluation of middle and secondary level science will occur in 1999.

SASKATCHEWAN

Saskatchewan students in both age groups performed as well in this assessment as Canadian students as a whole.

CHART 39

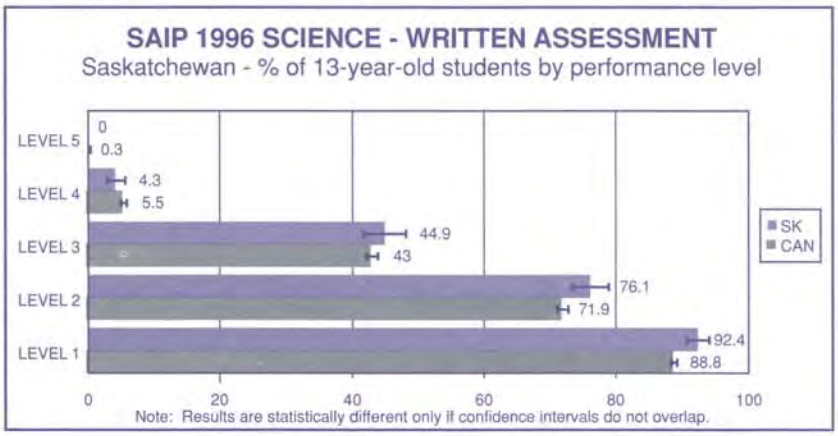
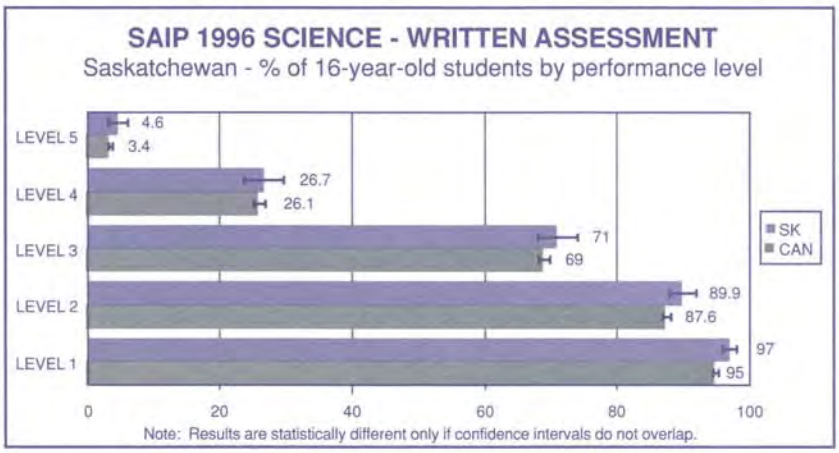


CHART 40



CONTEXT STATEMENT

Social Context

Manitoba has a population of approximately one million, 60 per cent of whom reside in the capital city of Winnipeg. Because Manitoba must meet the educational needs of a wide range of ethnic and cultural groups, English-as-a-Second-Language instruction is provided for immigrant students. There is a strong Franco-Manitoban community in the province with students enrolled in the Français Program. In addition, the French Immersion Program has become an option for about 10 per cent of students. Manitoba has a broad economic base, with agriculture being the main economic activity.

Organization of School System

Manitoba's school system enrols approximately 200,000 students in kindergarten through senior 4 (grade 12). It employs about 15,000 teachers in 48 school divisions and eight districts. For program delivery purposes, schools are encouraged to group grades according to early years (kindergarten to grade 4), middle years (grades 5–8), and senior years (senior 1–4). 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 in grade 9 (senior 1), and most 16-year-old students were in senior 3 or senior 4.

Science Teaching

In 1994, the Manitoba government released *NEW DIRECTIONS: A Blueprint for Action*, a comprehensive plan designed to renew the kindergarten to senior 4 educational system through a partnership approach with stakeholders. This plan identified four foundation skill areas—literacy and communication, problem-solving, human relations and technology—that will be included in teaching and learning within all subject areas. It also underlined the importance for science education to be real and relevant for all students. Science teachers are expected to use techniques such as journal writing, cooperative learning, and research activities to connect classroom teaching with the real world. Students are also expected to learn important factual knowledge and how to connect the factual concepts with technological and societal issues.

As part of a pan-Canadian outcomes framework project, Manitoba Education and Training is currently working with other ministries of education to prepare a framework document for Science education (K–senior 4). Manitoba will subsequently align provincial curriculum with the pan-Canadian framework and develop performance standards at grades 3, 6, and senior 1.

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 re-focus its resources on a comprehensive standards testing program as part of the *NEW DIRECTIONS* educational reform initiative. The most recent provincial science assessment was administered to a sample of anglophone, French Immersion and francophone students throughout the province in 1994. Since science is a core subject area at grades 3, 6, and senior 1, students will be administered standards tests in science when this student testing program is fully implemented.

For the SAIP science assessment, students were tested in the language of instruction. Francophone and French Immersion students wrote the Français version of the assessment and English-speaking students wrote the English version.

MANITOBA (E)

Manitoba 13-year-olds and 16-year-olds who took part in the English form of the assessment performed as well as Canadians students as a whole. This province underlines the importance for science education to be real and relevant to all students. It is also actively involved in a pan-Canadian science outcomes framework on which provincial curriculum will be aligned.

CHART 41

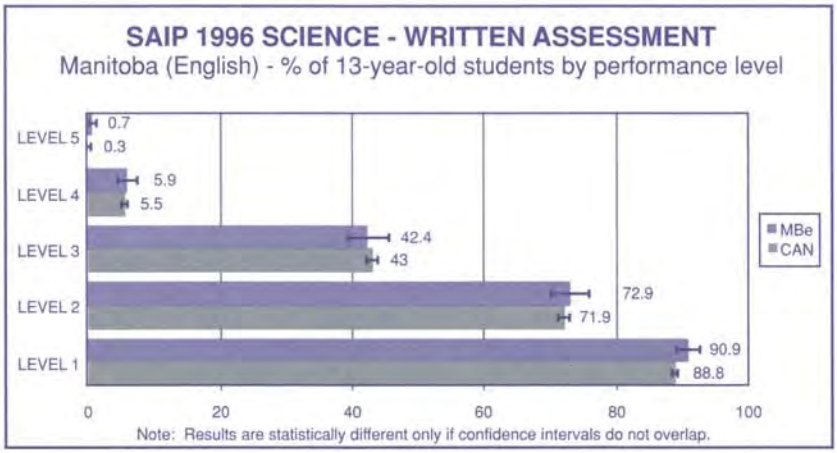
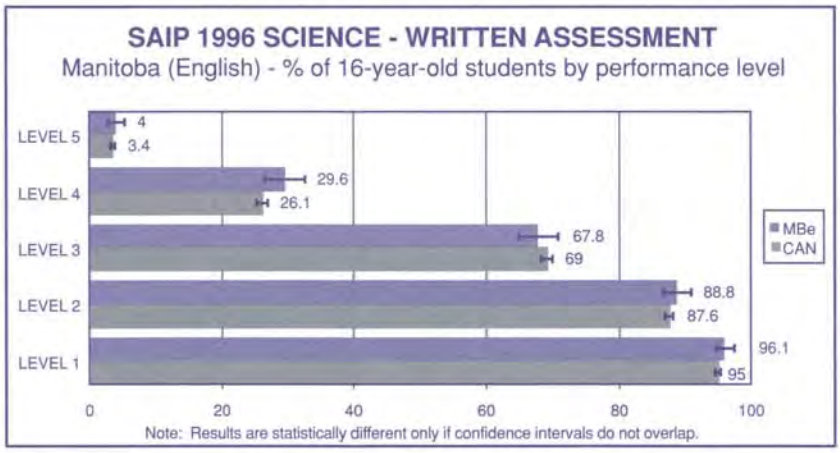


CHART 42



MANITOBA (F)

In this province, there is a significant difference in performance between the 13-year-olds who wrote the test in French and that of Canadian 13-year-olds as a whole. Sixteen-year-olds, however, performed as well as those in Canada as a whole. As previously noted, this province underlines the importance for science education to be real and relevant to all students. It is also actively involved in a pan-Canadian science outcomes framework on which provincial curriculum will be aligned.

CHART 43

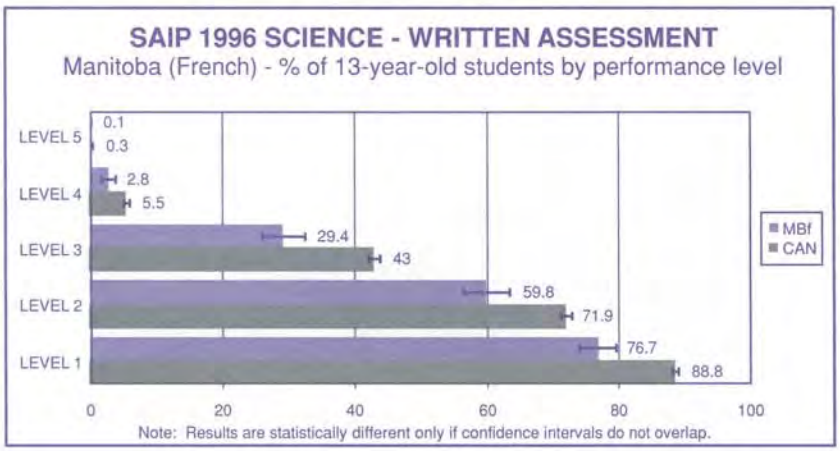
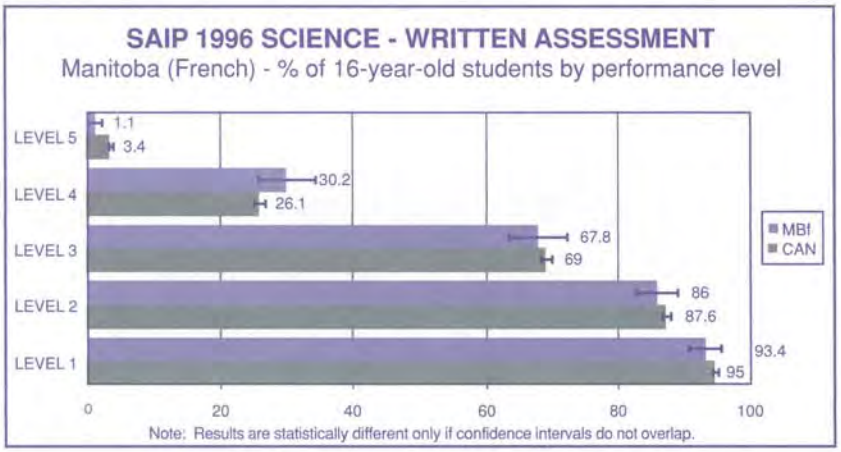


CHART 44



CONTEXT STATEMENT

Social Context

Ontario is characterized by large urban school boards that serve densely populated communities, small-town and rural school boards whose students are more widely dispersed, and northern district school boards that serve small numbers of students spread over wide geographic areas. About half the boards have minority-language sections — mainly French-language — whose schools provide elementary and secondary education that parallels that provided by the majority-language sections. There are also four French-language school boards in the province.

A critical issue in the provision of education programs and services for all of Ontario's students is the diverse ethnocultural composition of Ontario's student population and the large number of children and youth from immigrant families. To overcome language and cultural barriers that could affect student achievement, schools, especially in urban areas, provide instruction in English/French as a second language and community outreach services. In addition, students with special needs are integrated increasingly into regular classrooms.

Organization of School System

Ontario's publicly funded school boards consist of both English-language and French-language public boards, which enrol 70 per cent of the student population, and both English-language and French-language Roman Catholic separate boards, which enrol 30 per cent. Five per cent of all students are in French-language school programs, and 80 per cent of these students are in Catholic separate schools.

In 1993-94, Ontario had 2,042,700 students enrolled in 164 school boards and 119,800 full-time teachers. Seventy per cent of the boards offer French-language education. The school program extends from kindergarten to the Ontario Academic Courses (OACs), usually taken in the final year of secondary school, which are designed for university-bound students.

Science Teaching

Ontario is restructuring and refocussing programs and program delivery in grades 1 to 9 and moving to an outcomes-based curriculum with a strong cross-curricular, collaborative, and integrated approach to teaching. Most science-related outcomes are included in a Mathematics, Science and Technology program area. Earth 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 1-6 is presented in an integrated, activity-based curriculum that encourages the exploration, from the child's perspective, of a variety of areas in science and technology. Between 1988 and 1992, some emphasis, in terms of professional development and classroom resource allocation, has been placed upon this program, both at a provincial and local level.

The science program in grades 7-10 provides a broad overview of science as a 'mosaic' of the traditional disciplines. Students are required to take science to the end of grade 10. Grade 10 is the first year in which science courses are offered at three levels of difficulty.

In grades 11 and 12, science programs are delivered in the more specialized areas of Chemistry, Physics, Biology, and Environmental Science and taught at three levels of difficulty, advanced, general, and basic. The OAC science programs in the last year of secondary school focus on preparation for university. The OAC programs consists of second courses in Chemistry, Physics, and Biology, as well as a Science in Society course.

Teachers of science are expected to design local programs based upon provincial curriculum guidelines and policy that include both the acquisition and application of knowledge of the content of science and the development and application of skills in the process of science.

Most 13-year-old students in this assessment are enrolled in either grade 7 or 8 science, both of which are mandatory. 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 evaluation and promotion. Ontario does not conduct province-wide examinations for these purposes. A program that monitors examinations in OAC courses has been established to provide training for teachers and to work toward more consistency in local assessment practices. Banks of assessment instruments have also been developed and distributed for a few science programs.

In the last few years there has been a tremendous change in the approach to assessment in Ontario. The province is moving rapidly to an outcomes-based curriculum and the development of criterion-referenced provincial standards for grades 3, 6, and 9. The formation, in 1996, of the Education Quality and Accountability Office (EQAO) in Ontario was the first stage in a new program that will ensure greater accountability and contribute to the enhancement of the quality of education in Ontario.

With respect to the science program, Ontario has a history of involvement in international assessments, such as the International Assessments in Mathematics and Science, conducted under the auspices of the International Association for the Evaluation of Educational Achievement (IEA). In addition, in the past, Ontario has conducted provincial reviews in senior division science courses.

Currently, the secondary school program is under review, and as a result there may be changes to secondary science education.

ONTARIO (E)

There is a significant difference in achievement between Ontario anglophone and Canada 13-year-old students only at levels 2 and 3. None is observable for 16-year-olds. A preliminary analysis indicates that the lower levels of achievement reached by the sizeable ESL student population in this province had a negative influence on the performance levels of the whole age group populations.

CHART 45

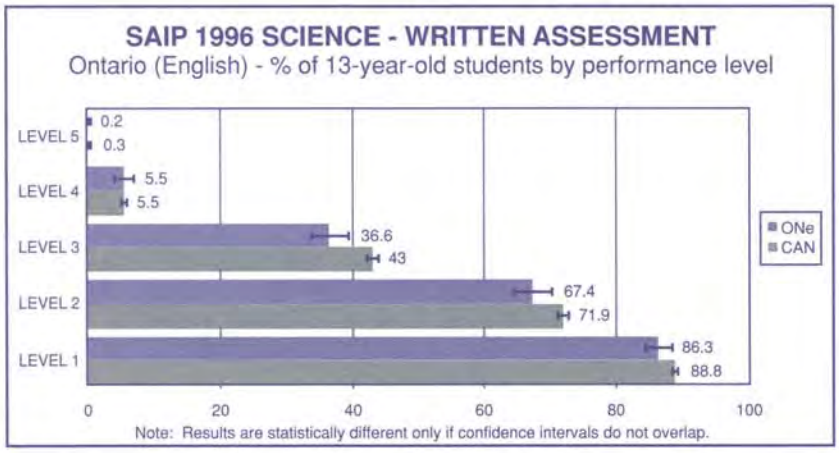
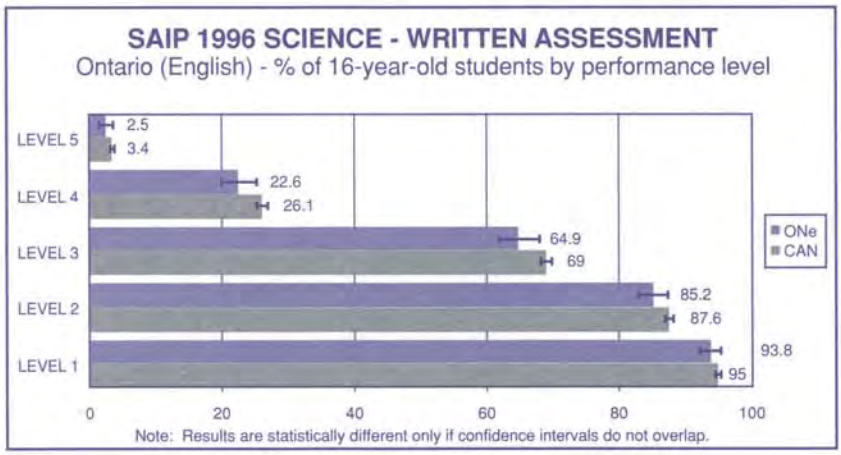


CHART 46



ONTARIO (F)

These charts show that there is a significant difference in performance between francophone students of both age groups and Canadian students as a whole. According to information from the student's questionnaire, francophone student populations in Ontario frequently include a sizeable proportion of students whose language spoken at home is other than French.

CHART 47

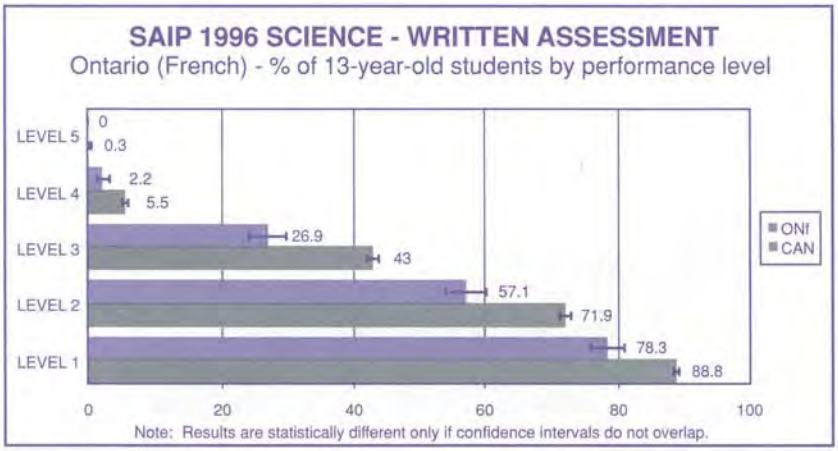
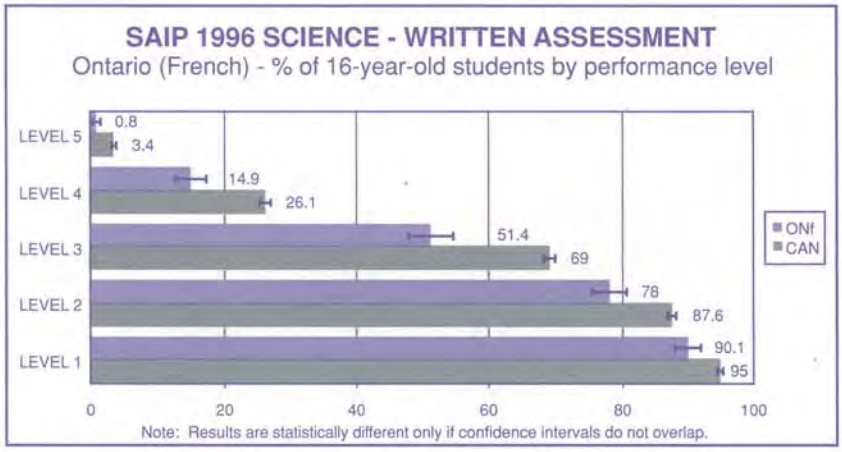


CHART 48



CONTEXT STATEMENT

Social Context

Quebec is currently undertaking a review of its educational system in order to meet the challenge of success. Based on the work of the Estates General on Education (which reported in October 1996) and on the advice of the *Conseil supérieur de l'éducation*, the Ministry of Education has launched a process of systemic renewal, slated to be completed by the year 2000, and designed to shift system emphasis from access to success.

