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

NOTES ON STATISTICAL INFORMATION

Confidence Intervals

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

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

Differences

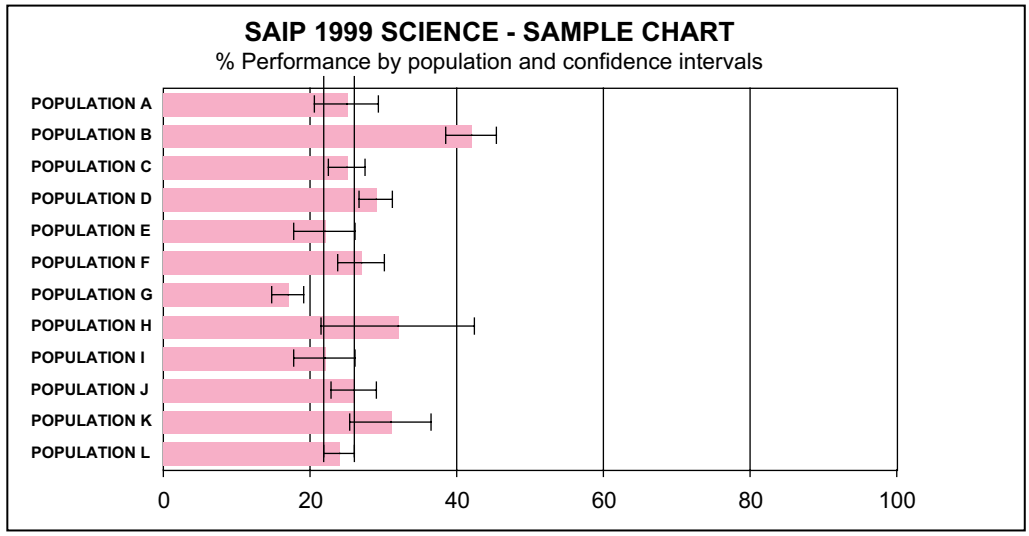
In this report the terms "difference" and "different," used in the context of performance levels and percentages, refer to a difference that is not due to chance. In a technical sense, they refer to a statistically significant difference.

Percentages

Percentages in this report are rounded to the nearest decimal.

Sample Chart

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

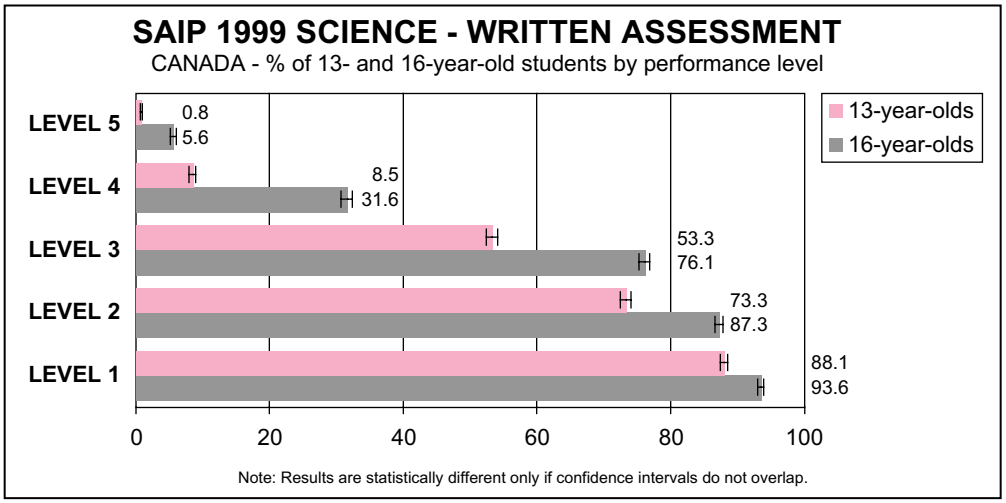


Results for Canada

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

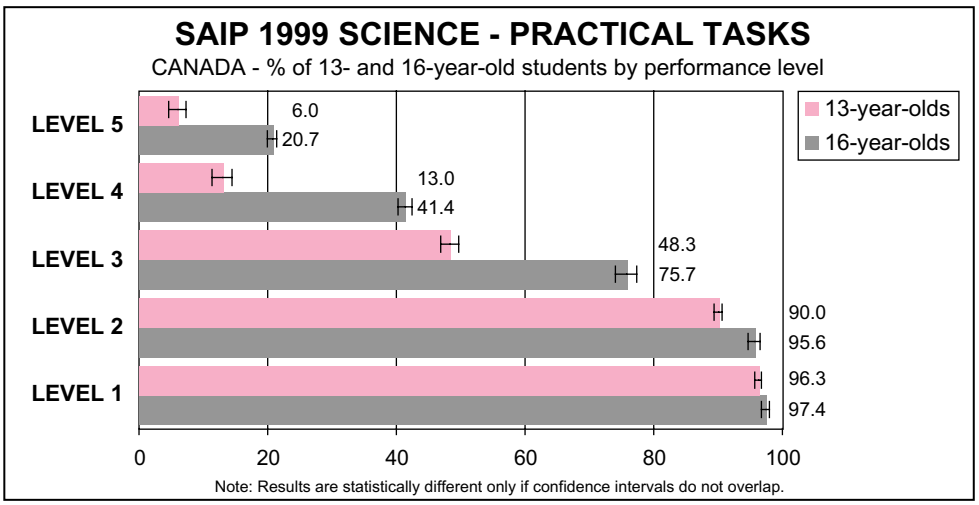
In both cases, as might be expected, there are more students from the 16-year-old population at higher levels, since students from both age groups were presented with identical instruments. With this data, what once would only have been an expectation can now be stated with some certainty.

