



Chapter 14: The Programme for International Student Assessment (PISA)

In 2006, approximately 400,000 15-year old students from 57 countries and economies around the world took part in the triennial (i.e., occurring once every three years) PISA assessment to determine their proficiency in reading, mathematics and science. This included approximately 22,000 Canadian students from about 1,000 schools spread across the ten provinces. In Newfoundland and Labrador, 1,741 students from 75 schools participated. This chapter will highlight the performance of this province's students.

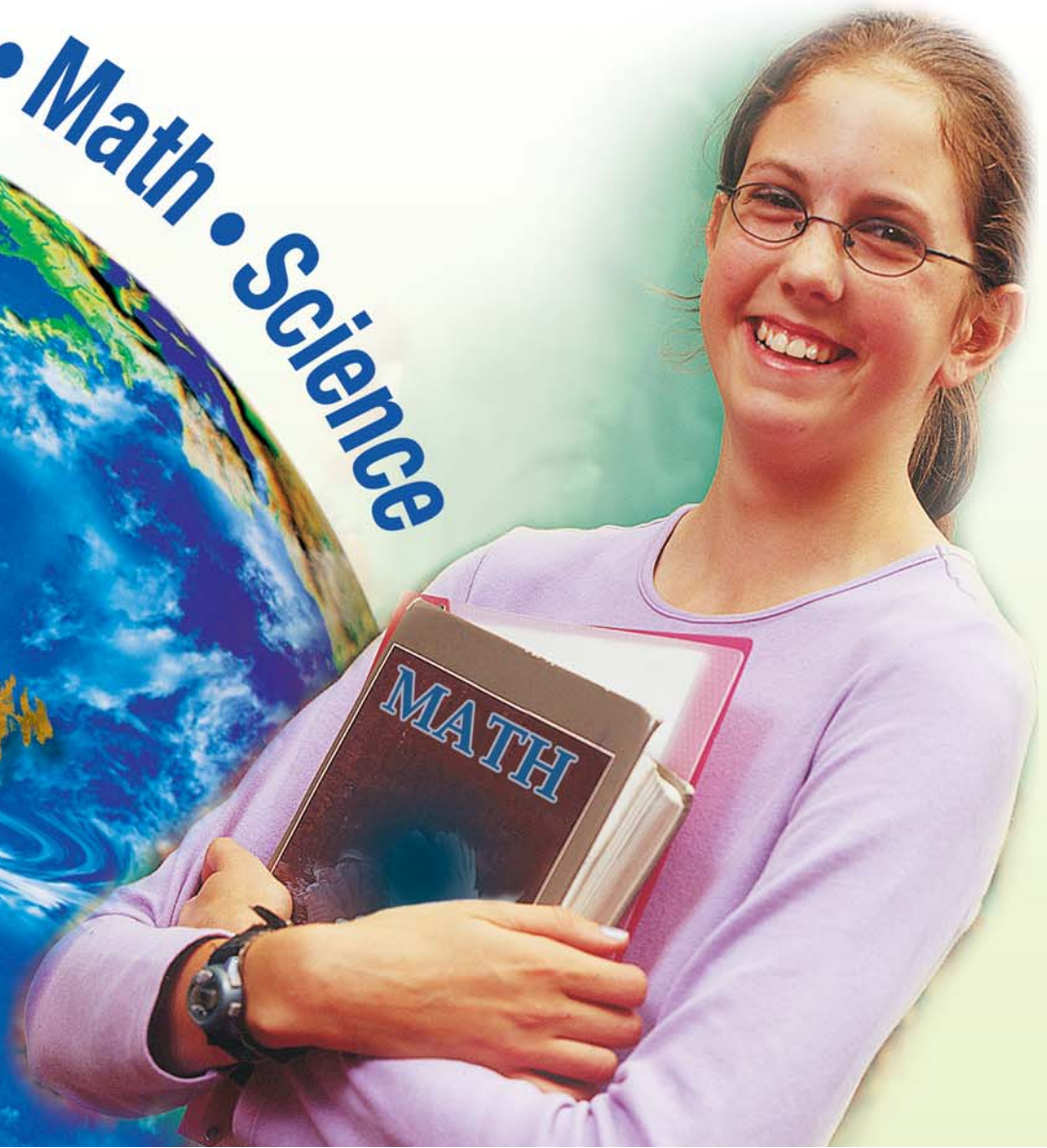
What is PISA?

In 2000, the Organization for Economic Cooperation and Development (OECD) initiated PISA with the intent to answer the following questions:

- How well are young adults prepared to meet the challenges of the future?
- Are they able to analyse, reason and communicate their ideas effectively?
- Do they have the capacity to continue learning throughout life?
- Are some kinds of teaching and school organization more effective than others?