This reform will be youth-focussed, since Quebec's young people will be required to live in the highly competitive world of the 21st century.

Schools will need to help young people develop their creativity, curiosity, and discipline, and teach them that the true meaning of excellence lies in surpassing one's own expectations.

The major areas of reform include early childhood, core subjects, vocational and technical training, lifelong learning, higher education, special measures needed to meet the challenge of success in the Montreal community, and finally a new sharing of responsibilities between the various stakeholders concerned with students' success.

Quebec's educational system is undertaking a process that will give students the tools they need to build their own success.

Organization of School System

In Quebec, school attendance is compulsory for six-year-olds (i.e. children turning six up to October 1 of a school year), until the end of the school year during which their sixteenth birthday occurs. The school year is made up of 180 teaching days.

Five-year-olds may also be registered in kindergarten (i.e. children turning five up to October 1 of a school year). Although kindergarten is not compulsory, in practice almost all five-year-olds are registered. Kindergarten is a one-year, half-day program delivered in elementary schools.

Elementary schooling begins after kindergarten. The normal week includes five full days with 23.5 hours of teaching. Elementary schooling lasts six years and leads directly to secondary school. A seventh year may be added for students who experience difficulties in school.

Secondary schooling lasts five years and is divided into two cycles. The normal week is five days and must include at least 25 hours of educational activities. The first cycle (junior high school) lasts three years and is strongly focussed on core subjects, except in the third year where the curriculum includes four optional credits. The second cycle (senior high school) allows students to continue their general schooling while providing opportunities to explore various avenues through a system of optional courses, before graduating to the college system or choosing a secondary vocational stream leading to a trade. Students obtain a secondary school diploma or a vocational diploma based on the educational requirements of the system.

Most 13-year-olds are registered in the second year of secondary school, and most 16-year-olds are in their final, fifth year of secondary school (some 16-year-olds are starting their college-level studies).

In 1994-95, 1,041,130 students were registered in the general stream in 2,671 public elementary and secondary schools spread among 157 school boards. Over 90 per cent of these students were registered in francophone schools and 9 per cent in anglophone schools. As well, 190,044 students were registered in 182 publicly funded private elementary and secondary schools. Government of Quebec subsidies make up 79.2 per cent of public boards' operating revenue, as compared to 51.6 per cent for subsidized private schools.

Science Teaching

In Quebec, natural science is a compulsory subject from the beginning of elementary school to the fourth year of secondary school (secondary IV) inclusive. Science is optional in the fifth year of secondary school (secondary V). Students wishing to pursue natural science or some technical programs at the college level (i.e. 12 or 13 years of study) must pass a secondary V physics and/or chemistry course.

The following optional and compulsory programs are offered throughout the school system. The common curriculum includes recommended time allotments for each course.

Program	Status	Recommended Time
Natural Science, Elementary 1, 2, 3	Compulsory	1 hour/week
Natural Science, Elementary 4, 5, 6	Compulsory	1 1/2 hours/week

Program	Status	Recommended Time
Ecology, Secondary I	Compulsory	100 hours/year
Physical Sciences, Secondary II	Compulsory	100 hours/year
Human Biology, Secondary III	Compulsory	100 hours/year
Physical Sciences, 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
Science Tools and Methods, 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 professional expert groups from the various disciplines, educational experts, 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 to pursue further science or specialized technical studies. It aims to convey an authentic vision of science by allowing students to grasp 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 and thought processes that prepare them for citizenship.

Science Testing

Secondary school students are assessed regularly by schools, using tests provided by the Ministry of Education or developed locally. Completion of a nature science course is not compulsory to obtain a secondary school diploma.

In the second cycle (senior high school), students undergo a summative assessment in physical sciences, chemistry, and physics. The assessment is made up of two parts, a written test (75 per cent of the final mark) and a practical laboratory test (25 per cent of the final mark). The pass mark is 60 per cent.

QUEBEC (E)

Quebec anglophone 13-year-olds and 16-year-olds show achievement that is similar to that of Canadian students as a whole, except for the older group at level 4.

CHART 49

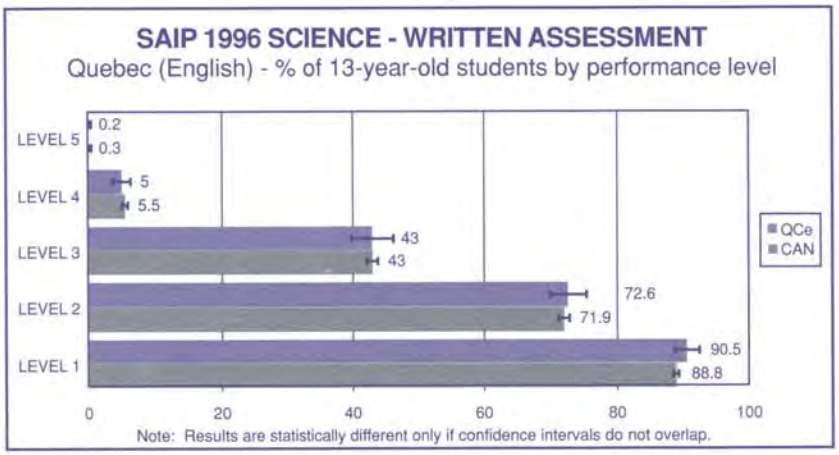
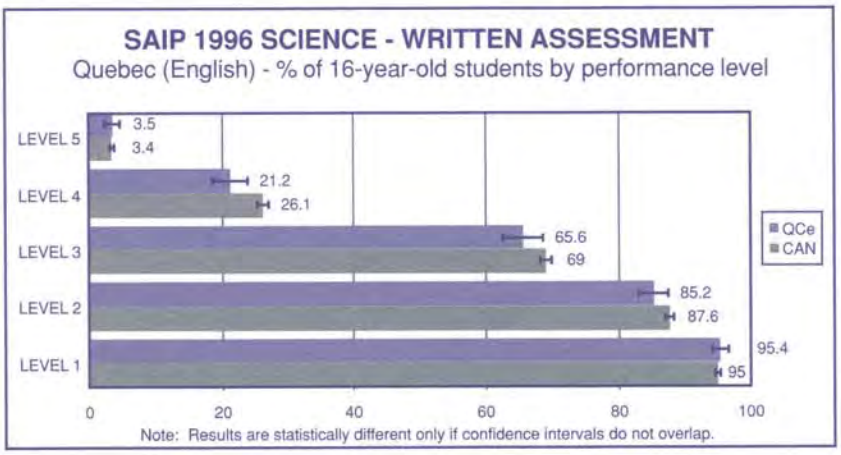


CHART 50



QUEBEC (F)

The percentage of 13-year-old francophone students in Quebec performing at level 3 or above is significantly higher than that of Canada. No significant difference is observed in the case of 16-year-olds.

CHART 51

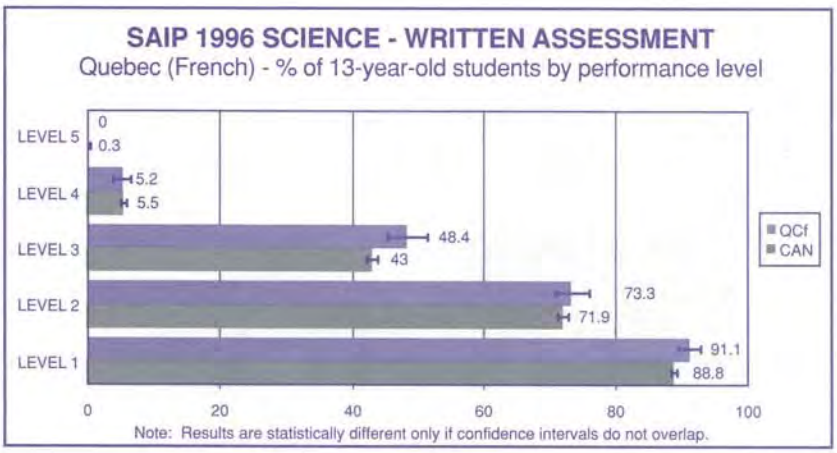
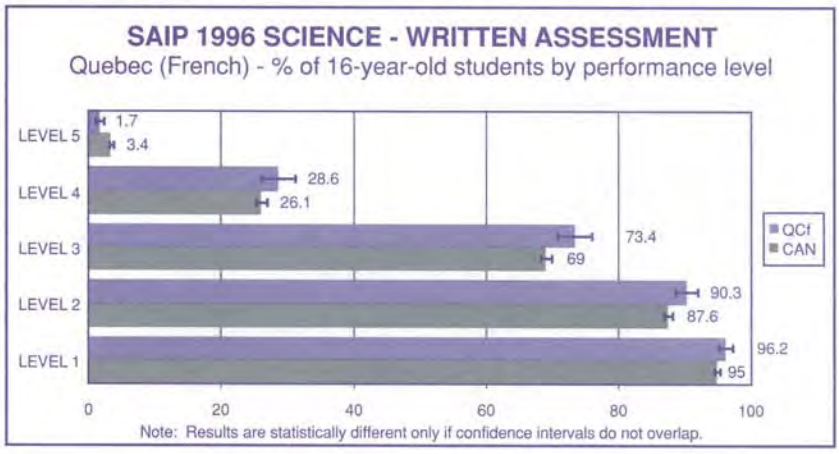


CHART 52



CONTEXT STATEMENT

Social Context

New Brunswick's population of 761,400 is 48 per cent urban and 52 per cent 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.

In 1992, New Brunswick amalgamated school districts, reducing the number from 42 to 18 (12 anglophone, six francophone).

In 1996, the province unveiled plans for a "Renewed Education System for New Brunswick", which addressed structural as well as quality issues. In this reform, the 18 existing school districts were maintained, but were grouped into eight administrative units (five anglophone, three francophone). As well, school boards were abolished, to be replaced by a parent-driven structure at the school, district, and provincial levels.

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. A new quality education agenda was proposed as part of the "Renewed Education System". Under the broad goals of more focus, greater accountability, and higher expectations, 14 objectives were enunciated. Parents, teachers, and other education partners are currently being consulted about how those objectives might best be attained.

In the 1995-96 school year, enrolment for kindergarten through grade 12 totalled 135,054. This includes 90,698 in anglophone, and 44,356 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 and a balance. Every effort is made to present science in connection with students' own experiences 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, show an interest in careers in science and technology, and develop the habits of lifelong learning.

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

- cooperation among four Atlantic Provinces at all grade levels in science, leading to a common science curriculum in the near future
- 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 pilots occurring next year 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 6 levels are specific to learning outcomes identified in the provincial mathematics, science, and language arts curriculum documents. They constitute an evaluation of the system with a focus on reporting group data rather than individual student achievement.

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 6 curricula, but also may reflect those taught in earlier grades.

One section of the science assessment requires students to conduct an experiment (given established conditions and materials) and to respond to a series of questions regarding the various skills employed when conducting the experiment. Finally, students are asked to create a report of their investigation — an accurate and clearly presented account in their own words.

Plans are currently in progress for future provincial exams in anglophone high schools in grade 12 Biology, Chemistry, and Physics.

NEW BRUNSWICK (E)

In this province, performance levels obtained by 13-year-olds and 16-year-olds are very similar to those of Canadian students as a whole except for the older group at level 4.

CHART 53

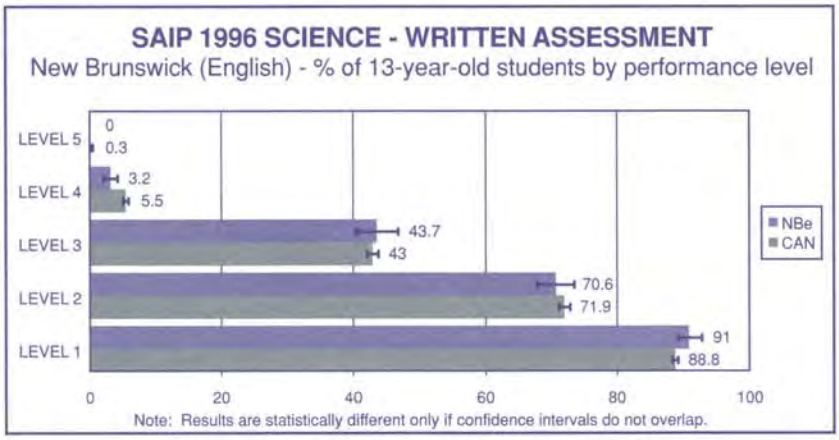
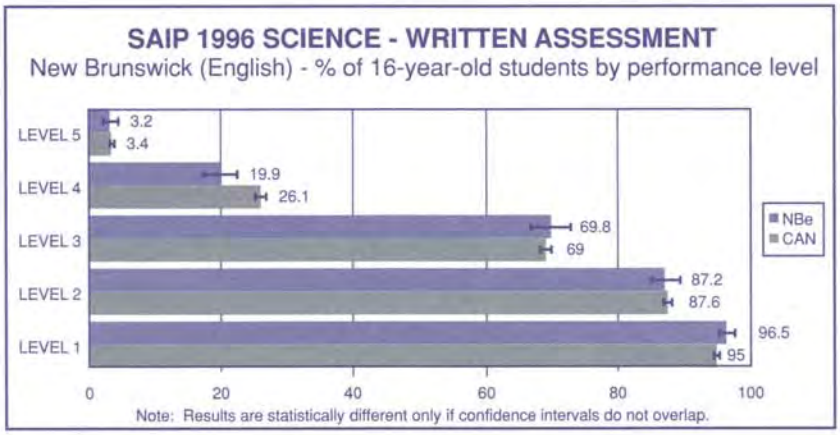


CHART 54



CONTEXT STATEMENT

Social Context

Socio-economic development in New Brunswick has improved in recent years. In spite of this trend, however, the unemployment rate is higher than the national average, and is higher still in the province's francophone regions. On January 1, 1996, New Brunswick had a total population of 761,400. The average unemployment rate in 1995 was 11.5 per cent, while the rate for Canada was 9.5 per cent. Among those aged 15 and up, New Brunswick recorded a participation rate of 59.3 per cent and an employment/population ratio of 52.5 per cent. Fifty-two per cent of New Brunswick's inhabitants live in rural areas, and 48 per cent live in urban areas.

New Brunswick has been officially bilingual since 1969. More than one-third of its population is of francophone origin. The total number of students is 135,054, of whom 32.8 per cent attend French-language schools.

Nearly half of all students enrolled in francophone schools live in a mainly anglophone environment.

Organization of the School System

New Brunswick's school system extends from kindergarten to grade 12. Students must be six years old by December 31 of the year they enrol. A public kindergarten system for five-year-olds has been in place since 1992.

In 1974, the province implemented a school system composed of two separate and distinct sectors and organized by language. The francophone sector of the Department of Education is responsible for providing study and evaluation programs that fulfil the needs of the francophone population. New Brunswick is divided into six francophone school districts (administered by three divisions) serving a population of 44,356 students, and twelve anglophone school districts (administered by five divisions) covering a population of 90,698 students.

Considerable effort has been expended in recent years to fulfil special requirements of students and make schooling accessible to all children. Under New Brunswick's *Schools Act and Regulations*, academic authorities must place exceptional students in regular classes as long as this does not interfere with the educational needs of all students. As a result, the level of integration in schools has risen; between kindergarten and grade 8, nearly 100 per cent of exceptional students have been integrated into regular classes, while close to 80 per cent of exceptional students are integrated into regular classes between grades 9 and 12. Programs are also in place to encourage potential dropouts to stay in school. As a result, New Brunswick's dropout rate is now one of the lowest in Canada. Francophone schools recorded a dropout rate of 3.2 per cent over the 1994-95 academic year.

Until now there has been no province-wide standard for academic achievement from grades 1 through 8, although such a standard is currently being implemented in these grades. In the majority of school districts, however, the minimum average required is 60 or 65 per cent. Meanwhile, students in grades 9 through 12 must have a minimum average of 55 per cent to obtain a credit. Provincial high school examinations, which make up 40 per cent of students' final marks in seven required subjects (including grade 10 Physics and grade 11 Chemistry), have been administered since 1991.

Science Curriculum

Between kindergarten and grade 12, science curriculum for the francophone sector has three main objectives including a social aspect (learning science), cognitive aspect (doing science) and an ethical aspect (learning about the nature of science).

Between kindergarten and grade 8, major subjects of study include concepts related to the life sciences, the relationships among the sciences, technology, and society, earth and space science, and such unifying notions as matter, force, energy, and light. Nevertheless, individual objectives vary with the subject and become more complex with each school year. Content, exploration activities and factual elements follow a hierarchy so that there is evidence of progression both within each unit and from one unit to the next. Within the mainly interdisciplinary organization of programs, total class time taken up by science courses ranges from a minimum of 4 per cent in grade 1 to a minimum of 12 per cent in grade 8.

Between grades 9 and 12, science classes follow a semester program in which a minimum of 115 hours per semester is devoted to any one class. Human Biology in grade 9, Physics in grade 10, and Chemistry in grade 11 are the three science courses required to graduate. Optional courses are also offered in these areas as well as in Environmental Science. All aspects of the SAIP assessments are covered in the science curriculum with the exception of Earth Sciences, for which most of the content is covered as part of Social Studies, Geography in particular.

Student Evaluation in Science

Since 1991, the francophone sector of the department administers provincial examinations in Physics in grade 10 and in Chemistry in grade 11, or at the end of obligatory instruction in these subjects at the high school level. Students' marks in the exams, which make up 40 per cent of their final marks, are submitted to schools within five days of writing the test. The questions, which are short answer or long answer, cover the main aspects of the program, including the nature of science, an integral part of the provincial science program. A detailed statistical report is then distributed to all schools and school districts. Teacher participation is essential throughout all aspects of exam planning, administration, and marking. This participation also benefits teachers in their own assessment practices.

NEW BRUNSWICK (F)

Francophone students of both age groups show levels of performance significantly different from those of Canadian students as a whole.

