OECD Programme for International Student Assessment

FACT SHEET

What is PISA?
The Programme for International Student Assessment (PISA), first undertaken in 2000, is a triennial survey of the knowledge and skills of 15-year-olds and one of the most ambitious international educational projects ever undertaken. Coordinated by the Organisation for Economic Co-operation and Development (OECD), PISA 2006 involved approximately 400,000 students from 57 countries and economies. PISA draws on leading international expertise to develop valid comparisons across countries and cultures and is significant because it provides education researchers and policy makers with comprehensive international data in three core learning areas. The focus was on science, but the assessment also included reading and mathematics and collected data on student, family, and school factors that help explain differences in performance.

Why does Canada participate in PISA?
Scientific and technological issues permeate our society and are at the core of many political, economic, and personal decisions. Being scientifically literate is an important component to understanding and advancing the links between science, technology, innovation, the economy, the environment, and our society.

An understanding of science and technology enables individuals to participate in a society in which science and technology issues play a significant role and impact on public policy and personal lives. Almost daily, we grapple with complex issues affecting our environment, our health, the food we eat, and our economy. The fastest growing economic sectors rely heavily upon science and technology-based innovation.

In response to these increasing demands and the need for highly educated citizens, Canada participated in PISA 2006 to assess the performance of 15-year-old students in science, reading, and mathematics; to explore students' attitudes to scientific issues; and to collect contextual information that might explain differences in performance across countries.

In Canada, students who participated in PISA 2000 also participated in the Youth in Transition Survey (YITS) — a longitudinal study of major transitions in young people's lives that follows the students for at least 10 years. The link between PISA and YITS will enable researchers and policy makers to study the impact of social and economic factors on the achievement of Canadian youth. It will also measure the influence of their level of skills and knowledge at age 15 on their future school-to-work transitions. Reports on these students are released approximately every two years.

Who participated in PISA?
In Canada, approximately 22,000 students from 1,000 different schools took part in PISA. The total number of students who participated from each province is outlined in Appendix A of the Canadian report. None of the three Canadian territories participated in PISA 2000, PISA 2003, or PISA 2006.

What is the planned OECD PISA assessment cycle?
In 2000, OECD PISA assessed reading as the major domain, and mathematics and science as the minor domains. In 2003, mathematics was the major domain, and science and reading were minor domains. Problem-solving skills were also tested in 2003. PISA 2006 assessed science as the major domain, with mathematics and reading as minor domains. The cyclical nature of the assessments allows countries — and provinces, in Canada's case — to compare achievement over time in all three domains.

PISA 2009 will again assess reading as the main domain, and science and mathematics as minor domains. In addition, a number of countries intend to participate in the Electronic Reading Assessment, a first-ever international assessment of its type.

How can student performance across OECD countries be compared?
Educational systems and school programs differ from one country to the next. Making comparisons of results from these various countries is a complex task. However, OECD countries developed a framework for each of the three domains that reflected in general terms what 15-year-old students are expected to know and be able to do. While PISA does assess students' knowledge and skills in science, reading, and mathematics, it focuses on what students will need in their future lives. PISA then seeks to assess what they can do with what they have learned. The results obtained from PISA will help determine whether students in participating countries reach similar levels of performance at about the same age.

How can student performance across Canada be compared?
In Canada, education is the exclusive responsibility of the provinces and territories; therefore, school programs differ from one part of the country to another. However, because of the universality of PISA's global benchmarks in scientific, mathematical, and reading literacy, the comparison between individual provinces and distinct countries is quite feasible.

In the Canadian report, the provincial breakdown of the PISA results allows us to compare the performance of students within each jurisdiction with the performance of those from other provinces, as well as with the performance of students from other developed countries. In all provinces, gender comparisons are also made. In some provinces (Manitoba, Ontario, Quebec, New Brunswick, and Nova Scotia), comparisons were made along linguistic lines.

How can we compare average scores?
Because scores were based on samples of students from each country and province, we cannot say with certainty that these scores are the same as those that would have been obtained had all 15-year-olds been tested. A "confidence interval" is a range of scores within which the score for the population is likely to fall 95 per cent of the time or 19 times out of 20.

When comparing two countries or two provinces, the two average scores cannot be said to be different from each other if the confidence interval for the two average scores overlaps. For example, countries performing about the same as Canada have a confidence interval for the average score that overlaps with Canada's confidence interval.

How does PISA define scientific literacy?
In PISA, **scientific literacy** is defined as an individual's capacity to use scientific knowledge, to identify questions, and to draw evidence-based conclusions in order to understand and help make decisions about the natural world and the changes made to it through human activity.