(Council of Ministers of Education, 2008a)

Reading • Math • Science



This international assessment occurs every three years to measure student ability in reading literacy, mathematics literacy, and scientific literacy. During each testing cycle, one of the three subject areas is considered a main domain and the other two are minor domains. The subject area identified as the major domain for that year involves a more intensive assessment. This allows information to be provided on several sub-domains. For example, in the last assessment conducted in 2006, science was the major domain. This produced results describing overall (or combined) scientific literacy and three scientific sub-domains (identifying scientific issues, explaining phenomena scientifically, and using scientific evidence).

There are two scores that can be derived from the PISA data - mean (or average) score and proficiency level. Since the assessment scales were developed according to levels of difficulty, student performance can be ranked according to proficiency. Each successive level is associated with tasks of increased difficulty (OECD, 2005, p.112). In other words, a student achieving a proficiency of 5 is more knowledgeable in a subject matter compared to a student achieving a level of 2. In general, a proficiency level of 1 means a student demonstrates a limited knowledge of the subject and a level of 5 or 6 means a student can identify more complex concepts and knowledge. Based on their performance, each student is assigned to the highest proficiency level for which s/he would be expected to answer the majority of the assessment questions correctly.



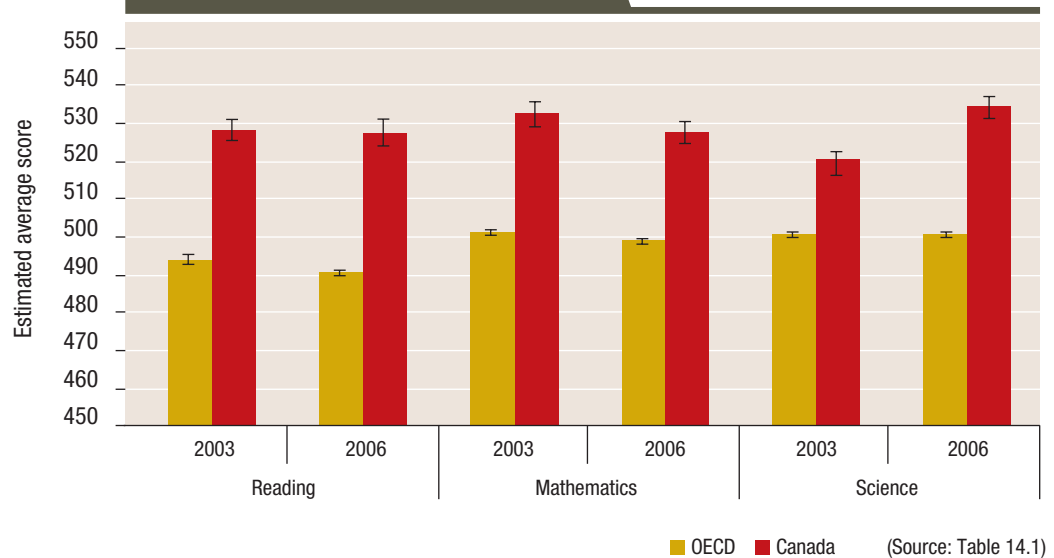
Confidence intervals were used to determine if differences among the provinces were significantly different. PISA uses a 95% confidence interval to represent the actual high and low end points where the actual mean score should fall 95% of the time. Differences were determined to be significantly different if the respective confidence intervals do not overlap. If the confidence intervals overlap then the differences are not considered to be significant.

How do Canadian students fare?

Canadian students are among the best in the world in reading, mathematics and science ranking within the top four countries during the 2003 and 2006 assessments. Only countries such as Korea, Finland and Hong Kong-China achieved significantly higher scores. Canadian students consistently achieved significantly higher average scores than other OECD countries in each of the subjects assessed. While some variation was present between the average scores of Canadian students between the two assessments, these differences were not statistically significant (see *figure 14.1*).



Figure 14.1: Performance of Canadian students in PISA (2003-2006)



Student performance in Newfoundland and Labrador on PISA (2003-2006)