CHART 55

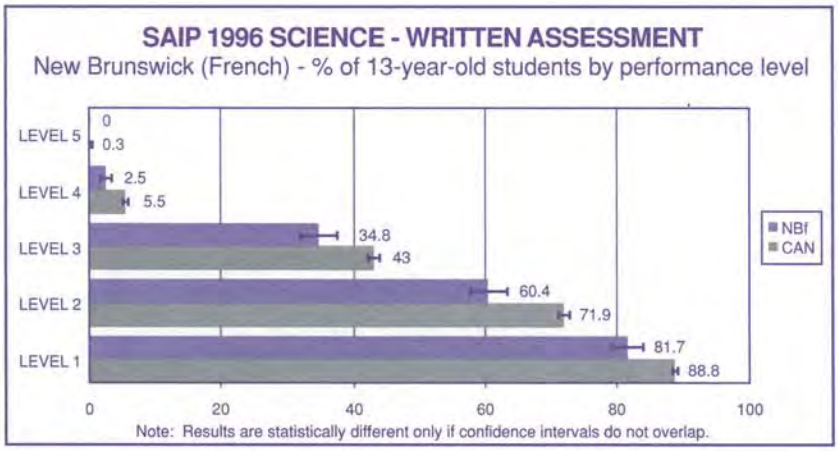
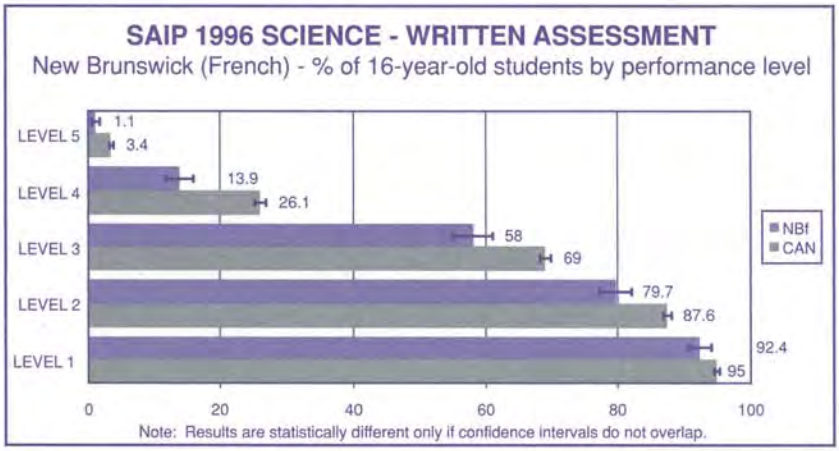


CHART 56



CONTEXT STATEMENT

Social Context

Nova Scotia is a small province with a population of 941,200, 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 compared to immigration in Canada as a whole. About nine per cent of the population speaks both English and French, or French only. Among the total population, about two per cent is Black, two and one-half per cent is aboriginal, and one and one-half per cent 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 163,000 in grades primary to 12. The province has a teaching force of 9,500 and is divided into seven school boards. About 97 per cent of the students are enrolled in anglophone school boards, and about three per cent of the students are enrolled 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 primary 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

Teachers and school districts are at various stages in their implementation of the new science programs at the high school level. Curriculum development and piloting of science programs at the junior high and elementary levels is ongoing. The aim of Nova Scotia's science education programs is to teach students essential skills, knowledge, and attitudes required to be scientifically and technologically literate in a societal context and so, in the curriculum, science is not treated as a collection of ideas and isolated skills, devoid of a context. Nova Scotia has attempted to achieve this aim by incorporating into the curriculum the following:

- science is a powerful way of knowing the world
- technology is a social process by which society utilizes natural and human resources to solve practical problems
- connections exist among science, its application in technology, and its implication for the environment and society
- there is a need for a variety of methodological and assessment strategies for diverse learners
- learning in science is an active process, which involves the employment of creativity, decision-making, and critical thinking skills
- learners are not viewed as passive but are seen as purposeful and ultimately responsible for their own learning. They bring their own personal experiences and insights to learning situations
- more emphasis needs to be given to oral communication, to small group learning and social/collaborative skills, and to independent learning
- there is a need to utilize a wide variety of print and non-print resources that are multi-level and multi-genre, and to ensure that multicultural evaluation is an integral component of instruction
- assessment is an integral part of teaching

Teachers from across the province work with department staff to develop curriculum and related assessments. At present Nova Scotia is working with the other Atlantic provinces to develop regional outcomes-based science curriculum for grades 1 to 12.

Science Testing

Nova Scotia is currently collaborating with the other Atlantic provinces to develop regional assessment instruments that will be congruent with the new regional science programs. The process has proven to be long and multi-faceted. Ministry personnel from curriculum and assessment as well as committees of teachers for each discipline area have been involved with the development and construction of the assessment instruments. Field testing of the external instruments has begun.

Over the past number of years in Nova Scotia, improvements in student assessment have been made in the classroom. This has been due in part to in-services and the new science programs, which contain a wide variety of assessment activities. Nova Scotia's assessment instruments support the diversity of students by asking a variety of questions at all levels of difficulty and by utilizing many styles of questions including multiple-choice, short answers, extended essays that are premised in a societal context, and performance-based activities.

NOVA SCOTIA (E)

In this province, the 13-year-olds and 16-year-olds who wrote this assessment in English performed as well as students from Canada as a whole, but there is a significant difference at level 4 for 16-year-olds.

CHART 57

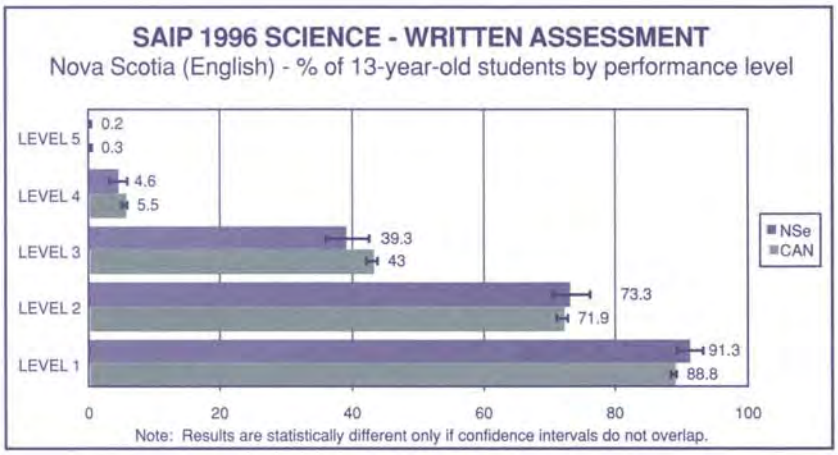
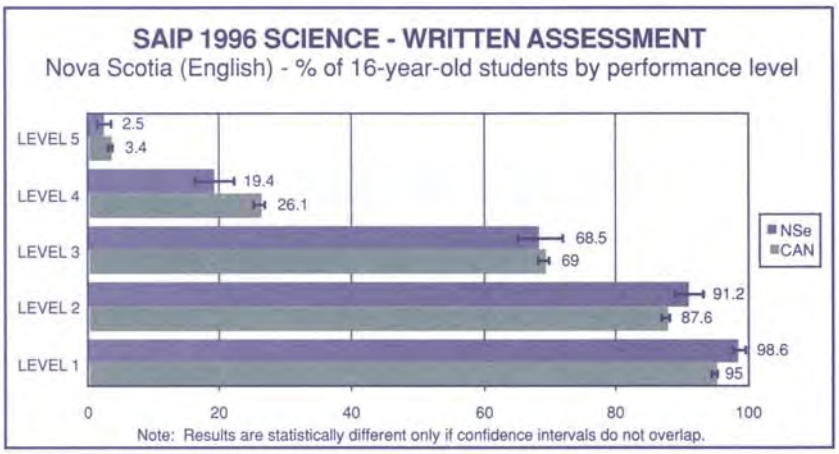


CHART 58



NOVA SCOTIA (F)

Francophone 13-year-olds in this province show performance that is significantly different from that of Canada as a whole for all levels. The 16-year-olds, however, achieve the highest percentages in Canada for levels 3 and above.

CHART 59

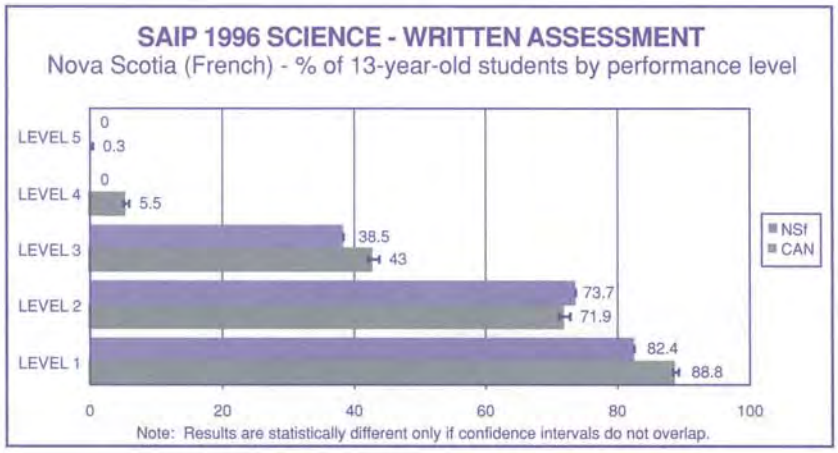
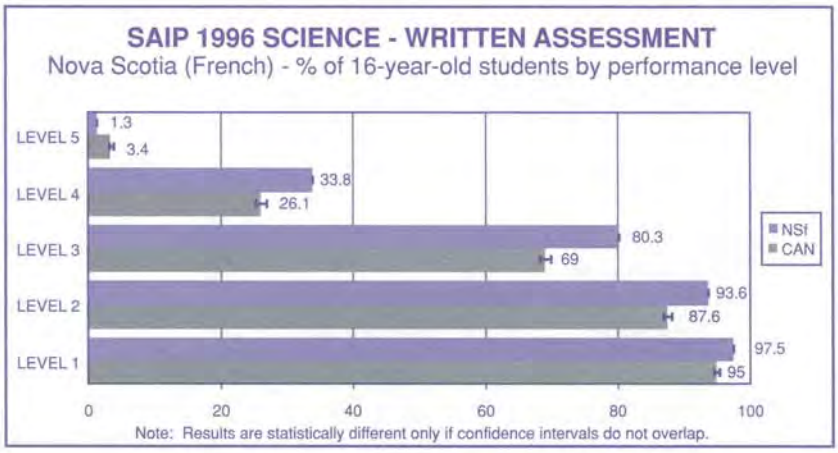


CHART 60



CONTEXT STATEMENT

Social Context

Prince Edward Island (PEI) is the smallest province both in terms of land — 5,660 square kilometres — and population — 135,500. 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 School System

At the time of the administration of the SAIP science assessment, PEI had three school boards and 24,400 students enrolled in 65 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.

There are various school configurations across the province. Of the 65 public schools, one school has grades 1 to 3; one school has grades 1 to 4; 22 schools have grades 1 to 6; one school has grades 5 to 8; one school has grades 4 to 6; 13 schools have grades 1 to 8; seven schools have grades 1 to 9; seven schools have grades 7 to 9; three schools have grades 9 to 12; and five senior high schools have grades 10 to 12. In addition, there are two francophone schools, grades 1 to 12.

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 postsecondary institutions, or in practical science courses for students with special needs.

Science Teaching

Prince Edward Island is working with the other Atlantic provinces to develop a common science curriculum for grades 1 to 12. Full implementation is anticipated by the year 2000.

Science teaching in the region is shaped by the vision of enabling and encouraging every student to become scientifically literate within an active learning environment, thereby fostering the development of those understandings, skills, and attitudes essential to lifelong learning and responsible citizenship.

Science Testing

Prince Edward Island 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.

PRINCE EDWARD ISLAND

These charts show that, in this province, students of both age groups show levels of performance comparable to those of Canada as a whole. This province notes, in its statement, that full implementation of the new Atlantic provinces science curriculum is anticipated for the year 2000.

CHART 61

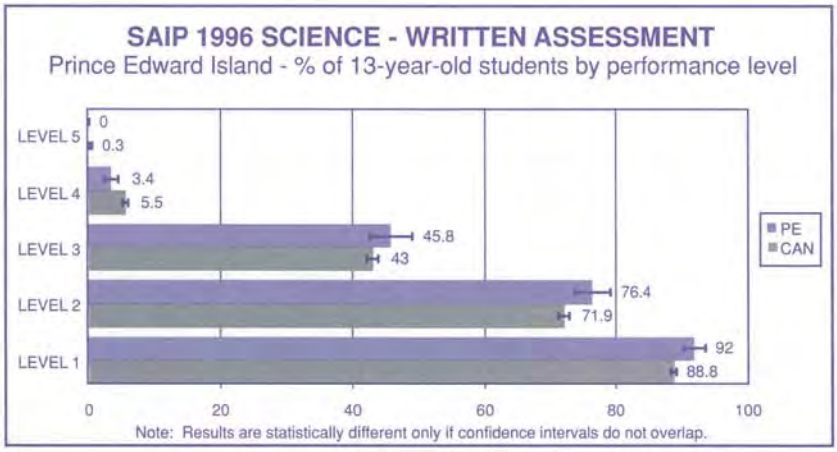
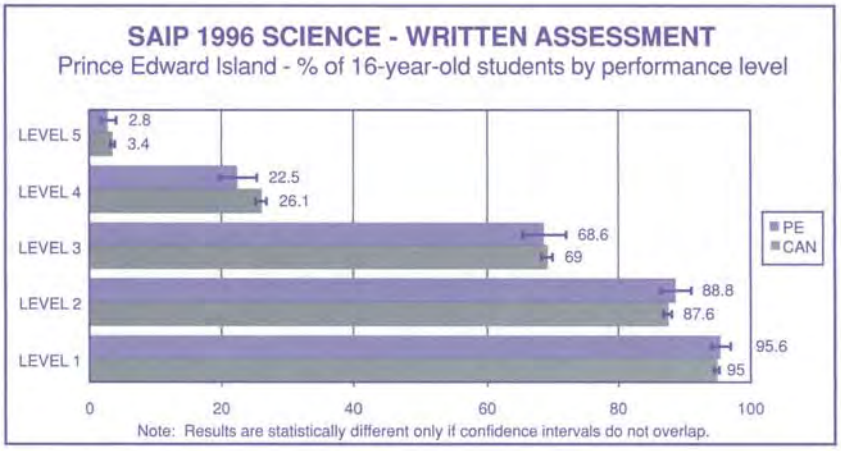


CHART 62



CONTEXT STATEMENT

Social Context

Newfoundland has a small population of approximately half a million people distributed over a large geographical area, which includes Labrador as well as the island of Newfoundland. Newfoundland's large size and small population provide many challenges for the delivery of education. In addition, enrolments have been declining steadily since 1972, making it increasingly difficult to maintain appropriate levels of programming, particularly in rural areas. Unemployment rates in the province have traditionally been high, but they have worsened in recent years in many rural communities as a result of the collapse of the fishery.

Organization of School System

For most of its educational history, the province has operated a denominational education system whereby responsibility for education is shared between the provincial government, through the Department of Education, and the major Christian churches, through the Denominational Education Councils. As of September 1996, the province had 27 school districts with a total of 479 schools. Total enrolment at that time was 110,456, and there were 7,224 school-based educators.

The compulsory school entry age is six years old by December 31, but students may enter kindergarten if they are five by that date. Typically, 13-year-olds are in grade 8 and 16-year-olds are in grade 11.

Science Teaching

In recent years major changes in science curriculum have occurred as a result of a number of significant research projects. *Towards An Achieving Society* (1989), the report of the provincial Task Force on Mathematics and Science Education, *Science for Every Student* (1984), Report 36 of the Science Council of Canada, and other reports such as *Science for All Americans* (1989) and *Benchmarks* (1993) from Project 2061 in the United States all emphasize the importance of scientific literacy in educating students for a changing future. In various ways, all of these reports identify preparation for further education and for work, citizenship, critical thinking, and personal development as the major goals of science education.

Currently, all students from kindergarten to grade 9 are required to take science as part of their program. For graduation, high school students are required to complete two two-credit courses from a selection of courses from the life, earth, and physical sciences. By the time 16-year-olds participate in the SAIP assessment, most would have met or exceeded this graduation requirement.

The science curriculum from kindergarten to grade 9 and high school courses are currently under review or have been revised based on a framework described in *Foundation for the Atlantic Canada Science Curriculum*. 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 the various grade levels up to grade 9 and for courses at the high school level.

Science Testing

Over the past 10 years, there has been an increasing emphasis on criterion-referenced testing. A provincial Science Criterion-Referenced Test was administered to grade 6 students on three occasions, in 1987, 1990, and 1993. Until the 1995-96 school year, at the high school level, students wrote provincial examinations in all 3000-level courses, such as Biology, Chemistry, Physics, Geology, and Environmental Science. Future developments under the auspices of the Atlantic Provinces Education Foundation will include the development of criterion-referenced tests, which will be administered at the end of the key stages.

NEWFOUNDLAND AND LABRADOR

In Newfoundland and Labrador, there are significantly different percentages of students of both age groups at level 3 than is the case for Canadian students as a whole. The Newfoundland and Labrador context statement notes that the science curriculum from kindergarten to grade 9 and high school courses are currently under review.

CHART 63

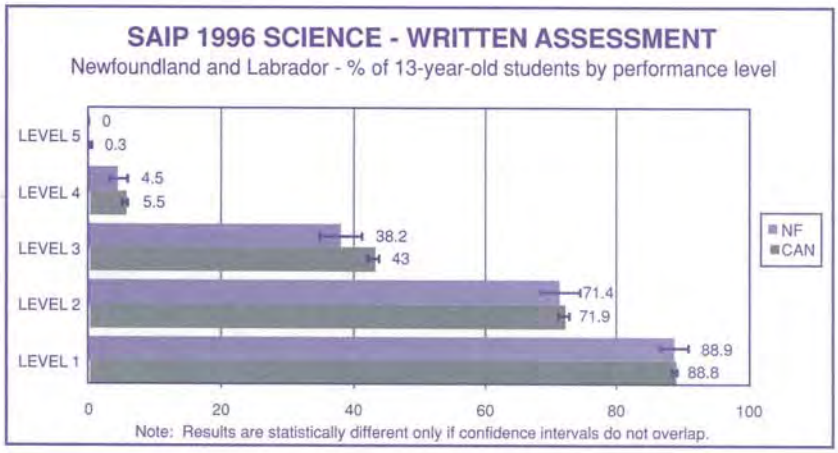
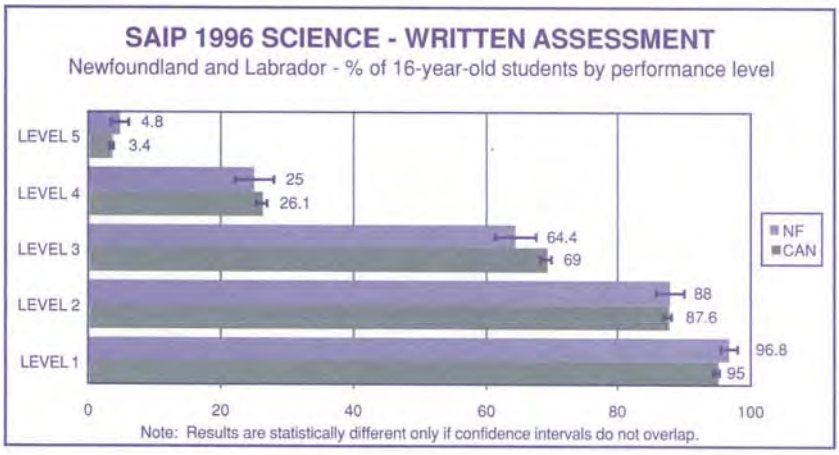


CHART 64



CONTEXT STATEMENT

Social Context

In 1970, the Government of the Northwest Territories (NWT) assumed the responsibility for education from the Federal Government and the Anglican and Roman Catholic churches. In the early 1980s, the Legislative Assembly's Special Committee on Education established eight divisional boards of education and two boards of education in Yellowknife representing the public and separate school systems. The boards are responsible for the administration of program delivery in their respective regions.