Three broad science competencies were assessed:

- *Identifying scientific issues* required students to recognize issues that can be explored scientifically and the key features of scientific investigation.
- *Explaining phenomena scientifically* involved the application of the knowledge of science to describe or interpret phenomena scientifically and predict changes.
- *Using scientific evidence* meant interpreting the evidence to draw conclusions; to explain them; to identify the assumptions, evidence, and reasoning that underpin them; and to reflect on their implications.

The PISA tasks required scientific knowledge of two kinds:

- *Knowledge of science.* This entailed an understanding of fundamental scientific concepts and theories, in core scientific areas. The four content areas covered were "Physical systems," "Living systems," "Earth and space systems," and "Technological systems," representing key aspects of understanding the natural world.
- *Knowledge about science.* This included understanding the purposes and nature of scientific enquiry and understanding scientific explanations, which are the results of scientific enquiry.

PISA 2006 also provides measures of students' attitudes to learning science, the extent to which they are aware of life opportunities that possessing science competencies may open, and the science learning opportunities and environments that their schools offer.

What are the levels of science achievement?
Science achievement was divided into six levels representing a group of tasks of increasing difficulty, with level 6 as the highest and level 1 as the lowest. A difference of

one level can be considered an important difference in student performance. Included below are examples of what was expected of students from a range of levels of difficulty on the science scales.

Sample Assessment Questions

Example of a difficult question

THE GREENHOUSE EFFECT: FACT OR FICTION
Students are to determine whether the greenhouse effect is fact or fiction. **To explain this scientific phenomenon,** they must read an article where two points of view are presented. They are also presented with two graphs. One student concludes from the graphs that the increase in the Earth's average temperature is due to carbon dioxide emission. The other student states that before drawing such a conclusion, other factors need to be considered. PISA students are asked to name a factor related to energy/ radiation coming from the sun or a factor related to a natural component such as water vapour or to a pollutant such as exhaust gas.

Example of a question of medium difficulty

CLOTHES
A team of scientists is developing "intelligent" clothes that will give disabled children the power of "speech." Children wearing waistcoats made of electrotextile, linked to a speech synthesizer, will be able to make themselves understood simply by tapping on the touch-sensitive material. The article then describes the properties of this unique material. In order to demonstrate their ability t**o identify scientific issues,** students are presented with a list of claims and asked if the claims made in the article can be tested through scientific investigation in the laboratory.

Example of an easier question

ACID RAIN
Students are **to use scientific evidence** to respond to this question on the effects of acid rain. They are presented with an experiment whereby a marble chip with a mass of 2.0 grams is placed in vinegar overnight. (Vinegar has about the same acidity as acid rain.) When a marble chip is placed in vinegar, bubbles of gas form. In a multiple-choice question, students are asked the mass of the dried marble chip after the experiment.

Attitude question
Following the question on acid rain, PISA explored students' attitudes to the scientific issues on a four-point scale of high to low interest in knowing such things as which human activities contribute to acid rain.

How does PISA define mathematical literacy and reading literacy?

Mathematical literacy is defined as the capacity to identify and understand the role that

mathematics plays in the world, to make well-founded judgments, and to use and engage with mathematics in ways that meet the needs of that individual's life as a constructive, concerned, and reflective citizen.

Reading literacy is defined in PISA as an individual's capacity to understand, use, and reflect on written texts in order to achieve one's goals, to develop one's knowledge and potential, and to participate in society.

Is the assessment fair to students across Canada?
Canada actively participated in PISA to ensure that the uniqueness of our country's education systems would be taken into account. Factors such as linguistic differences, rural and urban school locations, and cultural influences were all considered. In addition, the universal framework for each subject incorporated an agreed-upon philosophy for all countries that is based upon the latest pedagogical research.

In the sense that Canadian students answered the same questions as students from every other country, it is very fair. The assessment is also unique in that it is not tied to the curriculum of any province or participating country but is instead a fair measurement of students' abilities to use their learning skills to solve real-life situations.

What did we learn from this assessment?
The report indicates that the performance of Canadian students is above the international average in all three subject areas. In fact, Canadian students, on average, finished in the top tier of all countries surveyed in every domain tested in the assessment.

In addition, the report gives parents and educators important information on the performance of Canadian students in science, mathematics, and reading across provinces and in an international context. Chapter 1 speaks to the high level of equity in performance in Canada.

Chapter 3 looks at differences in performance across student characteristics. It examines areas of performance between genders, the lower performance of immigrant versus non-immigrant students, and the lesser impact of socioeconomic status on performance in Canada compared to other countries.

In the Canadian report, factors such as the relationship between student engagement in science and its impact on course selection, educational pathways, and career choice are outlined in chapter 4.