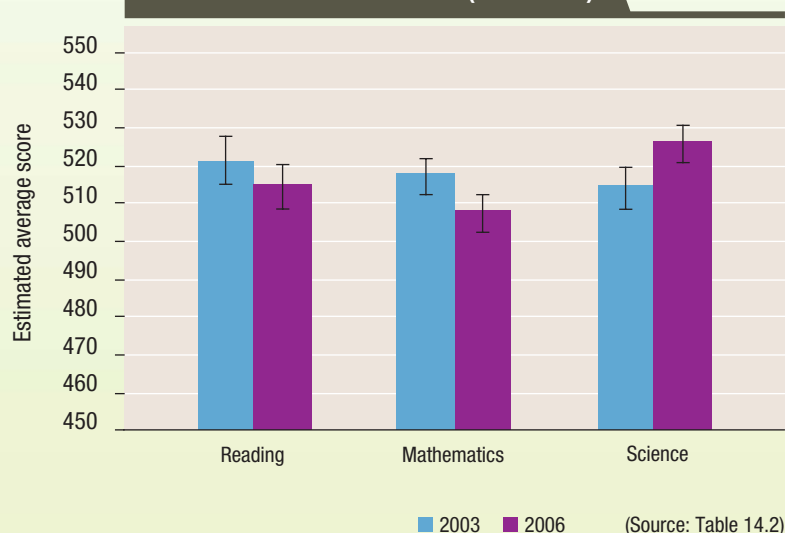
In Newfoundland and Labrador, slight decreases (i.e., less than ten points) occurred in the average scores on the reading and mathematics assessments. There was a slight improvement in performance on the science assessment. The average score increased by 11.7 points from 513.8 in 2007 to 525.5 in 2008.

These changes were not significantly different (see *figure 14.2*).

PISA 2006 in focus

The remainder of the chapter will focus on the performance of students in Newfoundland and Labrador on the 2006 PISA assessment. For each of the areas assessed, the two measures of student performance (i.e., average scores and proficiency levels) will be provided and comparisons made to other Canadian jurisdictions.

Figure 14.2: Performance of Newfoundland and Labrador students in PISA (2003-2006)



Reading

The reading section of the assessment focuses on determining the ability of students to use written information in situations they will encounter in life. Specifically, PISA defines reading literacy as the ability to, “understand, use and reflect on written texts to achieve one’s goals, develop one’s knowledge and potential and to participate in society,” (OECD, 2007, p.284).

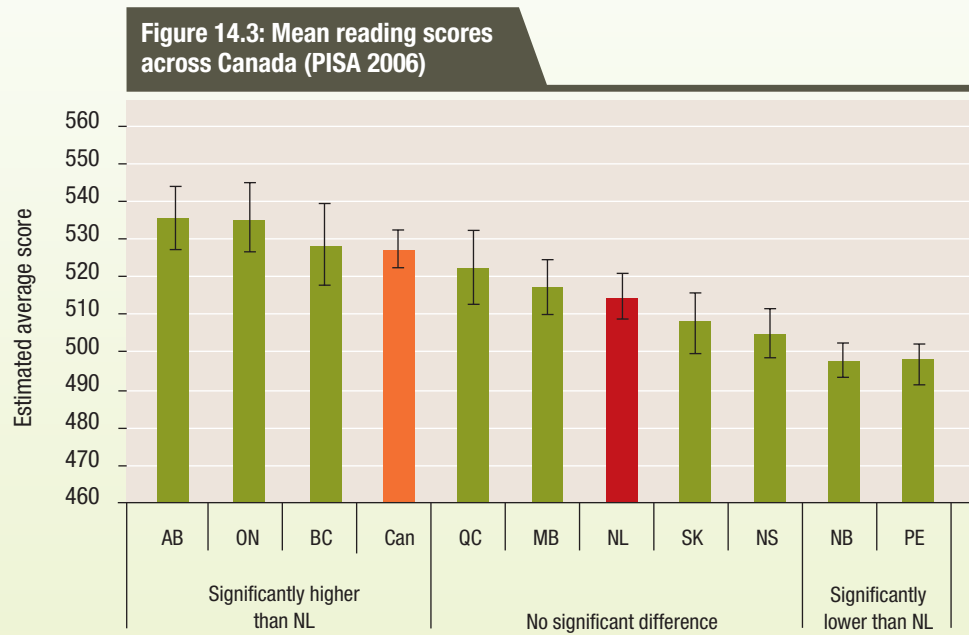
Mean reading scores

In the 2006 assessment, the average score of this province’s students was 513.7 with only students in Alberta, British Columbia, and Ontario achieving significantly higher scores. Students in New Brunswick and Prince Edward Island scored significantly lower average scores (see *figure 14.3*).

Proficiency levels

The performance of students in reading can be divided into five proficiency levels ranging from one to five. A student assessed with a proficiency level of 1 will have a limited understanding of reading comprehension. The highest level is 5 where students can read and understand a very complex reading passage.