Organization of School System

The student population of the NWT is linguistically diverse with eleven official languages used across the territories. Science at the elementary level is taught in any of the official regional languages of the NWT, while Junior High and senior Secondary science programming is taught predominantly in English with integration of the other official languages representative of the region.

All teachers in the NWT hold a professional teaching certificate or equivalent and receive certification from the Department of Education. The Department of Education, Culture, and Employment , Arctic College, and boards of education have developed programs such as regional teacher education programs, cross-cultural science camps, science camps, Math / Science Teacher Society, Inuuqatigiit and Dene Kede curricula, which train northerners as teachers. These initiatives will enable schools to reflect the cultural, linguistic, and intellectual needs of their community.

Science Teaching

The NWT Elementary and Junior High Science curricula were developed in 1986 and 1991 respectively to meet the scientific literacy and numeracy needs of each student. Science program delivery can be taught in any of the eleven official languages of the NWT. To meet the diverse cultural needs of each student the curriculum documents Inuuqatigiit (Eastern Arctic) and Dene Kede (Western Arctic) were developed to enhance subject curricula and make programming more culturally relevant to the students. These documents are student-centred with a community based philosophy on education. These documents encourage a melding of western science concepts and traditional knowledge. The senior Secondary Science programs (10-12) are based on the Alberta curricula, with students writing grade 12 departmental examinations. The strategic plan, "Our Students, Our Future", emphasizes the importance of a balance in curricular goals, so that schooling includes the social, emotional, spiritual, intellectual, and physical aspects of students' lives. To this end, science in the classroom is student-centred and culturally based; reflects the community in which the children live; and encourages curiosity, careers in science, and the pursuit of lifelong learning. Advances in satellite communications and technology has given students in the NWT access to electronic educational programming, electronic bulletin boards, and the World Wide Web. This enables students to become active participants in the "global science village" and explore science-technology and society connections and careers.

Science Testing

There is no system-wide departmental assessment of students in the NWT, aside from the Alberta grade 12 departmental exams. Each board of education is responsible for its own methods of assessment. Performance assessments are carried out by a few boards annually at the grades 3, 6, 9, and 12 levels. Since 1991 the Department of Education and all boards in the NWT have participated in the national SAIP assessments.

NORTHWEST TERRITORIES

In this assessment, 13-year-olds and 16-year-olds from the Northwest Territories reached significantly different levels of performance than those in Canada as a whole. It is worth noting that science programs in the Northwest Territories can be taught in any of eleven official languages and that curriculum documents encourage a melding of western science concepts and traditional knowledge.

CHART 65

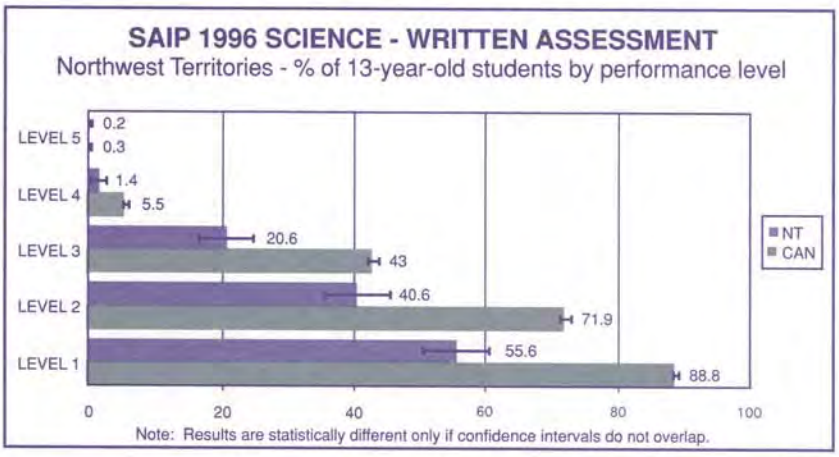
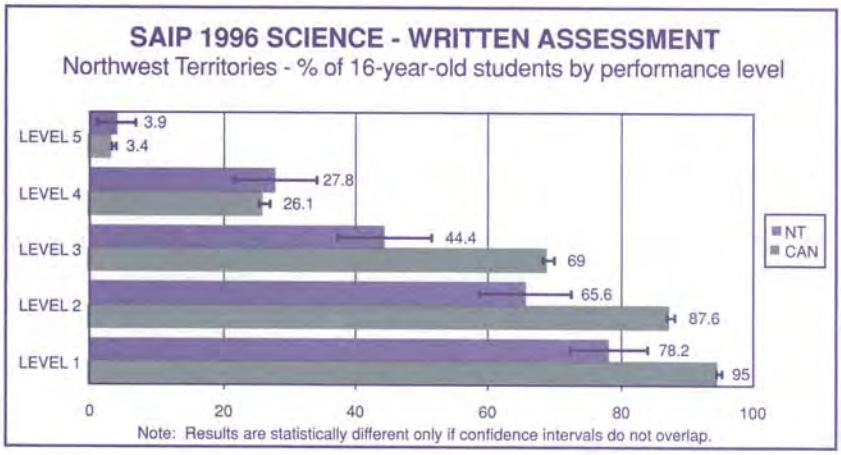


CHART 66



CONTEXT STATEMENT

Social Context

Yukon is characterized by both moderate-enrolment urban schools located in the capital city of Whitehorse, and small-enrolment schools located in rural communities throughout the territory. In addition, there are a few one- and two-room schools in remote or very sparsely populated areas. English is the primary language in the great majority of homes. There are few English-as-a-second-language students in Yukon, and they are more likely to be of Asian than First Nations ancestry. In the schools where native languages are offered, they are taught as second languages.

Land claims settlements and the recently adopted *Education Act* both emphasize the need to modify the existing curriculum and to develop more of the curriculum locally so that it is more inclusive and reflective of Yukon's First Nations. These demands are placing considerable pressure on schools and teachers.

Organization of School System

Yukon has 29 schools with a total enrolment from kindergarten to grade 12 of 6,060. Nearly half the schools (14) are designated rural schools. They typically have small student populations, several multi-grade classes, and low pupil-teacher ratios. Many rural schools do not offer grades 11 and 12, and they offer few optional programs in the secondary grades.

Unlike most jurisdictions in Canada, Yukon has no school boards and no school taxes. School superintendents work for the Department of Education, which is responsible for most aspects of school operations. Communities, however, have a significant amount of control over schools. Almost every school has a school council, which has some but not all of the powers of a school board, including the responsibility for school rules, school plans, and dispute resolution.

Yukon follows the British Columbia (BC) curriculum in all subject areas; however, the BC curriculum is often modified — with departmental approval — to reflect local needs and conditions. Up to 20 per cent of a student's educational program may be developed locally. grades are organized into three segments: elementary (kindergarten to grade 6), junior high (grades 7 to 9), and senior high (grades 10 to 12). 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 per cent of Yukon students are of First Nations ancestry. These students often participate in native language programs and/or various locally developed courses aimed at developing awareness, appreciation, and knowledge of First Nations culture and traditions. The remainder of the student population is of predominantly European or British ancestry. Approximately 7 per cent of Yukon students are enrolled in a French immersion program, while nearly 1.5 per cent attend *École Émilie-Tremblay*, the territory's only French school.

Almost all 13-year-olds are in grade 7 or 8, and most 16-year-olds are in grade 10 or 11.

Science Teaching

Major changes in the science curriculum in the past 10 years include:

- 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 offered on a pilot basis at one selected site

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 the biology, chemistry, and geology of Yukon.

Science Testing

Starting in the 1995–96 school year all students in grades 8 to 11 will participate in end-of-term territorial exams, which are criterion based and curriculum referenced. These exams count for 25 per cent of the student's final school mark. As well, 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.

YUKON

Yukon's 13-year-olds and 16-year-olds show levels of performance that are not significantly different from those of Canada as a whole. Yukon notes, in its statement, that students follow the British Columbia science curriculum, which is frequently modified to reflect local needs.

CHART 67

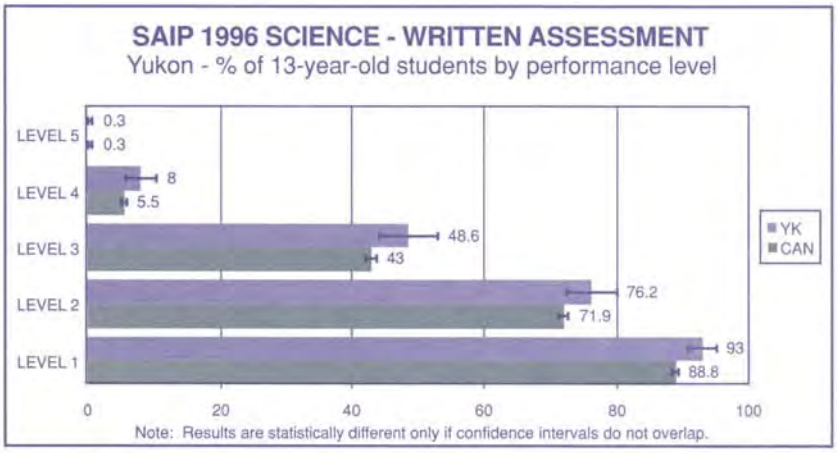
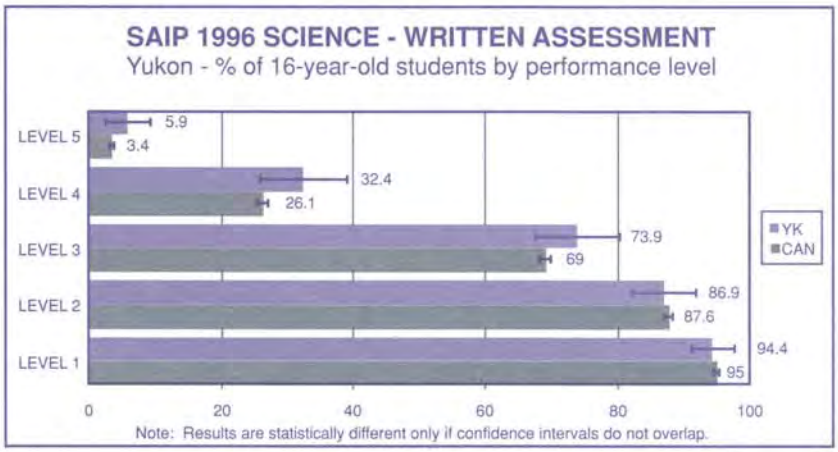


CHART 68



Because practical tasks assessment is very demanding in terms of time, effort, and cost, the SAIP had originally intended to develop a smaller sample, which would yield results that would be valid for Canada as a whole but would not allow reliable information for individual provinces. However, four provinces opted to develop larger samples so that they would obtain results representative of their whole populations: Saskatchewan, Ontario (English and French), New Brunswick (French), and Nova Scotia (English and French).

The students of both age groups in this province show performance levels comparable to those of Canadian students as a whole.

CHART 69

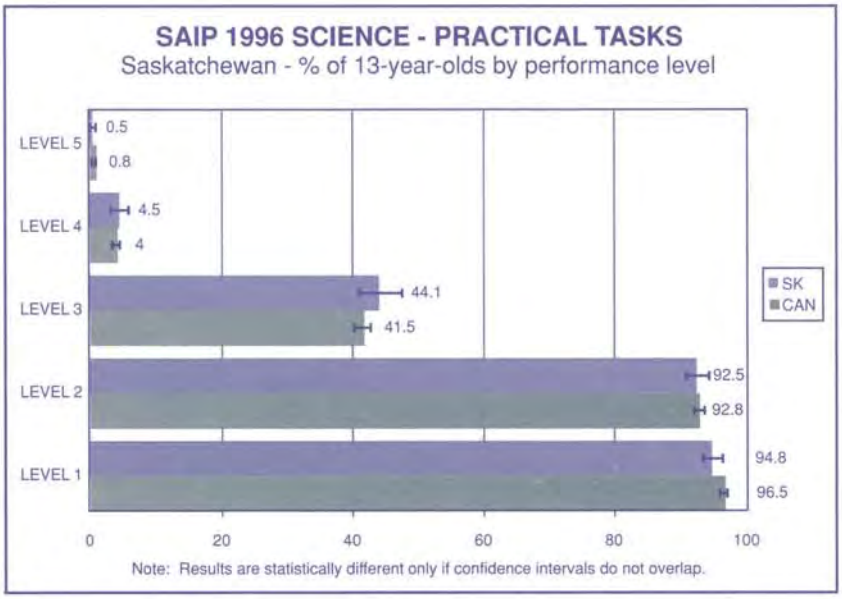
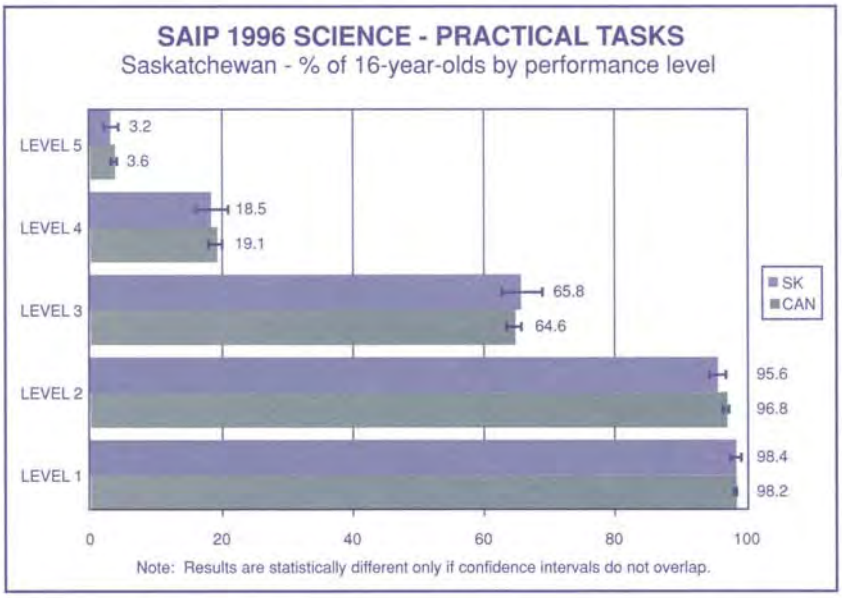


CHART 70



In this province, 13-year-old and 16-year-old anglophones performed as well as their peers in Canada.

CHART 71

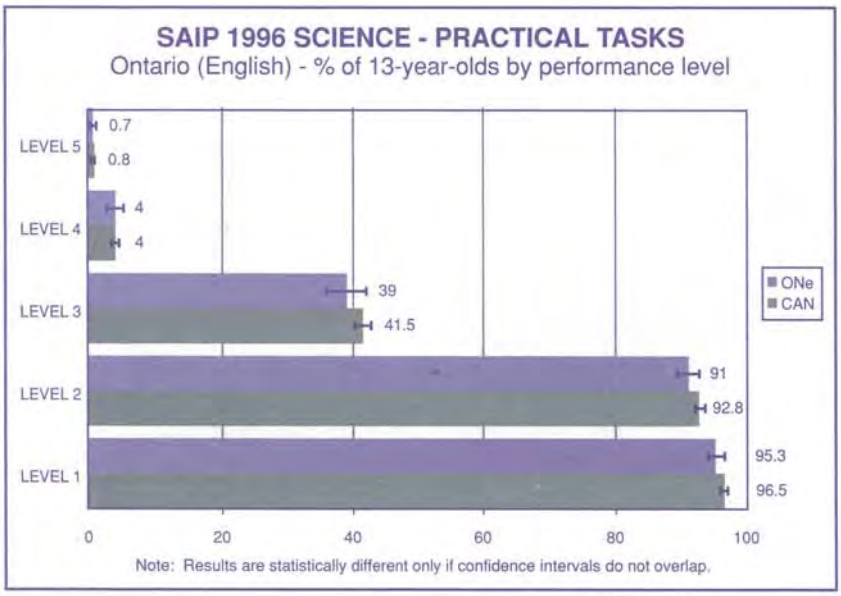
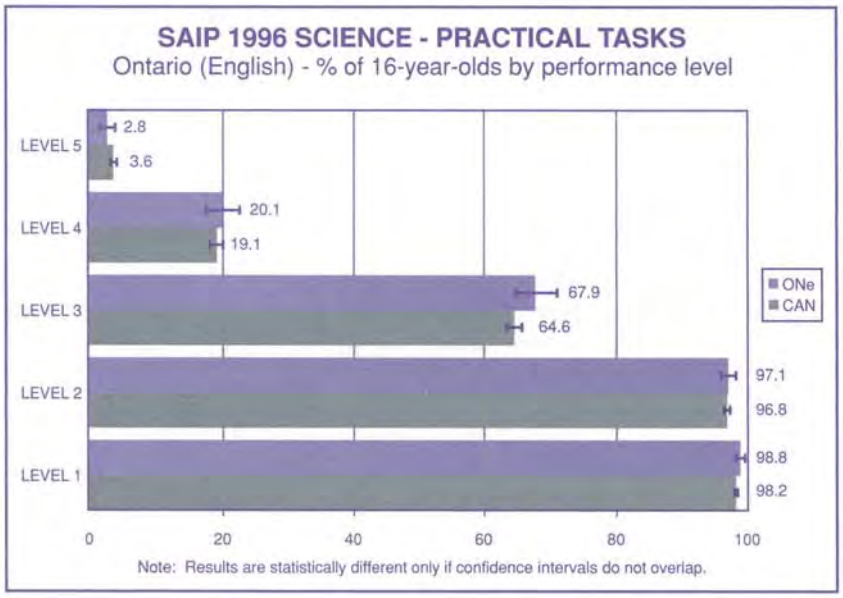


CHART 72



ONTARIO (F)

In this assessment, the charts show that Ontario francophone students of both age groups achieved significantly different levels of performance than did Canadian students as a whole.