In science, on the combined scale, only two countries/economies performed better than Canada (Finland and Hong Kong–China). In the subdomains of "identifying scientific issues" and "using scientific evidence," only one country had higher scores than Canada, while in the subdomain of "explaining phenomena scientifically," four countries performed significantly better than Canada.

In science, all provinces performed at or above the OECD mean, with several provinces performing as well as the top-ranked countries.

In science, the main domain tested in 2006, in the combined scale and the three subdomains, there was a difference between English-language and French-language school systems. Students enrolled in French-language school systems in Nova Scotia, New Brunswick, Ontario, and Manitoba performed significantly less well than those in the English-language school system. In the combined scale, in Quebec, there was a small but statistically significant difference, with results favouring the French-language system, and also in the subdomain "explaining phenomena scientifically," while no significant difference was observed in the other two subdomains.

In mathematics, only Chinese Taipei, Finland, Korea, and Hong Kong–China outperformed Canada. Canada fell within a group that included the Netherlands, Switzerland, Macao-China, Japan, New Zealand, and Belgium.

In mathematics performance, there were significant differences favouring the English-language system in New Brunswick and Ontario, while no significant differences in mathematics were observed in Nova Scotia and Manitoba. There were significant differences in mathematics favouring the French-language system in Quebec.

In reading, Canada was outperformed by Korea, Finland, and Hong Kong–China. While performance has remained stable in Canada since 2003, improved performance in reading in two countries resulted in these two countries outperforming Canada.

As in earlier PISA assessments, students enrolled in the French-language school systems in Nova Scotia, New Brunswick, Ontario, and Manitoba performed significantly less well in reading than students in the English-language school system. In Quebec, student performance did not differ between the two systems.

PISA has also shown Canadian educators where improvements could make our education systems even better.

How did the performance of 15-year-olds change between PISA 2000, PISA 2003, and PISA 2006?

In PISA 2006, science was, for the first time, the major domain assessed. To undertake an assessment with increased coverage of the scientific competencies, the framework was expanded from that used in 2000 and 2003, and a significant number of science items were added to the assessment. As a result of the changes, using the data gathered in 2006 as baseline data, it is only in 2009 that a true examination of change over time will be possible.

Student performance in reading and mathematics has remained stable since 2000. However, the students of two countries made significant improvements in reading and outperformed Canadian students.

How do boys and girls compare?
In Canada, on the combined science scale, no gender difference was observed other than in Newfoundland and Labrador, where girls outperformed boys by 12 score points. In PISA 2006, this pattern of no significant gender differences was observed across most countries. The exceptions were the 13 countries that showed an advantage in favour of girls and the 10 countries that showed an advantage in favour of boys.

On the subscale of "using scientific evidence," there were no substantial gender differences; however, there were significant differences on the sub-scale "explaining scientific phenomena," where, in 8 of the 10 provinces, boys outperformed girls. This pattern was reflected in most countries. In contrast, in the subdomain "identifying scientific issues," in all provinces and in most countries, girls outperformed boys.

As was the case in previous PISA assessments, in PISA 2006, girls in all provinces outperformed boys by 33 score points in reading.

While the pattern in mathematics was similar to previous assessments, in Canada, boys outperformed girls in mathematics by 14 score points, a far smaller gap than for reading. At the provincial level, boys outperformed girls in 6 of the 10 provinces, with no significant gender differences observed in Newfoundland and Labrador, New Brunswick, Prince Edward Island, and Saskatchewan.

What kind of information does the Canadian report contain that differs from the OECD PISA report?
The Canadian report gives a provincial breakdown of the results and also quantitative information on some of the student and home factors that influence the performance of Canadian students.

How will the results be used?
The results will be used by provincial education ministries/departments as they seek quantitative information to help determine not only where their students are succeeding but also where improvement is needed.

OECD plans to produce further thematic reports based on the PISA 2006 performance data and the results of the student and school questionnaires. As with other assessments, PISA 2006 will be a valuable resource for education researchers and policy makers who wish to study and propose improvements to Canada's systems of education. The federal government will also conduct analyses of PISA data sets, as will provinces who undertake analyses pertinent to their unique educational circumstances.

Who developed the test?
OECD developed PISA, with contributions and regular input from all the countries that participated in the assessment.

What is the cost to date of PISA?
The direct costs for PISA are funded by HRSDC, while indirect costs are assumed by the participating provinces. In each of three years, the direct cost for PISA 2006 was $2.2 million.

Who are the Canadian partners involved in OECD PISA?
Human Resources and Social Development Canada, Statistics Canada, and the Council of Ministers of Education, Canada are partners in administering PISA and in producing the Canadian PISA report.