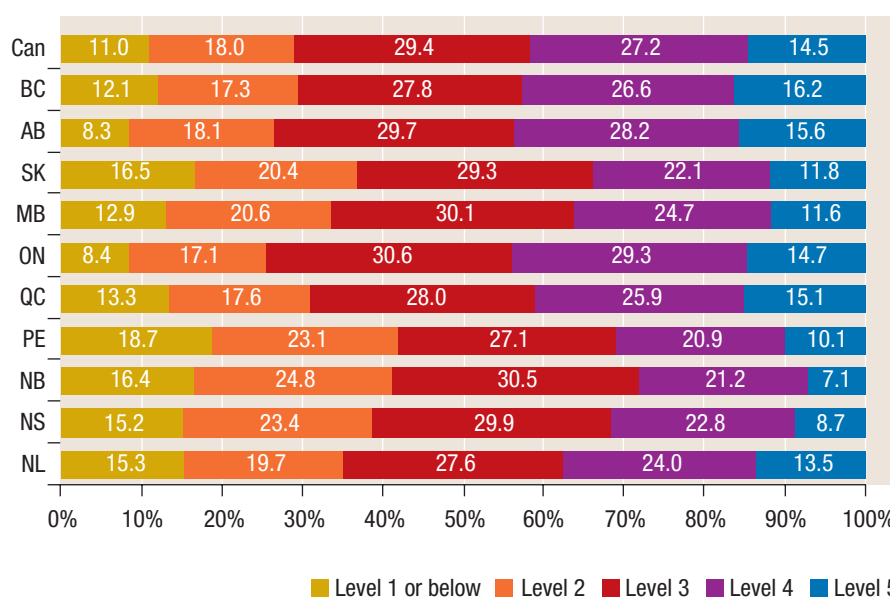
Overall, 15.3% of the province’s students achieved the lowest level of proficiency (i.e., level 1 or below) in reading. There were three provinces where this percentage was higher. This included Prince Edward Island (18.7%), Saskatchewan (16.5%) and New Brunswick (16.4%). However, 13.5% demonstrated the highest level of proficiency (i.e., level 5) with only Ontario, Quebec, Alberta and British Columbia having a higher percentage of students at this level. The majority of the province’s students (51.6%) were assessed at level 3 or 4. Similar percentages of students within these levels can be found across Canada (see *figure 14.4*).



(Source: Table 14.3)



Figure 14.4: Reading proficiency levels (PISA 2006)



(Source: Table 14.4)

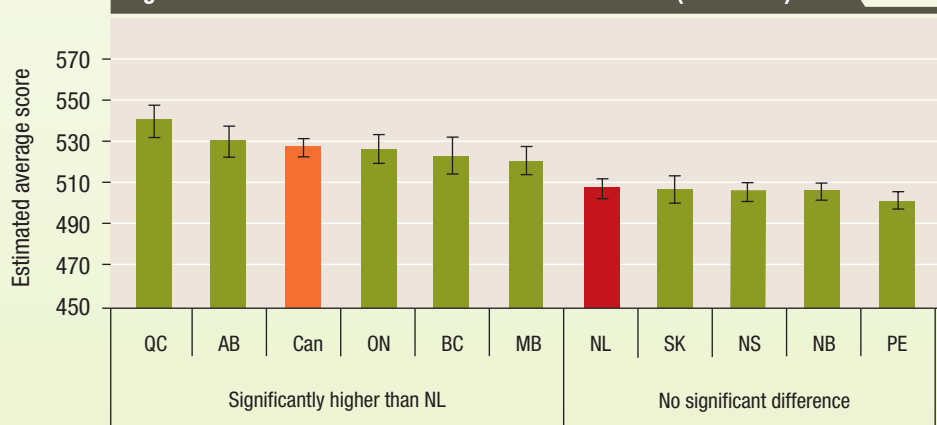
Mathematics

To assess proficiency in mathematics, PISA uses the concept of mathematical literacy. This is defined as, “the capacity of students to analyse, reason and communicate effectively as they pose, solve and interpret mathematical problems in a variety of situations involving quantitative, spatial, probabilistic or other mathematical concepts,” (OECD, 2007, p.304).

Mean mathematical scores

Across Canada, students in the province achieved the sixth highest average score in mathematics. There was a significant difference between the Canadian and provincial average scores (527.0 and 507.0 points respectively). There were no significant differences among Newfoundland and Labrador and the other Atlantic Canadian provinces and Saskatchewan (see figure 14.5).