CHART 73

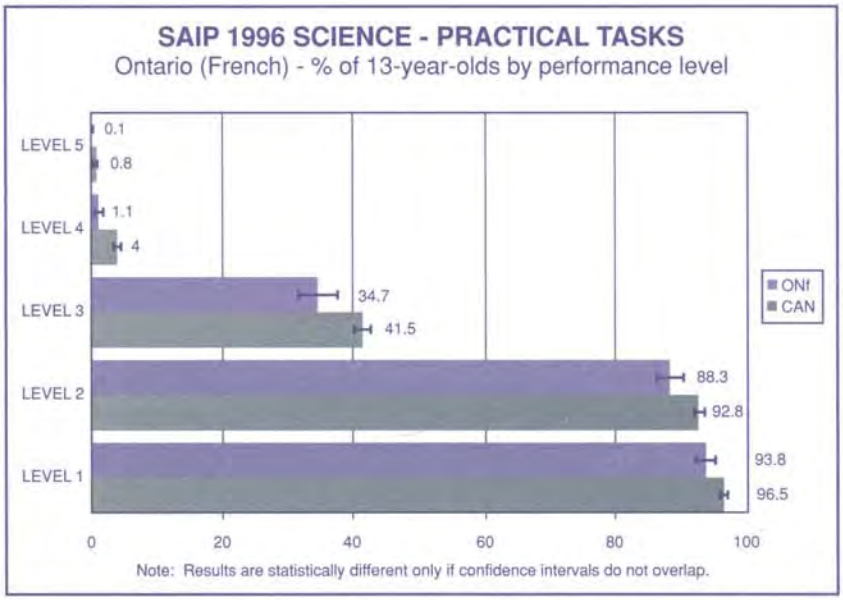
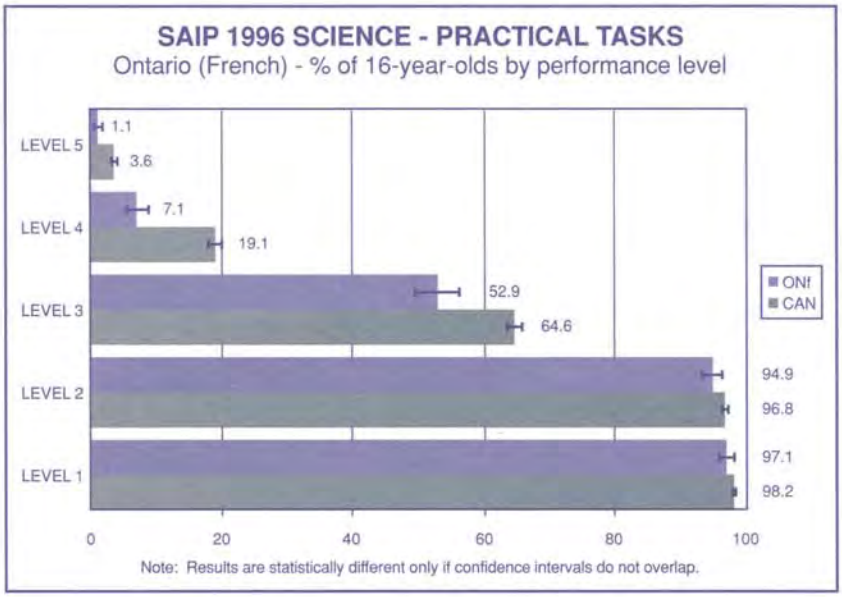


CHART 74



In both age groups, francophone students in this province show significantly different performances from those of Canadian students as a whole.

CHART 75

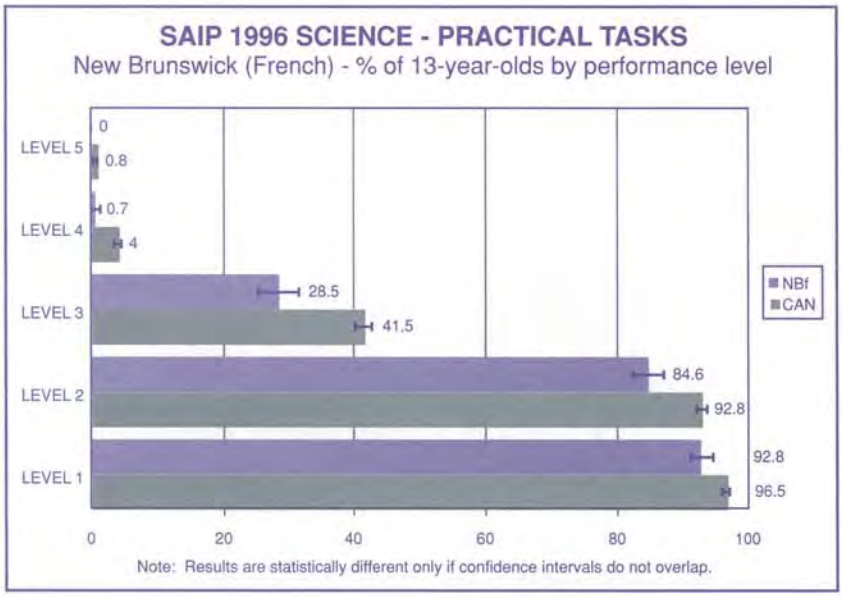
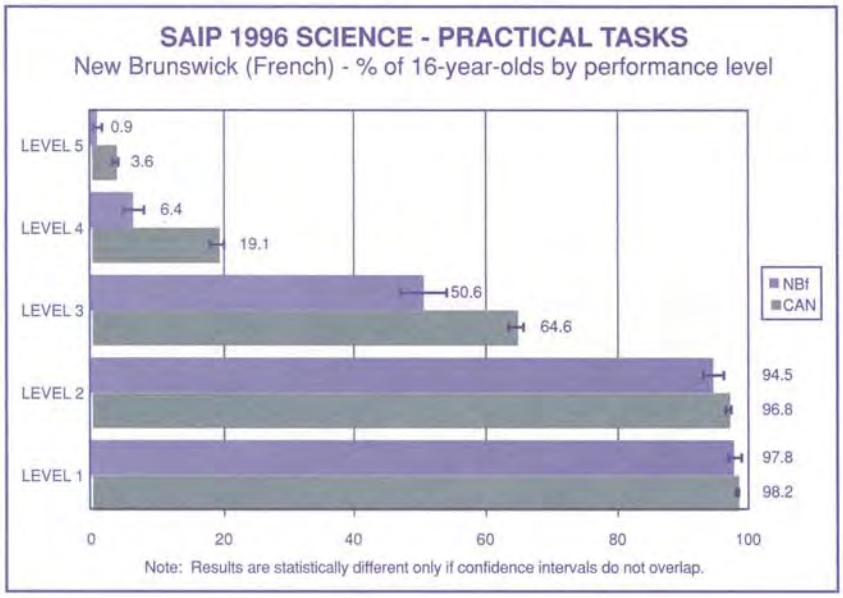


CHART 76



The charts indicate that, in this province, students of both age groups achieved as well as Canadian students as a whole.

CHART 77

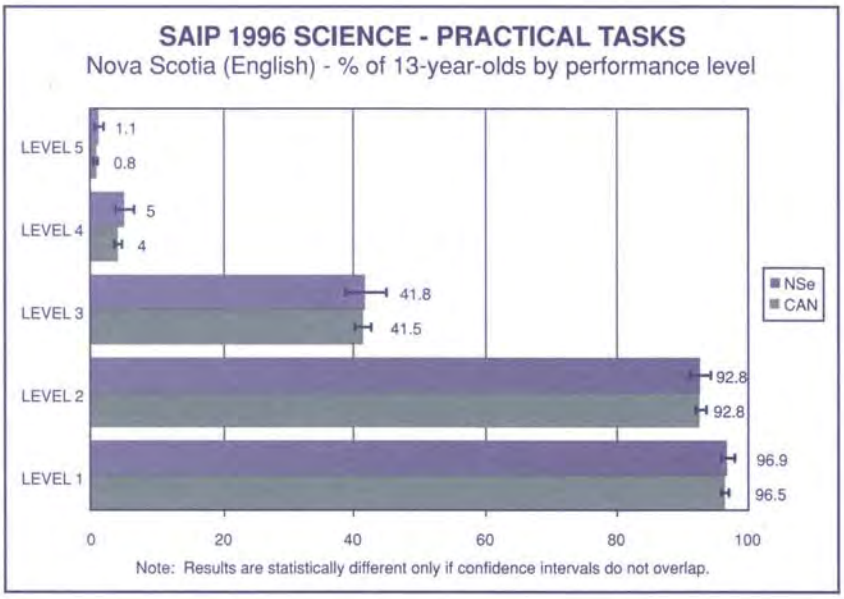
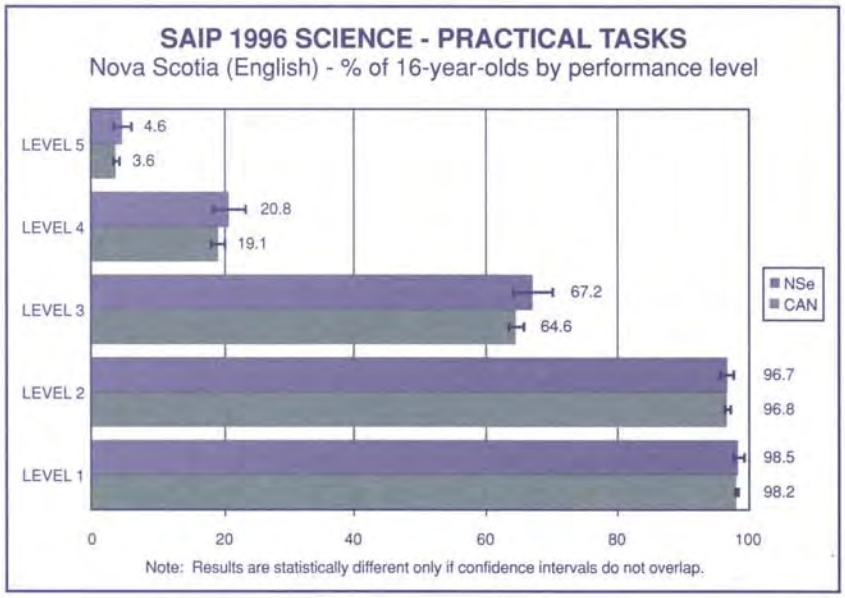


CHART 78



There is a significant difference in performance at levels 3 to 5 for both age groups.

CHART 79

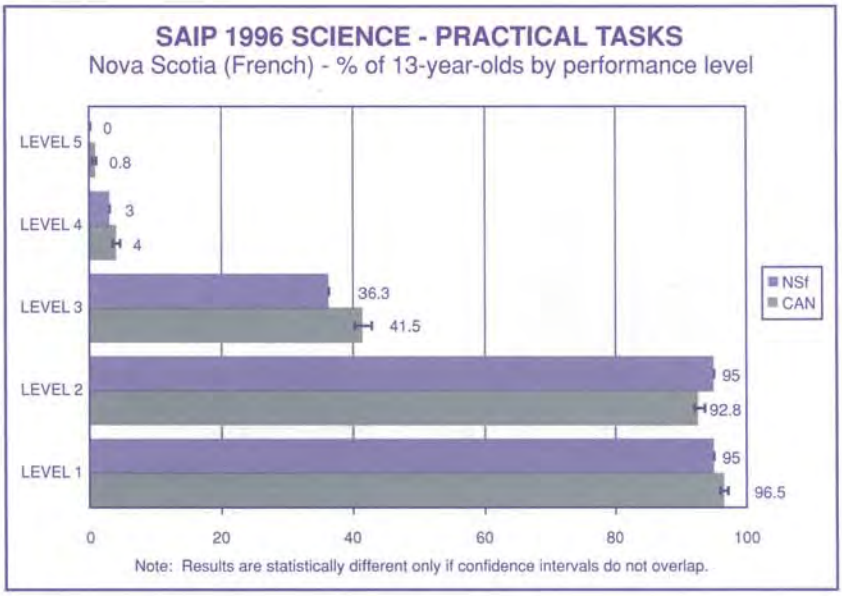
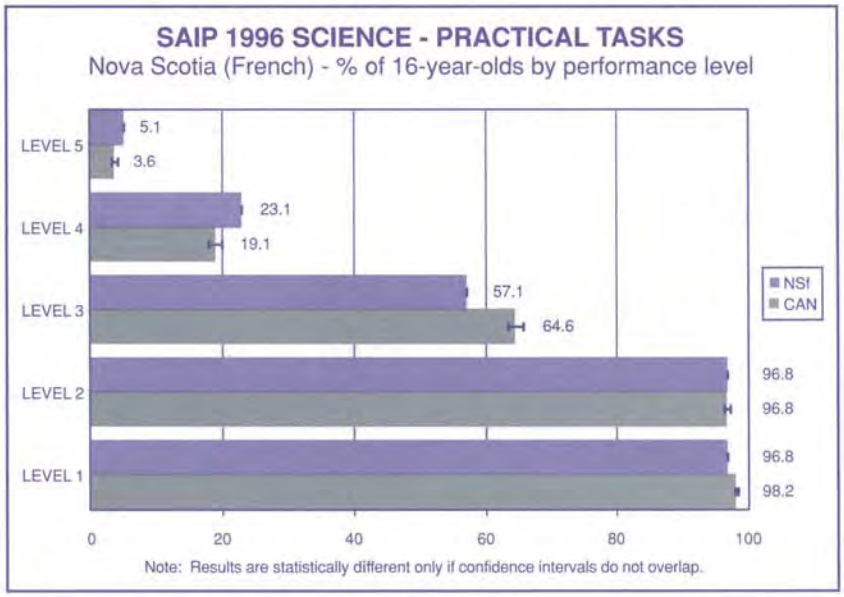


CHART 80



STUDENT QUESTIONNAIRE INFORMATION

The Student Questionnaire for the science assessment contained 58 items dealing with student characteristics, school and science course organization, attitudes and practices with regard to science, etc. The following pages highlight some of the information gathered through the responses to the questionnaire. The data* apply to Canada as a whole but not necessarily to any individual provinces.

Percentages are rounded. Percentages in the left column apply to the whole age group population (w.a.g.) and add up to 100% except where all options are not listed here (grade levels and preferred science domain). Percentages in the right column apply only to the populations listed on the same lines in the left column and do not normally add up to 100%. For example, 9% of all 13-year-olds who took part in the assessment were in grade 7, and only 10% of these grade 7 thirteen-year-olds performed at levels 3 to 5.

What grade are you in?

AGE GROUPS AND GRADES (% OF W.A.G)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds in grade 7/sec. I (9%)	10%
13-year-olds in grade 8/sec. II (70%)	42%
13-year-olds in grade 9/sec. III (19%)	56%
16-year-olds in grade 10/sec. IV (11%)	37%
16-year-olds in grade 11/sec. V (66%)	72%
16-year-olds in grade 12/cegep I (18%)	76%

Most 13-year-olds who participated in the science assessment were in grade 8 and most 16-year-olds in grade 11. There is a positive relationship between school grade and performance: for both age groups, the higher the grade the stronger the performance.

Are you in an ESL/FSL program?

AGE GROUPS AND ESL PROGRAMS (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds in an ESL program (7%)	18%
13-year-olds not in an ESL program (93%)	43%
16-year-olds in an ESL program (5%)	32%
16-year-olds not in an ESL program (95%)	69%

About 7% of 13-year-olds and 5% of 16-year-olds who took part in this assessment were in an ESL program. Students in these programs performed significantly less strongly than those in regular programs.

* Data are based on a CHI-SQUARE statistical analysis. In general, when percentages in the left column exceed 5%, differences in percentages in the right column are significant.

Do you agree that, to do well in science, ...?

...YOU NEED LOTS OF HARD WORK AND STUDYING AT HOME (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who agree (87%)	42%
13-year-olds who do not agree (13%)	37%
16-year-olds who agree (90%)	69%
16-year-olds who do not agree (10%)	54%

...YOU NEED LOTS OF NATURAL ABILITY (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who agree (55%)	51%
13-year-olds who do not agree (45%)	56%
16-year-olds who agree (61%)	67%
16-year-olds who do not agree (39%)	69%

...YOU NEED TO MEMORIZE TEXTBOOKS AND NOTES (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who agree (46%)	40%
13-year-olds who do not agree (54%)	43%
16-year-olds who agree (50%)	67%
16-year-olds who do not agree (50%)	68%

...YOU NEED GOOD LUCK (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who agree (19%)	24%
13-year-olds who do not agree (81%)	47%
16-year-olds who agree (16%)	69%
16-year-olds who do not agree (84%)	72%

Very high percentages of students of both age groups think that to do well in science you need lots of hard work and studying at home. Those who think so perform significantly better than those who do not. The percentages of 13- and 16-year-olds who think that the key to success in science is to memorize the textbooks or notes are surprisingly high.

How do you feel about science?

FEELING TOWARD SCIENCE (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who like science (77%)	44%
13-year-olds who do not like science (23%)	33%
16-year-olds who like science (74%)	72%
16-year-olds who do not like science (26%)	55%

In both age groups, three-quarters of the students say they like science. Those who perform significantly better than average like science better than those who do not.

Do you feel confident about your overall abilities in science?

CONFIDENCE ABOUT ABILITIES IN SCIENCE (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who feel confident (93%)	43%
13-year-olds who do not feel confident (7%)	22%
16-year-olds who feel confident (87%)	70%
16-year-olds who do not feel confident (13%)	51%

A great majority of 13-year-olds and 16-year-olds feel confident about their overall abilities in science and about their ability to carry out scientific experiments. In both cases there is a positive relationship with performance at the higher levels.

What contributes to your interest in science?

SCIENCE EXPERIMENTS CONTRIBUTE TO MY INTEREST IN SCIENCE (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who agree (75%)	42%
13-year-olds who disagree (25%)	27%
16-year-olds who agree (64%)	68%
16-year-olds who disagree (36%)	58%

TEAM WORK CONTRIBUTES TO MY INTEREST IN SCIENCE (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who agree (63%)	41%
13-year-olds who disagree (37%)	51%
16-year-olds who agree (56%)	67%
16-year-olds who disagree (44%)	73%

THE TEACHER CONTRIBUTES TO MY INTEREST IN SCIENCE (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who agree (42%)	42%
13-year-olds who disagree (58%)	41%
16-year-olds who agree (46%)	68%
16-year-olds who disagree (54%)	65%

TOPICS STUDIED CONTRIBUTE TO MY INTEREST IN SCIENCE (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who agree (33%)	43%
13-year-olds who disagree (67%)	35%
16-year-olds who agree (43%)	69%
16-year-olds who disagree (57%)	53%

SCIENCE APPLICATIONS IN DAILY LIFE CONTRIBUTE TO MY INTEREST IN SCIENCE (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who agree (27%)	43%
13-year-olds who disagree (73%)	36%
16-year-olds who agree (39%)	70%
16-year-olds who disagree (61%)	55%

In both age groups students say that science experiments and team work contribute more to their interest in science than science applications to daily life, topics studied or the teacher. In some cases, there is a positive relationship between agree, and performance. However, teamwork appears to be negatively related to performance level.

Are you considering a career in the sciences?

CONSIDERING A CAREER IN SCIENCE (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who say they are (19%)	60%
13-year-olds who say they are not or they do not know yet (81%)	37%
16-year-olds who say they are (26%)	84%
16-year-olds who say they are not or they do not know yet (74%)	61%

About 19% of 13-year-olds and 26% of 16-year-olds say they are considering a career in science. There is a strong positive relationship between those students and performance at higher levels.

What field of science do you prefer?

SCIENCE DOMAIN PREFERRED BY STUDENTS (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who prefer Biology (14%)	53%
13-year-olds who prefer Chemistry (17%)	42%
13-year-olds who prefer Physics (6%)	48%
13-year-olds who prefer Earth Science (11%)	35%
13-year-olds who prefer Environmental Science (13%)	35%
16-year-olds who prefer Biology (30%)	71%
16-year-olds who prefer Chemistry (11%)	73%
16-year-olds who prefer Physics (7%)	81%
16-year-olds who prefer Earth Science (9%)	59%
16-year-olds who prefer Environmental Science (12%)	55%

Thirteen-year-olds prefer Chemistry more than the other fields but those who prefer Biology performed better, while 16-year-olds prefer Biology much more than all other fields but those who prefer Physics show stronger performance at higher levels.

On average, how often each week do the following activities happen?