Figure 14.5: Mean mathematics scores across Canada (PISA 2006)



(Source: Table 14.5)

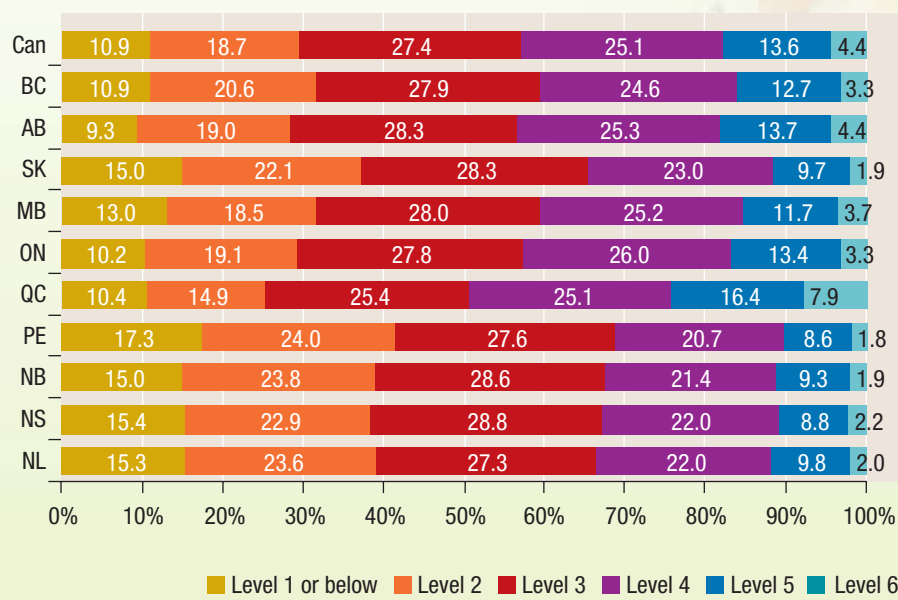
Proficiency levels

There are six proficiency levels in the mathematics assessment with level 1 the lowest and 6 the highest. At level 1, students are able to answer clearly defined questions involving familiar concepts with all the relevant information provided. A student with a proficiency level of 6 can solve mathematically complex problems.

The majority of students in Newfoundland and Labrador were assessed at a proficiency level of between 2 and 4. With the exception of Quebec, a similar trend is seen across the country. Quebec led the country with the highest percentage (24.2%) of students assessed at levels 5 and 6. There were 15.3% of this province's students assessed at the lowest level (i.e., level 1 or below) and 11.8% at the highest level. Both Nova Scotia and New Brunswick recorded similar percentages of students at these levels (see figure 14.6).



Figure 14.6: Mathematical proficiency levels (PISA 2006)



(Source: Table 14.6)



Science

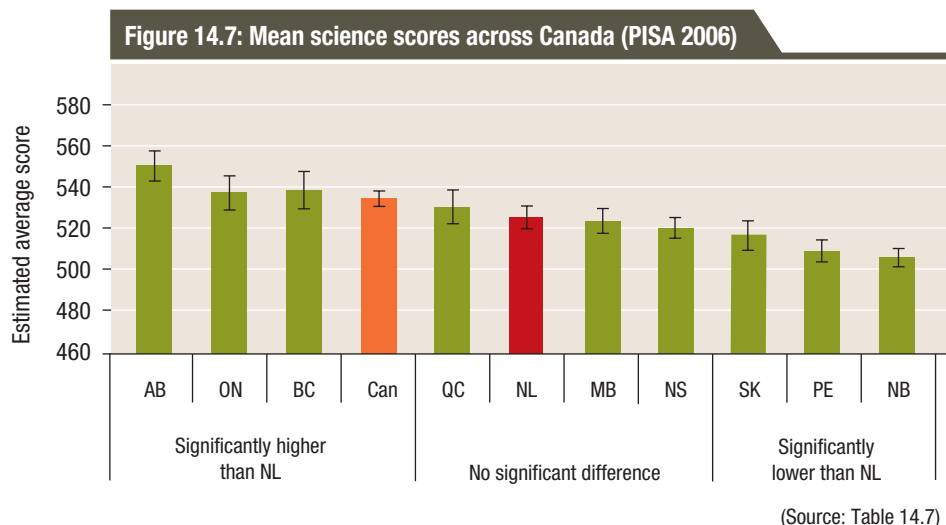
The science assessment was designed to determine how well students have learned fundamental scientific concepts and theories and apply this information in life's experiences. To accomplish this, PISA measures scientific literacy or "an individual's scientific knowledge and the ability to use that knowledge to identify questions, acquire new knowledge, explain scientific phenomena and draw evidence-based conclusions about science related issues," (OECD, 2007, p.34). In the 2006 assessment, science was the main domain assessed. This allowed results to be reported for student ability to find support for scientific inquiry, explain phenomena scientifically, identify scientific issues and use scientific evidence.

In each of the areas, student scores were grouped into six proficiency levels with level 1 representing the lowest scores (and easiest tasks) and level 6, the highest scores (with the most difficult questions). At level 1 a student would only demonstrate a limited scientific knowledge, whereas a student at level 6 would be able to consistently identify, explain and apply scientific knowledge and knowledge about science in a variety of complex life situations (OECD, 2007, p.43).