TEACHER SHOWS HOW TO DO SCIENCE PROBLEMS (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who say ... 0 to 2 times a week (63%)	42%
13-year-olds who say ... 3 or more times a week (37%)	41%
16-year-olds who say ... 0 to 2 times a week (44%)	60%
16-year-olds who say ... 3 or more times a week (56%)	76%

I COPY NOTES FROM THE BOARD (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who say ... 0 to 2 times a week (46%)	44%
13-year-olds who say ... 3 or more times a week (54%)	39%
16-year-olds who say ... 0 to 2 times a week (33%)	67%
16-year-olds who say ... 3 or more times a week (67%)	68%

I PARTICIPATE IN SCIENCE PROJECTS (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who say ... 0 to 2 times a week (69%)	45%
13-year-olds who say ... 3 or more times a week (31%)	34%
16-year-olds who say ... 0 to 2 times a week (78%)	71%
16-year-olds who say ... 3 or more times a week (22%)	54%

TEACHER GIVES DEMONSTRATIONS OF EXPERIMENTS (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who say ... 0 to 2 times a week (67%)	45%
13-year-olds who say ... 3 or more times a week (33%)	35%
16-year-olds who say ... 0 to 2 times a week (74%)	70%
16-year-olds who say ... 3 or more times a week (26%)	58%

I DO EXPERIMENTS OR PRACTICAL INVESTIGATIONS (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who say ... 0 to 2 times a week (84%)	42%
13-year-olds who say ... 3 or more times a week (16%)	35%
16-year-olds who say ... 0 to 2 times a week (89%)	68%
16-year-olds who say ... 3 or more times a week (11%)	57%

I WORK ON MY OWN FROM WORKSHEETS OR TEXTBOOKS (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who say ... 0 to 2 times a week (50%)	42%
13-year-olds who say ... 3 or more times a week (50%)	41%
16-year-olds who say ... 0 to 2 times a week (47%)	66%
16-year-olds who say ... 3 or more times a week (53%)	69%

I WORK IN PAIRS OR IN SMALL GROUPS (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who say ... 0 to 2 times a week (55%)	42%
13-year-olds who say ... 3 or more times a week (45%)	41%
16-year-olds who say ... 0 to 2 times a week (56%)	68%
16-year-olds who say ... 3 or more times a week (44%)	66%

I USE THINGS FROM EVERYDAY LIFE IN SOLVING SCIENCE PROBLEMS (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who say ... 0 to 2 times a week (75%)	41%
13-year-olds who say ... 3 or more times a week (25%)	43%
16-year-olds who say ... 0 to 2 times a week (81%)	68%
16-year-olds who say ... 3 or more times a week (19%)	65%

In the science class, teachers "show students how to do science problems" mostly once or twice a week, according to the 13-year-olds, and up to four or more times a week, according to the 16-year-olds. Approximately 53% of the 13-year-olds and 67% of the 16-year-olds "copy notes from the board" more than three times a week in their science class. In both age groups, about 60% of the students report that they participate in science projects once or twice a week in their class. About 70% of students of both age groups say they "work on their own from worksheets or textbooks" from one to four times a week in their science class. Almost 50% of students of both age groups say they "use things from everyday life in solving science problems" in their science class. In both age groups, 47% of students say they work in pairs or small groups once or twice a week in their science class, and 28% say they do so three or four times a week. In the science class, teachers give demonstrations of experiments once or twice a week, according to 54% of the 13-year-olds and 60% of the 16-year-olds; three or four times a week, according to 22% of the 13-year-olds and 18% of the 16-year-olds. In both age groups, more than 40% of students say they never "do experiments or practical investigations by themselves in class" while about 45% say they do so once or twice a week. In general, for both age groups, those who report that these activities occur 0 to 2 times a week perform better than those who say that they happen 3 or more times a week.

At school, where are your experiments done?

WHERE SCIENCE EXPERIMENTS ARE DONE (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who say ... in lab only (20%)	40%
13-year-olds who say ... in class only (25%)	32%
13-year-olds who say ... in both lab and class (27%)	51%
16-year-olds who say ... in lab only (30%)	65%
16-year-olds who say ... in class only (7%)	48%
16-year-olds who say ... in both lab and class (41%)	72%

About 30% of 13-year-olds and 10% of 16-year-olds report no science laboratory facilities. For both age groups, students who report doing their experiments in both the lab and the classroom show higher levels of performance.

Outside of class, on average, how often do you consult ... for additional help in science?

OUTSIDE OF CLASS I CONSULT A TEACHER (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who say ... never (52%)	47%
13-year-olds who say ... 1 to 2 times a week (36%)	39%
13-year-olds who say ... 3 or more times a week (12%)	25%
16-year-olds who say ... never (51%)	69%
16-year-olds who say ... 1 to 2 times a week (39%)	68%
16-year-olds who say ... 3 or more times a week (10%)	53%

OUTSIDE OF CLASS I CONSULT A PARENT/GUARDIAN (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who say ... never (49%)	44%
13-year-olds who say ... 1 to 2 times a week (37%)	43%
13-year-olds who say ... 3 or more times a week (14%)	29%
16-year-olds who say ... never (71%)	70%
16-year-olds who say ... 1 to 2 times a week (23%)	62%
16-year-olds who say ... 3 or more times a week (6%)	48%

OUTSIDE OF CLASS I CONSULT OTHER STUDENTS (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who say ... never (24%)	46%
13-year-olds who say ... 1 to 2 times a week (50%)	43%
13-year-olds who say ... 3 or more times a week (26%)	29%
16-year-olds who say ... never (23%)	63%
16-year-olds who say ... 1 to 2 times a week (48%)	69%
16-year-olds who say ... 3 or more times a week (29%)	48%

OUTSIDE OF CLASS I CONSULT OTHER PEOPLE (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who say ... never (68%)	46%
13-year-olds who say ... 1 to 2 times a week (26%)	36%
13-year-olds who say ... 3 or more times a week (6%)	29%
16-year-olds who say ... never (68%)	71%
16-year-olds who say ... 1 to 2 times a week (27%)	62%
16-year-olds who say ... 3 or more times a week (5%)	48%

More than 50% of students of both age groups never ask a teacher for help outside of their science class. Their main source of additional help with science appears to be other students. More than 70% of 16-year-olds never consult their parents or guardians for additional help in science. In both age groups, nearly 70% of students never ask other people for help with their science work. The relationship, here, tends to indicate that the less students consult for additional help, the better they perform at levels 3 to 5. This may be congruent with the fact that strong performers may not feel the need for additional help as much as weaker performers.

How many times a year do you use computer to ... ?

... ILLUSTRATE SCIENCE EXPERIMENTS (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who say ... never (73%)	44%
13-year-olds who say ... 1 to 3 times a week (17%)	36%
13-year-olds who say ... 4 or more times a week (10%)	35%
16-year-olds who say ... never (75%)	67%
16-year-olds who say ... 1 to 3 times a week (15%)	67%
16-year-olds who say ... 4 or more times a week (10%)	69%

... WRITE LABORATORY REPORTS (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who say ... never (52%)	41%
13-year-olds who say ... 1 to 3 times a week (22%)	40%
13-year-olds who say ... 4 or more times a week (26%)	45%
16-year-olds who say ... never (53%)	65%
16-year-olds who say ... 1 to 3 times a week (24%)	66%
16-year-olds who say ... 4 or more times a week (23%)	74%

... COLLECT AND ANALYSE DATA (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who say ... never (66%)	42%
13-year-olds who say ... 1 to 3 times a week (21%)	39%
13-year-olds who say ... 4 or more times a week (13%)	41%
16-year-olds who say ... never (66%)	68%
16-year-olds who say ... 1 to 3 times a week (20%)	65%
16-year-olds who say ... 4 or more times a week (14%)	69%

... DO CALCULATIONS (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who say ... never (72%)	44%
13-year-olds who say ... 1 to 3 times a week (16%)	33%
13-year-olds who say ... 4 or more times a week (12%)	38%
16-year-olds who say ... never (73%)	68%
16-year-olds who say ... 1 to 3 times a week (13%)	62%
16-year-olds who say ... 4 or more times a week (14%)	68%

... WRITE PROJECT REPORTS (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who say ... never (42%)	42%
13-year-olds who say ... 1 to 3 times a week (29%)	42%
13-year-olds who say ... 4 or more times a week (29%)	41%
16-year-olds who say ... never (40%)	65%
16-year-olds who say ... 1 to 3 times a week (31%)	68%
16-year-olds who say ... 4 or more times a week (29%)	70%

The percentages of students who never use computers in their science courses are very high. It would appear that computers are most often used for writing project reports. As far as computer use is concerned, there seems to be very little difference between the two age groups. The data do not, in general, indicate a strong relationship between computer usage and performance.

Do you have access to the following resources?

ACCESS TO SCIENCE BOOKS IN THE SCHOOL LIBRARY (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who say they do (68%)	44%
13-year-olds who say they do not (32%)	21%
16-year-olds who say they do (68%)	69%
16-year-olds who say they do not (32%)	34%

ACCESS TO SCIENCE BOOKS IN THE MUNICIPAL LIBRARY (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who say they do (85%)	47%
13-year-olds who say they do not (15%)	25%
16-year-olds who say they do (90%)	71%
16-year-olds who say they do not (10%)	45%

ACCESS TO COMPUTERS (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who say they do (75%)	45%
13-year-olds who say they do not (25%)	32%
16-year-olds who say they do (83%)	71%
16-year-olds who say they do not (17%)	52%

ACCESS TO INTERNET (% OF W.A.G.)	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who say they do (33%)	51%
13-year-olds who say they do not (67%)	41%
16-year-olds who say they do (46%)	74%
16-year-olds who say they do not (54%)	66%

ACCESS TO PERSON RESPONSIBLE FOR LAB EXPERIMENTS	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who say they do (57%)	46%
13-year-olds who say they do not (43%)	37%
16-year-olds who say they do (47%)	71%
16-year-olds who say they do not (53%)	59%

Did you participate in science field trips this year or last year?

PARTICIPATED IN SCIENCE FIELD TRIPS	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who say they did (30%)	42%
13-year-olds who say they did not (70%)	42%
16-year-olds who say they did (40%)	69%
16-year-olds who say they did not (60%)	67%

Did you participate in a science fair this year or last year?

PARTICIPATED IN A SCIENCE FAIR	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who say they did (30%)	39%
13-year-olds who say they did not (70%)	44%
16-year-olds who say they did (46%)	65%
16-year-olds who say they did not (54%)	68%

How many times a year do you undertake the following activities outside of your science courses?

READ SCIENCE MAGAZINES	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who say ... daily (2%)	36%
13-year-olds who say ... once a week or a month (30%)	43%
13-year-olds who say ... rarely (68%)	41%
16-year-olds who say ... daily (1%)	61%
16-year-olds who say ... once a week or a month (26%)	70%
16-year-olds who say ... rarely (73%)	67%

WATCH SCIENCE PROGRAMS ON TELEVISION	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who say ... daily (7%)	43%
13-year-olds who say ... once a week or a month (58%)	44%
13-year-olds who say ... rarely (35%)	38%
16-year-olds who say ... daily (5%)	67%
16-year-olds who say ... once a week or a month (62%)	70%
16-year-olds who say ... rarely (33%)	62%

ATTEND MEETING/ACTIVITY OF SCHOOL SCIENCE CLUB	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who say ... once a month or more (7%)	21%
13-year-olds who say ... rarely (93%)	43%
16-year-olds who say ... once a month or more (4%)	49%
16-year-olds who say ... rarely (96%)	68%

ATTEND A MEETING OF ENVIRONMENT PROTECTION GROUP	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who say ... once a month or more (9%)	22%
13-year-olds who say ... rarely (91%)	43%
16-year-olds who say ... once a month or more (9%)	59%
16-year-olds who say ... rarely (91%)	68%

VISIT MUSEUMS OR SCIENCE INTERPRETATION CENTRES	% OF THESE STUDENTS AT LEVELS 3 TO 5
13-year-olds who say ... daily (1%)*	12%
13-year-olds who say ... once a week (2%)*	19%
13-year-olds who say ... once a month (20%)	46%
13-year-olds who say ... rarely (77%)	42%
16-year-olds who say ... daily (1%)*	39%
16-year-olds who say ... once a week (1%)*	36%
16-year-olds who say ... once a month (15%)	67%
16-year-olds who say ... rarely (83%)	68%

With regards to these activities, the percentages are quite similar for the 13-year-olds and the 16-year-olds. The activity in which most students engage is watching science programs on television. The least popular seems to be attending a meeting or an activity of a science club at school. More 13-year-olds than 16-year-olds report visiting museums and science interpretation centres. These percentages tend to indicate that students who engage in these activities less often show stronger performance than those who do more frequently.

*When interpreting the results, these percentages should be viewed with caution.

CONCLUSION

This report describes the outcome of another major achievement in the Canadian education sector. Canada's provinces designed and developed together a science assessment that was administered to thirty-seven thousand 13- and 16-year-old students, both English- and French-speaking. The development and administration of a science assessment in ten provinces and two territories was challenging, given the diversity of student circumstances and education experiences across the country. Yet this exercise has produced an assessment of skills that are usually impossible to address in large-scale testing. This assessment has been made possible by the cooperation extended to the development team by students, teachers, parents and stakeholder representatives. Together, they created a series of descriptive criteria that were used as proxies for common expectations and as benchmarks for the assessment framework and instruments.

These instruments have produced results that will largely confirm, but occasionally contradict, public preconceptions of our students' scientific skills. For example, 16-year-olds perform much better than 13-year-olds. Although this will come as no surprise, this process marks the first time the extent of the achievement gap in science is measured and documented nation-wide. We can at least infer that our educational systems do foster the development of scientific knowledge and skills between the ages of 13 and 16.

Among both age groups in the assessment, girls were found to possess as many science inquiry and problem-solving skills as do boys of the same age. This contradicts the usually expressed view that boys do better than girls in science.

Both in the written test and in the practical tasks, the majority of students achieved results at level 3, or in other words in the middle of a five-level scale. To be classed at level 3 in the written test, a student must, for example, show that she or he can

- describe physical properties of objects
- distinguish living things from non-living things and their respective environments
- 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
- classify substances according to their physical properties
- compare various plant and animal adaptations
- know that the amount of energy in the universe is conserved, can change form, and be transferred
- know that the movement and tilt of Earth affects 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
- 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

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

It would appear that the assessment designers expected 13-year-old students to achieve results at level 2 at least, and at level 3, while the 16-year-old group was expected to achieve level 3 at least, and level 4. We were therefore pleasantly surprised to see that a sizeable proportion of 13-year-olds were classed at levels 4 and 5. The fairly large proportion of level 5 results among 16-year-olds in some jurisdictions will also be of comfort to education authorities since that level requires evidence of sophisticated abilities in science.

Comparisons between the written test and the practical tasks results should only be attempted with caution. While students may appear to have achieved higher or lower scores in skills than knowledge, this may not reflect actual achievement since different criteria were used in the two evaluations, and it is impossible to equate the degree of difficulty of the tasks assigned to each. Comparisons between groups assessed in English and in French should also be attempted only with caution. Although efforts were made to produce equivalent assessment instruments in each language, we know from several interpan-canadian studies that perfect equivalency is difficult to achieve.

The next SAIP science assessment is scheduled for 1999. Results from, and expectations established for, the 1996 assessment will serve as points of comparison for the next science assessment. Only then, perhaps, will the full significance of the 1996 science assessment become clear.

APPENDIX I

PAN-CANADIAN EXPECTATIONS

Pan-Canadian Expectation-Setting Procedures for the 1996 SAIP Science Assessment

Definition

Expectation-setting is an evaluative judgment of the percentage of Canadian students who should achieve at or above predetermined criterion levels of scientific performance, for a specific set of assessment instruments in a specific set of circumstances or context. Expectations are not fixed or static. Expectations will vary according to the nature and complexity of the questions or tasks demanded in various assessment instruments, the criteria used for evaluating student work, the procedures used for administering and scoring student materials, the attributes of the student population being assessed, and the composition of the panel that sets the expectations. The Council of Ministers of Education, Canada (CMEC) will define Pan-Canadian expectations for all future assessment rounds of the School Achievement Indicators Program in mathematics and language arts, as well as for the next science assessment scheduled for 1999.

Rationale

Publicly declared performance expectations provide a comparator, which students, parents, educators, and the general public can use to gauge student outcomes. If only the assessment results are reported, the question remains, "Should we be satisfied with the results?" The School Achievement Indicators Program is a criterion-referenced assessment, and not a norm-referenced assessment. Criterion-referenced expectations provide another means of interpreting results, in addition to Canadian norms and interprovincial comparisons.

The single cut-off score used as a standard associated with minimal competence was not adopted. American research (Jaeger, 1989) indicates that this type of standard fails to recognize a range of student ability, tends to undermine rather than reinforce curricula, and has the effect of disadvantaging youth from impoverished and minority families.

Determining a range of expectations, with multiple cutoffs, is more useful to teachers, administrators, and policy-makers for making program decisions to meet a variety of student needs.

Purposes of Expectations

Expectations are an integral part of the School Achievement Indicators Program. They serve to place an interpretive framework around assessment data, and to highlight strengths and areas for improvement in student performance. In this way, they suggest improvements in curricula, instructional strategies, and public policy. Expectations serve as realistic or desirable, and not optimal or idealistic, guidelines for students, parents, educational professionals, and policy-makers over the three-year interval between specific subject area assessments. When plotted over a number of years, the evolving expectations may become an important indicator for the Pan-Canadian Education Indicators Program.

Composition and Selection of the Pan-Canadian Expectation-Setting Panel

The composition of the panel, and the procedure used, were based on a wide review of the educational literature on defining criterion-referenced performance expectations. In addition, the practices of several Canadian provinces were considered, and three psychometricians were consulted, as CMEC developed a model for defining science expectations. A pilot exercise was conducted in Ottawa in November 1995 with a panel of pan-canadian nongovernmental organizations using the 1994 SAIP reading and writing materials. The resulting expectation-setting model built on existing practices and experiences for defining expectations, yet is unique in its approach as a modification of the Angoff method (Angoff, 1971).

Over 100 invitations were extended by all provincial ministries to a cross section of nongovernmental organizations and education groups. The combined pan-Canadian panel was to consist of one hundred members, with approximately half of the members drawn from education stakeholder groups, and half to be non-educators drawn from the wider community, including science organizations, business and industry groups, and community organizations.

The Western regional session was to include 25 members, the Atlantic session, 25 representatives, and the central Canadian sessions combined were to feature 50 panelists. At least 25 members were to be practising classroom teachers of 13- and 16-year-old students. University academics, business and industry leaders, school administrators and trustees, university student leaders, aboriginal representatives, community leaders, pan-Canadian and provincial scientific agency researchers, and parents were among those who sat on the panel that adjudicated student outcomes.

A total of 84 participants responded and attended one of the four sessions convened in Regina, Halifax, and Ottawa (two simultaneous sessions) in September-October 1996. All sessions enabled French and English panelists to participate in the language of their choice. All panelists participated anonymously in the expectation-setting process — their names, affiliation, regional background, and individual ratings were not linked.

Procedure

Expectations were established for both the written and the practical task components of the 1996 SAIP Science Assessment for both 13-year-old and 16-year-old students. Panelists were mailed a common set of assessment materials and information about the design of the School Achievement Indicators Program, for their preparation.

All four sessions were facilitated in English and French by a team of ministry representatives from Alberta, Saskatchewan, and New Brunswick. Ministry officials from host provinces and regions facilitated small group discussions. Most facilitators had been involved in designing or administering the assessment. A psychometrician, several teachers' organization representatives, evaluation specialists from the Ontario Education Quality and Accountability Office, a curriculum specialist from the Pan-Canadian Science curriculum development project, and members of the CMEC Secretariat were among the observers in the sessions.