Combined science: Mean scores

Overall, average scores in the combined science assessment ranged from a high of 550.3 in Alberta to a low of 506.1 in New Brunswick. Only three provinces and Canada as a whole recorded significantly higher average scores on the combined science assessment than Newfoundland and Labrador. Saskatchewan, New Brunswick and Prince Edward Island were significantly lower (see figure 14.7).





Combined science proficiency levels

The majority (74.5%) of students in Newfoundland and Labrador had a proficiency level of between 2 and 4 in combined science. An additional 13.5% demonstrated the highest level of proficiency (i.e., level 5 or 6). This was the highest percentage among the four Atlantic Canadian provinces and close to the Canadian percentage. Only Alberta recorded a significantly higher percentage of students at this level. The remaining 12.0% of students were assessed at level 1 or below. This was at the Canadian average and only significantly behind the percentages of students in Alberta, British Columbia and Ontario (see figure 14.8).

Sub-domains

The province's students performed quite well in the three science sub-domains assessed. Newfoundland and Labrador was on par with the Canadian average on the identifying scientific issues sub-domain but was significantly below in the explaining phenomena scientifically and the using scientific evidence sub-domains (see figure 14.9). Table 14.9, found at the end of the document, provides the average scores for the other provinces in each of the sub-domains.

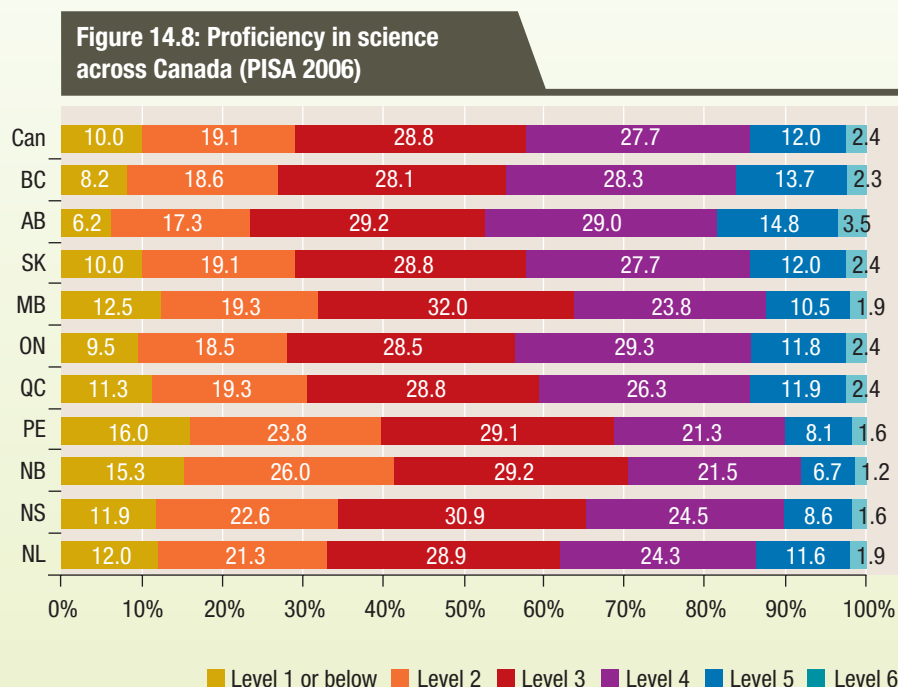
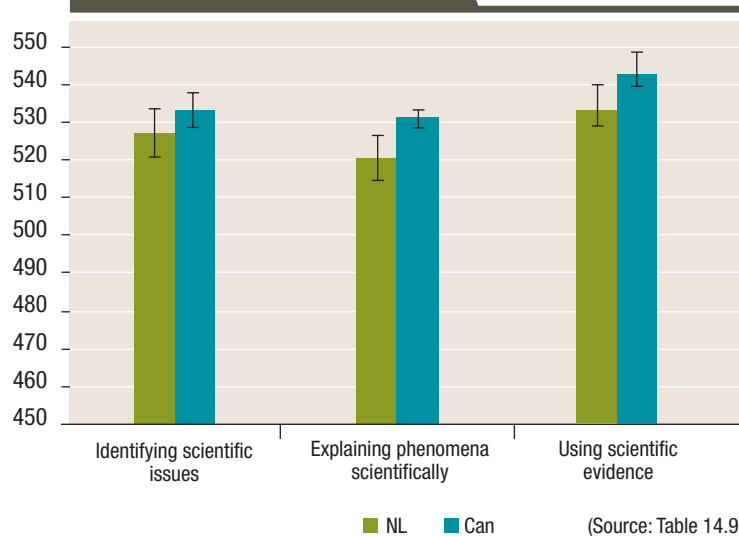




Figure 14.9: Mean scores on the science sub-domains (PISA 2006)



Gender differences: A provincial perspective

Girls, once again, appear to hold an advantage over boys. In the reading and science assessments, girls achieved significantly higher scores with the largest gap occurring in the reading section. There was no significant difference between boys and girls in their performance in mathematics (see *figure 14.10a*).