Each regional session was of two days' duration and followed the same agenda. Panelists were provided with an overview of the SAIP design and the underlying assumptions behind science assessment materials and criteria. Complete and open disclosure of any information relevant to the assessment was provided. Methods used for sampling, for administering the materials, and for scoring student work were clarified. Characteristics of the student population that participated, as revealed by questionnaire data, were explained. Examples of the science assessment tasks were demonstrated, and samples of actual student work were provided to each panelist. Panelists were asked to set realistic not idealistic expectations, and asked to consider the varying opportunities that Canadian students would have to learn in consideration of the varying curricula and provincial or territorial contexts in which Canadian adolescents learn science.

of panelists were:

- For the practical component: "What percentage of 13- (16-)year-old students should achieve at or above each performance level as illustrated by the assessment tasks?"
- For the written assessment: "What percentage of 13- (16-)year-old students should achieve at or above each performance level as illustrated by the assessment questions?"

In the first stage, panelists were provided with a thorough explanation of all assessment materials, assumptions, criteria, attributes of the student population, as well as samples of students' work. This was a blind review: actual results for the assessment were not divulged. Panelists independently reviewed all evidence in light of the central question. In small groups, facilitators clarified the nature of the question and assessment tasks. Without consulting others or engaging in small group discussion, each member privately recorded his or her preliminary estimate of proportions of Canadian students who should achieve at or above each of the five performance levels. These individual estimates were collected and displayed for all regional panel members to consider. The upper and lower quartiles of panelists' expectations were highlighted, as well as the median provisional expectation.

The second stage was an informed review. Actual Canadian results were presented on the charts alongside the panelists' provisional expectations for the particular regional session alone. Results were provided for Canada as a whole, combining both French and English student performance, along with the confidence interval. Facilitators provided a verbal overview of preliminary expectations and described those cases where there was a mismatch between expectations and results.

Panelists then returned to small groups and were invited to provide commentary on the preliminary expectations. Once every panelist had spoken and group discussion was conducted, each panelist was given an opportunity to privately revise his or her preliminary estimates in light of the actual results and the insights generated in the small group discussion. The revised estimates were recorded, collected, and displayed on the wall charts alongside actual Canadian results.

Panelists in the Halifax and Ottawa sessions were not provided with the expectations of preceding regional sessions.

Interpretation

The final independent judgments of all panelists were weighted equally and combined into a set of pan-Canadian expectations. The inter-quartile range (25th percentile to 75th percentile) of judgments were used to set the final pan-Canadian expectations for students at or above each level, at each age, for both the written and practical components. Final expectations were the median estimate, or 50th percentile expectation, of all participants in the four regional expectation-setting exercises.

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APPENDIX II

WRITTEN ASSESSMENT: DATA TABLES

SAIP / SCIENCE -- WRITTEN ASSESSMENT DISTRIBUTION OF FREQUENCIES

13-year-olds

POPULATION	Performance: Below 1	Level 1	Level 2	Level 3	Level 4	Level 5	
BC-E	10.9	14.2	29.4	42.5	2.4	0.6	%
	1.9	2.1	2.8	3.0	0.9	0.5	Err
		89.1	74.9	45.5	3.0	0.6	% cumul
		1.9	2.6	3.0	1.0	0.5	Err
AB-E	8.5	8.5	27.3	44.4	10.1	1.2	%
	1.6	1.6	2.6	2.9	1.8	0.7	Err
		91.5	83.0	55.7	11.3	1.2	% cumul
		1.6	2.2	2.9	1.9	0.7	Err
SK-E	7.6	16.3	31.2	40.6	4.3	0.0	%
	1.7	2.3	2.9	3.1	1.3	0.0	Err
		92.4	76.1	44.9	4.3	0.0	% cumul
		1.7	2.7	3.1	1.3	0.0	Err
MB-E	9.1	18.0	30.5	36.5	5.2	0.7	%
	1.8	2.4	2.9	3.0	1.4	0.5	Err
		90.9	72.9	42.4	5.9	0.7	% cumul
		1.8	2.8	3.1	1.5	0.5	Err
MB-F	23.3	16.9	30.4	26.6	2.7	0.1	%
	2.9	2.6	3.2	3.1	1.1	0.2	Err
		76.7	59.8	29.4	2.8	0.1	% cumul
		2.9	3.4	3.2	1.1	0.2	Err
ON-E	13.7	18.9	30.9	31.0	5.3	0.2	%
	2.0	2.3	2.7	2.7	1.3	0.3	Err
		86.3	67.4	36.6	5.5	0.2	% cumul
		2.0	2.8	2.8	1.4	0.3	Err
ON-F	21.7	21.1	30.2	24.7	2.2	0.0	%
	2.6	2.6	2.9	2.7	0.9	0.0	Err
		78.3	57.1	26.9	2.2	0.0	% cumul
		2.6	3.1	2.8	0.9	0.0	Err
QC-E	9.5	17.9	29.6	38.0	4.8	0.2	%
	1.8	2.4	2.8	3.0	1.3	0.3	Err
		90.5	72.6	43.0	5.0	0.2	% cumul
		1.8	2.8	3.1	1.4	0.3	Err
QC-F	8.9	17.9	24.9	43.2	5.2	0.0	%
	1.7	2.3	2.6	2.9	1.3	0.0	Err
		91.1	73.3	48.4	5.2	0.0	% cumul
		1.7	2.6	3.0	1.3	0.0	Err
NB-E	9.0	20.4	26.9	40.5	3.2	0.0	%
	1.8	2.6	2.8	3.1	1.1	0.0	Err
		91.0	70.6	43.7	3.2	0.0	% cumul
		1.8	2.9	3.2	1.1	0.0	Err
NB-F	18.3	21.3	25.6	32.3	2.5	0.0	%
	2.3	2.4	2.6	2.8	0.9	0.0	Err
		81.7	60.4	34.8	2.5	0.0	% cumul
		2.3	2.9	2.8	0.9	0.0	Err
NS-E	8.7	18.0	33.9	34.7	4.5	0.2	%
	1.9	2.6	3.2	3.2	1.4	0.3	Err
		91.3	73.3	39.3	4.6	0.2	% cumul
		1.9	2.9	3.3	1.4	0.3	Err
NS-F	17.6	8.8	35.1	38.5	0.0	0.0	%
	---	---	---	---	---	---	Err
		82.4	73.7	38.5	0.0	0.0	% cumul
		---	---	---	---	---	Err
PE-E	8.0	15.6	30.6	42.4	3.4	0.0	%
	1.7	2.3	2.9	3.1	1.1	0.0	Err
		92.0	76.4	45.8	3.4	0.0	% cumul
		1.7	2.7	3.1	1.1	0.0	Err
NF-E	11.1	17.5	33.2	33.8	4.5	0.0	%
	2.1	2.5	3.1	3.1	1.4	0.0	Err
		88.9	71.4	38.2	4.5	0.0	% cumul
		2.1	3.0	3.2	1.4	0.0	Err
NT-E	44.4	14.9	20.0	19.2	1.1	0.2	%
	5.0	3.6	4.0	4.0	1.1	0.5	Err
		55.6	40.6	20.6	1.4	0.2	% cumul
		5.0	5.0	4.1	1.2	0.5	Err
YK-E	7.0	16.8	27.6	40.6	7.8	0.3	%
	2.2	3.3	3.9	4.3	2.3	0.4	Err
		93.0	76.2	48.6	8.0	0.3	% cumul
		2.2	3.7	4.4	2.4	0.4	Err
Total	11.2	16.8	28.9	37.6	5.2	0.3	%
	0.5	0.6	0.8	0.8	0.4	0.1	Err
		88.8	71.9	43.0	5.5	0.3	% cumul
		0.5	0.8	0.8	0.4	0.1	Err

SAIP / SCIENCE -- WRITTEN ASSESSMENT DISTRIBUTION OF FREQUENCIES

16-year-olds

POPULATION	Performance: Below 1	Level 1	Level 2	Level 3	Level 4	Level 5	
BC-E	4.7	7.7	18.3	45.6	18.2	5.4	%
	1.4	1.7	2.5	3.2	2.5	1.4	Err
		95.3	87.6	69.2	23.6	5.4	% cumul
		1.4	2.1	2.9	2.7	1.4	Err
AB-E	5.7	3.4	12.2	36.5	34.1	8.1	%
	1.4	1.1	1.9	2.8	2.8	1.6	Err
		94.3	90.8	78.6	42.1	8.1	% cumul
		1.4	1.7	2.4	2.9	1.6	Err
SK-E	3.0	7.2	18.9	44.2	22.2	4.6	%
	1.1	1.7	2.6	3.4	2.8	1.4	Err
		97.0	89.9	71.0	26.7	4.6	% cumul
		1.1	2.0	3.1	3.0	1.4	Err
MB-E	3.9	7.3	21.1	38.2	25.6	4.0	%
	1.3	1.7	2.7	3.2	2.8	1.3	Err
		96.1	88.8	67.8	29.6	4.0	% cumul
		1.3	2.1	3.0	3.0	1.3	Err
MB-F	6.6	7.4	18.3	37.6	29.1	1.1	%
	2.4	2.5	3.7	4.6	4.3	1.0	Err
		93.4	86.0	67.8	30.2	1.1	% cumul
		2.4	3.3	4.4	4.3	1.0	Err
ON-E	6.2	8.7	20.3	42.3	20.1	2.5	%
	1.5	1.7	2.5	3.1	2.5	1.0	Err
		93.8	85.2	64.9	22.6	2.5	% cumul
		1.5	2.2	3.0	2.6	1.0	Err
ON-F	9.9	12.1	26.6	36.5	14.1	0.8	%
	2.0	2.1	2.9	3.2	2.3	0.6	Err
		90.1	78.0	51.4	14.9	0.8	% cumul
		2.0	2.7	3.3	2.3	0.6	Err
QC-E	4.6	10.2	19.6	44.4	17.8	3.5	%
	1.3	1.9	2.5	3.1	2.4	1.2	Err
		95.4	85.2	65.6	21.2	3.5	% cumul
		1.3	2.2	3.0	2.6	1.2	Err
QC-F	3.8	5.8	16.9	44.8	26.9	1.7	%
	1.1	1.4	2.2	2.9	2.6	0.7	Err
		96.2	90.3	73.4	28.6	1.7	% cumul
		1.1	1.7	2.6	2.6	0.7	Err
NB-E	3.5	9.3	17.5	49.9	16.7	3.2	%
	1.2	2.0	2.5	3.4	2.5	1.2	Err
		96.5	87.2	69.8	19.9	3.2	% cumul
		1.2	2.2	3.1	2.7	1.2	Err
NB-F	7.6	12.7	21.8	44.1	12.8	1.1	%
	1.6	2.1	2.6	3.1	2.1	0.6	Err
		92.4	79.7	58.0	13.9	1.1	% cumul
		1.6	2.5	3.1	2.1	0.6	Err
NS-E	1.4	7.4	22.7	49.1	16.9	2.5	%
	0.9	1.9	3.0	3.6	2.7	1.1	Err
		98.6	91.2	68.5	19.4	2.5	% cumul
		0.9	2.1	3.4	2.9	1.1	Err
NS-F	2.5	3.8	13.4	46.5	32.5	1.3	%
	---	---	---	---	---	---	Err
		97.5	93.6	80.3	33.8	1.3	% cumul
		---	---	---	---	---	Err
PE-E	4.4	6.7	20.3	46.0	19.8	2.8	%
	1.5	1.8	2.9	3.6	2.8	1.2	Err
		95.6	88.8	68.6	22.5	2.8	% cumul
		1.5	2.3	3.3	3.0	1.2	Err
NF-E	3.2	8.8	23.6	39.4	20.2	4.8	%
	1.2	1.9	2.8	3.3	2.7	1.4	Err
		96.8	88.0	64.4	25.0	4.8	% cumul
		1.2	2.2	3.2	2.9	1.4	Err
NT-E	21.8	12.6	21.2	16.6	23.9	3.9	%
	5.9	4.8	5.9	5.4	6.1	2.8	Err
		78.2	65.6	44.4	27.8	3.9	% cumul
		5.9	6.8	7.1	6.4	2.8	Err
YK-E	5.6	7.5	13.1	41.5	26.5	5.9	%
	3.3	3.8	4.8	7.0	6.3	3.4	Err
		94.4	86.9	73.9	32.4	5.9	% cumul
		3.3	4.8	6.3	6.7	3.4	Err
Total	5.0	7.4	18.7	42.8	22.7	3.4	%
	0.4	0.5	0.7	0.9	0.7	0.3	Err
		95.0	87.6	69.0	26.1	3.4	% cumul
		0.4	0.6	0.8	0.8	0.3	Err

SAIP / SCIENCE -- WRITTEN ASSESSMENT DISTRIBUTION OF FREQUENCIES

13-year-olds

	GENDER			
	Female	Male	Other*	Total
Below 1	10.7	11.5	59.8	11.2 %
	0.7	0.8	11.4	0.5 Err
Level 1	16.0	17.7	9.2	16.8 %
	0.9	0.9	6.7	0.6 Err
	89.3	88.5	40.2	88.8 % cumul
	0.7	0.8	11.4	0.5 Err
Level 2	29.3	28.6	7.9	28.9 %
	1.1	1.1	6.3	0.8 Err
	73.3	70.9	31.0	71.9 % cumul
	1.1	1.1	10.8	0.8 Err
Level 3	38.8	36.5	20.0	37.6 %
	1.2	1.1	9.3	0.8 Err
	43.9	42.3	23.2	43.0 % cumul
	1.2	1.2	9.8	0.8 Err
Level 4	5.0	5.3	3.1	5.2 %
	0.5	0.5	4.1	0.4 Err
	5.2	5.8	3.1	5.5 % cumul
	0.5	0.6	4.1	0.4 Err
Level 5	0.2	0.5	0.0	0.3 %
	0.1	0.2	0.0	0.1 Err
	0.2	0.5	0.0	0.3 % cumul
	0.1	0.2	0.0	0.1 Err

16-year-olds

	GENDER			
	Female	Male	Other*	Total
Below 1	4.1	5.2	74.8	5.0 %
	0.5	0.6	10.5	0.4 Err
Level 1	8.4	6.4	0.7	7.4 %
	0.7	0.6	2.0	0.5 Err
	95.9	94.8	25.2	95.0 % cumul
	0.5	0.6	10.5	0.4 Err
Level 2	19.6	17.9	4.6	18.7 %
	1.0	1.0	5.1	0.7 Err
	87.5	88.4	24.5	87.6 % cumul
	0.8	0.8	10.4	0.6 Err
Level 3	44.0	41.9	14.7	42.8 %
	1.2	1.2	8.6	0.9 Err
	68.0	70.5	19.9	69.0 % cumul
	1.2	1.1	9.6	0.8 Err
Level 4	21.1	24.5	5.2	22.7 %
	1.0	1.1	5.3	0.7 Err
	23.9	28.6	5.2	26.1 % cumul
	1.1	1.1	5.3	0.8 Err
Level 5	2.9	4.0	0.0	3.4 %
	0.4	0.5	0.0	0.3 Err
	2.9	4.0	0.0	3.4 % cumul
	0.4	0.5	0.0	0.3 Err

*not specified

SAIP / SCIENCE -- WRITTEN ASSESSMENT DISTRIBUTION OF FREQUENCIES

13-year-olds

	LANGUAGE			
	English	French	Total	
Below 1	11.5	10.4	11.2	%
	0.6	1.0	0.5	Err
Level 1	16.4	18.1	16.8	%
	0.7	1.2	0.6	Err
	88.5	89.6	88.8	% cumul
	0.6	1.0	0.5	Err
Level 2	30.2	25.3	28.9	%
	0.9	1.4	0.8	Err
	72.1	71.5	71.9	% cumul
	0.9	1.5	0.8	Err
Level 3	36.2	41.5	37.6	%
	0.9	1.6	0.8	Err
	41.9	46.2	43.0	% cumul
	1.0	1.6	0.8	Err
Level 4	5.3	4.7	5.2	%
	0.4	0.7	0.4	Err
	5.7	4.7	5.5	% cumul
	0.5	0.7	0.4	Err
Level 5	0.4	0.0	0.3	%
	0.1	0.0	0.1	Err
	0.4	0.0	0.3	% cumul
	0.1	0.0	0.1	Err

16-year-olds

	LANGUAGE			
	English	French	Total	
Below 1	5.2	4.3	5.0	%
	0.5	0.7	0.4	Err
Level 1	7.7	6.4	7.4	%
	0.6	0.8	0.5	Err
	94.8	95.7	95.0	% cumul
	0.5	0.7	0.4	Err
Level 2	19.0	17.7	18.7	%
	0.8	1.3	0.7	Err
	87.1	89.3	87.6	% cumul
	0.7	1.1	0.6	Err
Level 3	42.3	44.4	42.8	%
	1.0	1.7	0.9	Err
	68.1	71.6	69.0	% cumul
	1.0	1.6	0.8	Err
Level 4	21.7	25.7	22.7	%
	0.9	1.5	0.7	Err
	25.8	27.3	26.1	% cumul
	0.9	1.5	0.8	Err
Level 5	4.0	1.6	3.4	%
	0.4	0.4	0.3	Err
	4.0	1.6	3.4	% cumul
	0.4	0.4	0.3	Err

SAIP / SCIENCE -- PRACTICAL TASKS DISTRIBUTION OF FREQUENCIES

13-year-olds

POPULATION	Below 1	Level 1	Level 2	Level 3	Level 4	Level 5	Total
			PERFORMANCE				
SK-E	5.2	2.3	48.5	39.6	4.0	0.5	%
	1.5	1.0	3.3	3.3	1.3	0.5	Err
		94.8	92.5	44.1	4.5	0.5	% cumul
		1.5	1.7	3.3	1.4	0.5	Err
ON-E	4.7	4.3	51.9	35.0	3.3	0.7	%
	1.3	1.3	3.2	3.0	1.1	0.5	Err
		95.3	91.0	39.0	4.0	0.7	% cumul
		1.3	1.8	3.1	1.2	0.5	Err
ON-F	6.2	5.5	53.7	33.6	1.0	0.1	%
	1.5	1.5	3.2	3.0	0.6	0.2	Err
		93.8	88.3	34.7	1.1	0.1	% cumul
		1.5	2.1	3.0	0.7	0.2	Err
NB-F	7.2	8.2	56.1	27.8	0.7	0.0	%
	1.8	1.9	3.4	3.1	0.6	0.0	Err
		92.8	84.6	28.5	0.7	0.0	% cumul
		1.8	2.5	3.1	0.6	0.0	Err
NS-E	3.1	4.1	51.1	36.8	3.9	1.1	%
	1.1	1.3	3.2	3.1	1.2	0.7	Err
		96.9	92.8	41.8	5.0	1.1	% cumul
		1.1	1.6	3.1	1.4	0.7	Err
NS-F	5.0	0.0	58.7	33.3	3.0	0.0	%
	---	---	---	---	---	---	Err
		95.0	95.0	36.3	3.0	0.0	% cumul
		---	---	---	---	---	Err
OTHERS	2.4	3.3	50.9	39.5	3.0	1.0	%
	0.9	1.0	2.9	2.8	1.0	0.6	Err
		97.6	94.4	43.5	4.0	1.0	% cumul
		0.9	1.3	2.8	1.1	0.6	Err
Total	3.5	3.7	51.3	37.6	3.1	0.8	%
	0.5	0.5	1.3	1.2	0.4	0.2	Err
		96.5	92.8	41.5	4.0	0.8	% cumul
		0.5	0.7	1.3	0.5	0.2	Err

16-year-olds

POPULATION	Below 1	Level 1	Level 2	Level 3	Level 4	Level 5	Total
			PERFORMANCE				
SK-E	1.6	2.8	29.9	47.3	15.3	3.2	100.0 %
	0.8	1.1	2.9	3.2	2.3	1.1	0.0 Err
		98.4	95.6	65.8	18.5	3.2	% cumul
		0.8	1.3	3.1	2.5	1.1	Err
ON-E	1.2	1.6	29.2	47.8	17.3	2.8	100.0 %
	0.7	0.8	2.9	3.2	2.4	1.1	0.0 Err
		98.8	97.1	67.9	20.1	2.8	% cumul
		0.7	1.1	3.0	2.6	1.1	Err
ON-F	2.9	2.2	42.0	45.8	6.0	1.1	100.0 %
	1.1	1.0	3.3	3.3	1.6	0.7	0.0 Err
		97.1	94.9	52.9	7.1	1.1	% cumul
		1.1	1.5	3.3	1.7	0.7	Err
NB-F	2.2	3.3	43.9	44.2	5.5	0.9	100.0 %
	1.0	1.2	3.5	3.5	1.6	0.7	0.0 Err
		97.8	94.5	50.6	6.4	0.9	% cumul
		1.0	1.6	3.5	1.7	0.7	Err
NS-E	1.5	1.8	29.5	46.4	16.2	4.6	100.0 %
	0.8	0.8	2.9	3.2	2.4	1.3	0.0 Err
		98.5	96.7	67.2	20.8	4.6	% cumul
		0.8	1.1	3.0	2.6	1.3	Err
NS-F	3.2	0.0	39.7	34.0	17.9	5.1	100.0 %
	---	---	---	---	---	---	0.0 Err
		96.8	96.8	57.1	23.1	5.1	% cumul
		---	---	---	---	---	Err
OTHERS	2.2	1.0	34.3	43.7	14.5	4.2	100.0 %
	0.8	0.6	2.7	2.9	2.0	1.2	0.0 Err
		97.8	96.8	62.5	18.8	4.2	% cumul
		0.8	1.0	2.8	2.3	1.	Err
Total	1.8	1.4	32.2	45.5	15.5	3.6	100.0 %
	0.3	0.3	1.2	1.3	0.9	0.5	0.0 Err
		98.2	96.8	64.6	19.1	3.6	% cumul
		0.3	0.5	1.2	1.0	0.5	Err

SAIP / SCIENCE -- PRACTICAL TASKS

13-year-olds

LEVEL	GENDER: Females	Males	Other*	Total	
Below 1	3.6	3.4	0.3	3.5	%
	0.7	0.7	1.7	0.5	Err
Level 1	3.6	3.8	0.3	3.7	%
	0.7	0.7	1.7	0.5	Err
	96.4	96.6	99.7	96.5	% cumul
	0.7	0.7	1.7	0.5	Err
Level 2	51.3	51.2	69.3	51.3	%
	1.8	1.8	14.7	1.3	Err
	92.8	92.8	99.4	92.8	% cumul
	0.9	0.9	2.5	0.7	Err
Level 3	37.3	38.0	22.9	37.6	%
	1.8	1.8	13.4	1.2	Err
	41.5	41.6	30.0	41.5	% cumul
	1.8	1.8	14.6	1.3	Err
Level 4	3.1	3.1	7.1	3.1	%
	0.6	0.6	8.2	0.4	Err
	4.3	3.7	7.1	4.0	% cumul
	0.7	0.7	8.2	0.5	Err
Level 5	1.2	0.5	0.0	0.8	%
	0.4	0.3	0.0	0.2	Err
	1.2	0.5	0.0	0.8	% cumul
	0.4	0.3	0.0	0.2	Err

16-year-olds

Level	GENDER: Females	Males	Other*	Total	
Below 1	1.6	1.9	0.0	1.8	%
	0.5	0.5	0.0	0.3	Err
Level 1	1.1	1.7	1.4	1.4	%
	0.4	0.5	6.3	0.3	Err
	98.4	98.1	100.0	98.2	% cumul
	0.5	0.5	0.0	0.3	Err
Level 2	31.5	33.0	16.4	32.2	%
	1.7	1.7	20.1	1.2	Err
	97.3	96.4	98.6	96.8	% cumul
	0.6	0.7	6.3	0.5	Err
Level 3	46.3	44.7	62.6	45.5	%
	1.8	1.8	26.3	1.3	Err
	65.8	63.3	82.2	64.6	% cumul
	1.7	1.8	20.8	1.2	Err
Level 4	15.7	15.2	19.7	15.5	%
	1.3	1.3	21.6	0.9	Err
	19.5	18.6	19.7	19.1	% cumul
	1.5	1.4	21.6	1.0	Err
Level 5	3.8	3.4	0.0	3.6	%
	0.7	0.7	0.0	0.5	Err
	3.8	3.4	0.0	3.6	% cumul
	0.7	0.7	0.0	0.5	Err

*not specified

SAIP / SCIENCE -- PRACTICAL TASKS

13-year-olds

Level	LANGUAGE French	English	Canada – Total
Below 1	1.8	4.0	3.5 %
	0.6	0.6	0.5 Err
Level 1	3.9	3.6	3.7 %
	0.8	0.6	0.5 Err
	98.2	96.0	96.5 % cumul
	0.6	0.6	0.5 Err
Level 2	54.2	50.3	51.3 %
	2.1	1.6	1.3 Err
	94.2	92.4	92.8 % cumul
	1.0	0.9	0.7 Err
Level 3	38.7	37.2	37.6 %
	2.0	1.6	1.2 Err
	40.0	42.1	41.5 % cumul
	2.0	1.6	1.3 Err
Level 4	1.3	3.7	3.1 %
	0.5	0.6	0.4 Err
	1.3	4.9	4.0 % cumul
	0.5	0.7	0.5 Err
Level 5	0.0	1.1	0.8 %
	0.0	0.3	0.2 Err
	0.0	1.1	0.8 % cumul
	0.0	0.3	0.2 Err

16-year-olds

Level	LANGUAGE French	English	Canada – Total
Below 1	1.9	1.7	1.8 %
	0.6	0.4	0.3 Err
Level 1	0.8	1.6	1.4 %
	0.4	0.4	0.3 Err
	98.1	98.3	98.2 % cumul
	0.6	0.4	0.3 Err
Level 2	41.1	29.6	32.2 %
	2.1	1.5	1.2 Err
	97.3	96.7	96.8 % cumul
	0.7	0.6	0.5 Err
Level 3	44.7	45.8	45.5 %
	2.1	1.6	1.3 Err
	56.2	67.1	64.6 % cumul
	2.1	1.5	1.2 Err
Level 4	10.5	17.0	15.5 %
	1.3	1.2	0.9 Err
	11.5	21.3	19.1 % cumul
	1.4	1.3	1.0 Err
Level 5	1.0	4.4	3.6 %
	0.4	0.7	0.5 Err
	1.0	4.4	3.6 % cumul
	0.4	0.7	0.5 Err

APPENDIX III

WRITTEN ASSESSMENT: SAMPLE-SIZE TABLES

SAIP 1996 SCIENCE - WRITTEN ASSESSMENT - SAMPLE SIZE

		13-YEAR-OLDS	*16-YEAR-OLDS*	*TOTAL*
		Number (%)	*Number (%)*	*Number (%)*
BC	Female	504(47.9 %)	442(46.7 %)	946(47.3 %)
	Male	548(52.0 %)	502(53.1 %)	1050(52.5 %)
	No info	1(0.1 %)	2(0.2 %)	3(0.2 %)
	Total	1053(100.0 %)	946(100.0 %)	1999(100.0 %)
AB	Female	521(47.2 %)	519(47.3 %)	1040(47.3 %)
	Male	563(51.0 %)	541(49.3 %)	1104(50.2 %)
	No info	20(1.8 %)	37(3.4 %)	57(2.6 %)
	Total	1104(100.0 %)	1097(100.0 %)	2201(100.0 %)
SK	Female	452(46.9 %)	424(50.4 %)	876(48.5 %)
	Male	499(51.8 %)	413(49.1 %)	912(50.5 %)
	No info	13(1.3 %)	4(0.5 %)	17(0.9 %)
	Total	964(100.0 %)	841(100.0 %)	1805(100.0 %)
MB-E	Female	495(50.9 %)	457(50.5 %)	952(50.7 %)
	Male	474(48.8 %)	446(49.3 %)	920(49.0 %)
	No info	3(0.3 %)	2(0.2 %)	5(0.3 %)
	Total	972(100.0 %)	905(100.0 %)	1877(100.0 %)
MB-F	Female	297(52.3 %)	187(52.8 %)	484(52.5 %)
	Male	268(47.2 %)	167(47.2 %)	435(47.2 %)
	No info	3(0.5 %)	0(0.0 %)	3(0.3 %)
	Total	568(100.0 %)	354(100.0 %)	922(100.0 %)
ON-E	Female	537(48.9 %)	490(49.1 %)	1027(49.0 %)
	Male	561(51.1 %)	507(50.9 %)	1068(51.0 %)
	Total	1098(100.0 %)	997(100.0 %)	2095(100.0 %)
ON-F	Female	490(49.9 %)	464(52.1 %)	954(51.0 %)
	Male	487(49.6 %)	424(47.6 %)	911(48.7 %)
	No info	5(0.5 %)	2(0.2 %)	7(0.4 %)
	Total	982(100.0 %)	890(100.0 %)	1872(100.0 %)
QC-E	Female	492(49.7 %)	496(51.6 %)	988(50.6 %)
	Male	495(50.0 %)	461(48.0 %)	956(49.0 %)
	No info	3(0.3 %)	4(0.4 %)	7(0.4 %)
	Total	990(100.0 %)	961(100.0 %)	1951(100.0 %)
QC-F	Female	594(54.1 %)	591(52.0 %)	1185(53.0 %)
	Male	503(45.9 %)	545(47.9 %)	1048(46.9 %)
	No info	0(0.0 %)	1(0.1 %)	1(0.0 %)
	Total	1097(100.0 %)	1137(100.0 %)	2234(100.0 %)

SAIP 1996 SCIENCE - WRITTEN ASSESSMENT - SAMPLE SIZE

		13-YEAR-OLDS	*16-YEAR-OLDS*	*TOTAL*
		Number (%)	*Number (%)*	*Number (%)*
NB-E	Female	482(51.2 %)	414(48.5 %)	896(49.9 %)
	Male	456(48.4 %)	439(51.5 %)	895(49.9 %)
	No info	4(0.4 %)	0(0.0 %)	4(0.2 %)
	Total	942(100.0 %)	853(100.0 %)	1795(100.0 %)
NB-F	Female	402(47.8 %)	422(54.0 %)	824(50.8 %)
	Male	436(51.8 %)	357(45.7 %)	793(48.9 %)
	No info	3(0.4 %)	2(0.3 %)	5(0.3 %)
	Total	841(100.0 %)	781(100.0 %)	1622(100.0 %)
NS-E	Female	425(49.0 %)	357(49.0 %)	782(49.0 %)
	Male	441(50.8 %)	369(50.6 %)	810(50.7 %)
	No info	2(0.2 %)	3(0.4 %)	5(0.3 %)
	Total	868(100.0 %)	729(100.0 %)	1597(100.0 %)
NS-F	Female	56(47.9 %)	34(60.7 %)	90(52.0 %)
	Male	61(52.1 %)	22(39.3 %)	83(48.0 %)
	Total	117(100.0 %)	56(100.0 %)	173(100.0 %)
PE	Female	359(53.4 %)	283(50.4 %)	642(52.1 %)
	Male	312(46.4 %)	276(49.2 %)	588(47.7 %)
	No info	1(0.1 %)	2(0.4 %)	3(0.2 %)
	Total	672(100.0 %)	561(100.0 %)	1233(100.0 %)
NF	Female	448(51.2 %)	417(48.7 %)	865(50.0 %)
	Male	425(48.6 %)	437(51.1 %)	862(49.8 %)
	No info	2(0.2 %)	2(0.2 %)	4(0.2 %)
	Total	875(100.0 %)	856(100.0 %)	1731(100.0 %)
NT	Female	142(45.7 %)	80(47.6 %)	222(46.3 %)
	Male	163(52.4 %)	85(50.6 %)	248(51.8 %)
	No info	6(1.9 %)	3(1.8 %)	9(1.9 %)
	Total	311(100.0 %)	168(100.0 %)	479(100.0 %)
YK	Female	122(48.4 %)	67(48.9 %)	189(48.6 %)
	Male	126(50.0 %)	69(50.4 %)	195(50.1 %)
	No info	4(1.6 %)	1(0.7 %)	5(1.3 %)
	Total	252(100.0 %)	137(100.0 %)	389(100.0 %)
CANADA	Female	6818(49.7 %)	6144(50.1 %)	12962(49.9 %)
	Male	6818(49.7 %)	6060(49.4 %)	12878(49.6 %)
	No info	70(0.5 %)	65(0.5 %)	135(0.5 %)
	Total	13706(100.0 %)	12269(100.0 %)	25975(100.0 %)

SAIP 1996 SCIENCE - PRACTICAL TASKS ASSESSMENT - SAMPLE SIZE

		13-YEAR-OLDS	*16-YEAR-OLDS*	*TOTAL*
		Number (%)	*Number (%)*	*Number (%)*
BC	Female	52(52.5 %)	49(51.0 %)	101(51.8 %)
	Male	47(47.5 %)	47(49.0 %)	94(48.2 %)
	Total	99(100.0 %)	96(100.0 %)	195(100.0 %)
AB	Female	35(36.8 %)	43(43.9 %)	78(40.4 %)
	Male	60(63.2 %)	55(56.1 %)	115(59.6 %)
	Total	95(100.0 %)	98(100.0 %)	193(100.0 %)
SK *	**Female**	**451(51.9 %)**	**439(47.4 %)**	**890(49.6 %)**
	Male	**400(46.0 %)**	**479(51.7 %)**	**879(48.9 %)**
	No info	**18(2.1 %)**	**9(1.0 %)**	**27(1.5 %)**
	Total	**869(100.0 %)**	**927(100.0 %)**	**1796(100.0 %)**
MB-E	Female	47(47.5 %)	49(53.8 %)	96(50.5 %)
	Male	52(52.5 %)	42(46.2 %)	94(49.5 %)
	Total	99(100.0 %)	91(100.0 %)	190(100.0 %)
MB-F	Female	38(48.1 %)	52(60.5 %)	90(54.5 %)
	Male	41(51.9 %)	34(39.5 %)	75(45.5 %)
	Total	79(100.0 %)	86(100.0 %)	165(100.0 %)
ON-E *	**Female**	**462(48.0 %)**	**460(49.3 %)**	**922(48.6 %)**
	Male	**500(51.9 %)**	**471(50.4 %)**	**971(51.2 %)**
	No info	**1(0.1 %)**	**3(0.3 %)**	**4(0.2 %)**
	Total	**963(100.0 %)**	**934(100.0 %)**	**1897(100.0 %)**
ON-F *	**Female**	**483(51.5 %)**	**445(50.9 %)**	**928(51.2 %)**
	Male	**453(48.3 %)**	**430(49.1 %)**	**883(48.7 %)**
	No info	**1(0.1 %)**	**0(0.0 %)**	**1(0.1 %)**
	Total	**937(100.0 %)**	**875(100.0 %)**	**1812(100.0 %)**
QC-E	Female	52(53.1 %)	58(57.4 %)	110(55.3 %)
	Male	46(46.9 %)	43(42.6 %)	89(44.7 %)
	Total	98(100.0 %)	101(100.0 %)	199(100.0 %)
QC-F	Female	148(49.7 %)	147(49.3 %)	295(49.5 %)
	Male	150(50.3 %)	151(50.7 %)	301(50.5 %)
	Total	298(100.0 %)	298(100.0 %)	596(100.0 %)

* Jurisdiction whose sample is representative of its population

SAIP 1996 SCIENCE - PRACTICAL TASKS ASSESSMENT - SAMPLE SIZE

		13-YEAR-OLDS	*16-YEAR-OLDS*	*TOTAL*
		Number (%)	*Number (%)*	*Number (%)*
NB-E	Female	44(44.9 %)	50(50.0 %)	94(47.5 %)
	Male	53(54.1 %)	50(50.0 %)	103(52.0 %)
	No info	1(1.0 %)	0(0.0 %)	1(0.5 %)
	Total	98(100.0 %)	100(100.0 %)	198(100.0 %)
NB-F *	**Female**	**410(50.7 %)**	**401(50.8 %)**	**811(50.8 %)**
	Male	**387(47.9 %)**	**389(49.2 %)**	**776(48.6 %)**
	No info	**11(1.4 %)**	**0(0.0 %)**	**11(0.7 %)**
	Total	**808(100.0 %)**	**790(100.0 %)**	**1598(100.0 %)**
NS-E *	**Female**	**462(48.5 %)**	**481(51.1 %)**	**943(49.8 %)**
	Male	**487(51.2 %)**	**460(48.8 %)**	**947(50.0 %)**
	No info	**3(0.3 %)**	**1(0.1 %)**	**4(0.2 %)**
	Total	**952(100.0 %)**	**942(100.0 %)**	**1894(100.0 %)**
NS-F *	**Female**	**46(46.9 %)**	**34(63.0 %)**	**80(52.6 %)**
	Male	**51(52.0 %)**	**20(37.0 %)**	**71(46.7 %)**
	No info	**1(1.0 %)**	**0(0.0 %)**	**1(0.7 %)**
	Total	**98(100.0 %)**	**54(100.0 %)**	**152(100.0 %)**
PE	Female	48(48.5 %)	40(43.5 %)	88(46.1 %)
	Male	51(51.5 %)	52(56.5 %)	103(53.9 %)
	Total	99(100.0 %)	92(100.0 %)	191(100.0 %)
NF	Female	53(52.5 %)	44(45.4 %)	97(49.0 %)
	Male	48(47.5 %)	53(54.6 %)	101(51.0 %)
	Total	101(100.0 %)	97(100.0 %)	198(100.0 %)
NT	Female	23(56.1 %)	16(45.7 %)	39(51.3 %)
	Male	18(43.9 %)	19(54.3 %)	37(48.7 %)
	Total	41(100.0 %)	35(100.0 %)	76(100.0 %)
YK	Female	27(40.9 %)	30(53.6 %)	57(46.7 %)
	Male	37(56.1 %)	26(46.4 %)	63(51.6 %)
	No info	2(3.0 %)	0(0.0 %)	2(1.6 %)
	Total	66(100.0 %)	56(100.0 %)	122(100.0 %)
CANADA *	**Female**	**2881(49.7 %)**	**2838(50.0 %)**	**5719(49.9 %)**
	Male	**2881(49.7 %)**	**2821(49.7 %)**	**5702(49.7 %)**
	No info	**38(0.7 %)**	**13(0.2 %)**	**51(0.4 %)**
	Total	**5800(100.0 %)**	**5672(100.0 %)**	**11472(100.0 %)**

* Jurisdiction whose sample is representative of its population