In the science sub-domains, girls outperformed boys in the identifying scientific issues and using scientific evidence sections. No significant difference existed in the exploring phenomena scientifically sub-domain (see *figure 14.10b*). There was no area where boys significantly outperformed girls.

These gender differences were not uniformly seen in other Canadian jurisdictions. In several areas Newfoundland and Labrador was the exception to the trend. For example, in the combined science assessment, Newfoundland and Labrador was the only province where girls significantly outperformed boys. In the rest of the country, no gender difference was present. In mathematics, the province was one of the only three where no gender differences were present. In the other provinces, boys significantly outperformed girls. *Table 14.11* at the end of the report outlines the gender differences seen across Canada.

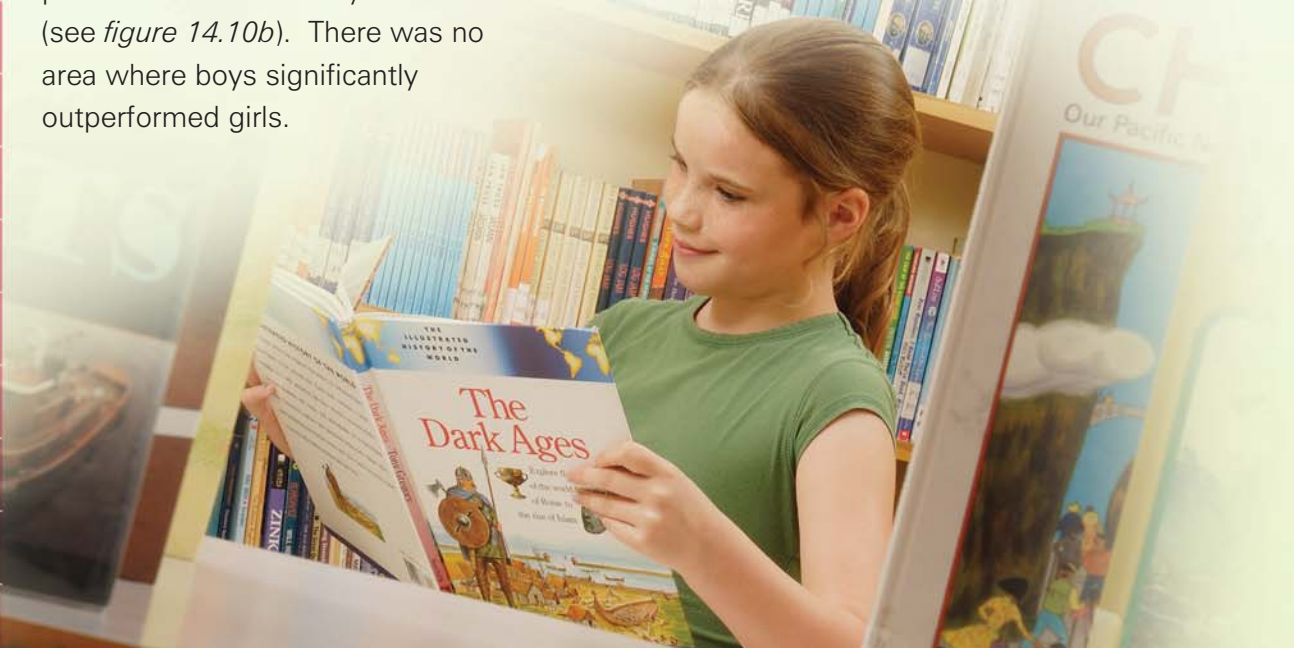
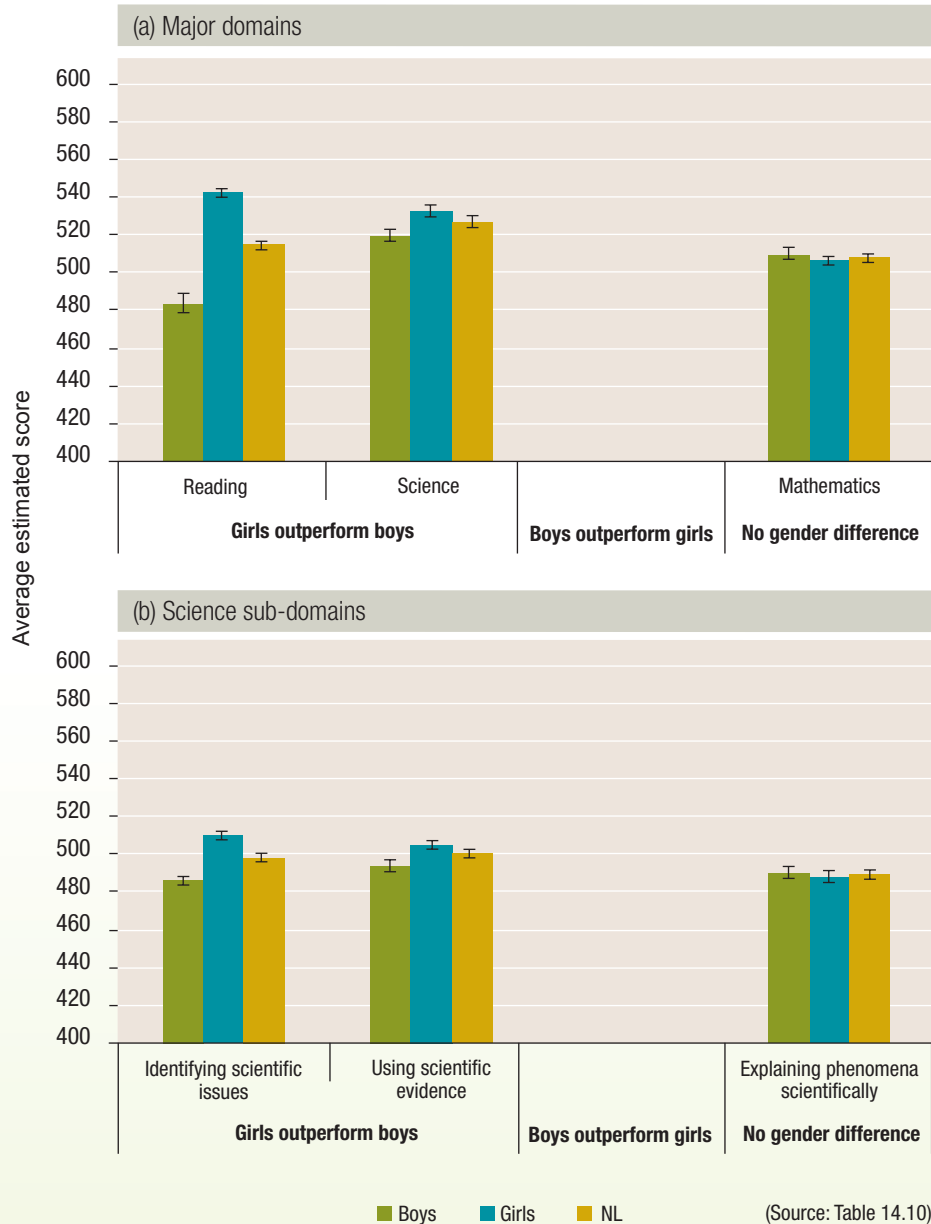


Figure 14.10: Gender differences in Newfoundland and Labrador (PISA 2006)



Summary

The province's adolescent students are consistently doing well in the areas of reading, mathematics and science with no significant changes from the previous assessment in 2003. Within Canada, Newfoundland and Labrador is leading

the way in Atlantic Canada achieving significantly higher scores than New Brunswick and Prince Edward Island and similar average scores to Nova Scotia. Alberta, Ontario and British Columbia continue to obtain the highest average scores in Canada (see *Table A*).



Table A: Performance of Newfoundland and Labrador students in relation to Canada (PISA 2006)

| | Significantly lower | No significant difference | Significantly higher |
|-------------------------------------|--|--|--|
| Reading | New Brunswick Prince Edward Island | Nova Scotia Quebec Manitoba Saskatchewan | Ontario Alberta British Columbia Canada |
| Mathematics | | Nova Scotia New Brunswick Prince Edward Island Saskatchewan | Quebec Ontario Manitoba Alberta British Columbia Canada |
| Science | New Brunswick Prince Edward Island Saskatchewan | Nova Scotia Quebec Manitoba | Ontario Alberta British Columbia Canada |
| Sub-domains | | | |
| Identifying scientific issues | New Brunswick Prince Edward Island | Nova Scotia Quebec Ontario Manitoba Saskatchewan British Columbia Canada | Alberta |
| Explaining phenomena scientifically | New Brunswick Prince Edward Island | Nova Scotia Quebec Manitoba Saskatchewan | Ontario Manitoba British Columbia Canada |
| Using scientific evidence | Nova Scotia New Brunswick Prince Edward Island Saskatchewan | Quebec Manitoba British Columbia | Ontario Alberta Canada |