CHART 1



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

CHART 2



In the practical task assessment, higher achievement by older students is again demonstrated. In this case, however, the difference seems to be greater at the higher levels. Some 90% of 13-year-olds and

over 95% of 16-year-olds reached level 2 where they can demonstrate such skills as identifying appropriate procedures and important variables.

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

Achievement Differences between 1996 and 1999

Written Assessment

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

CHART 3

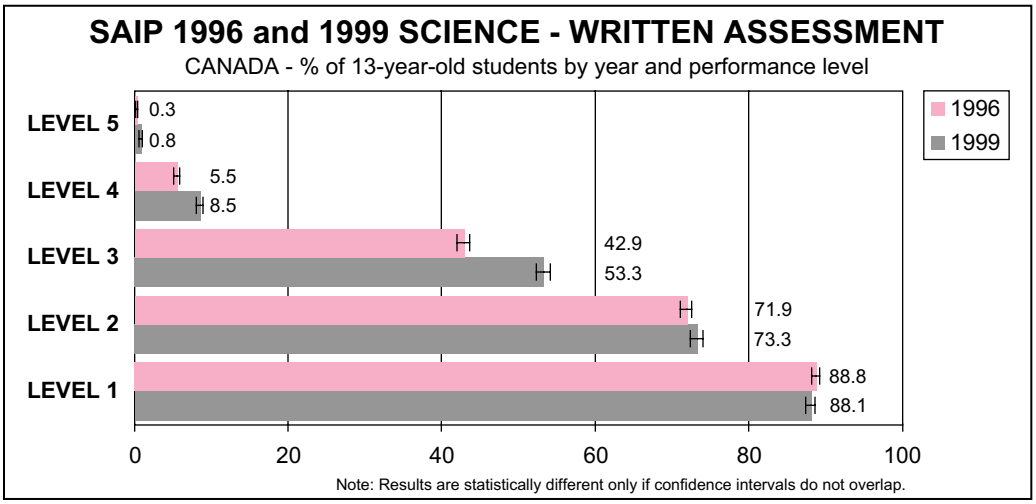
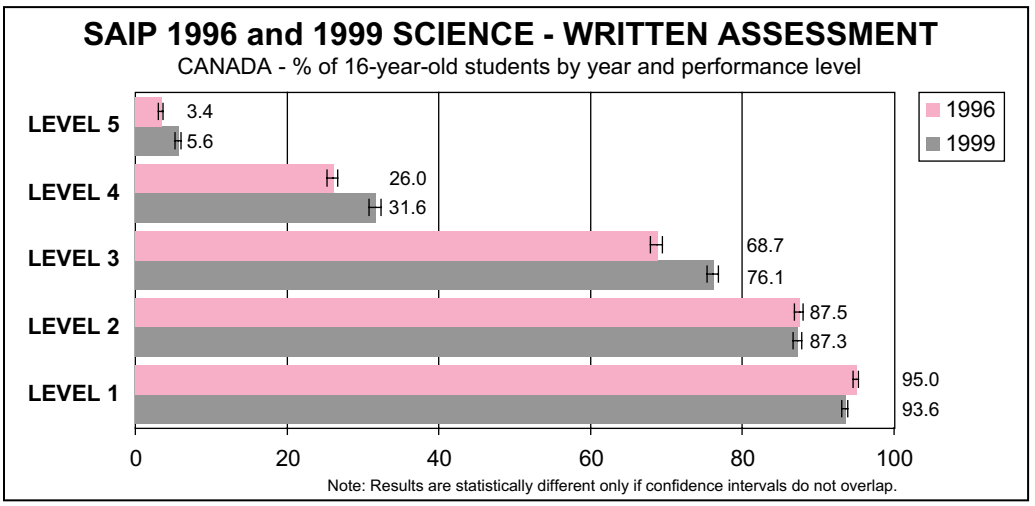


CHART 4



Practical Tasks

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

CHART 5

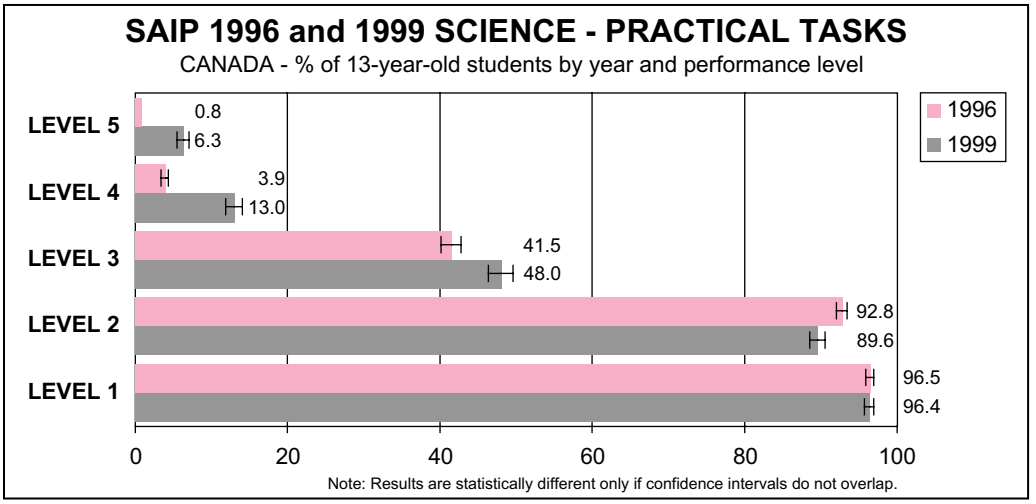
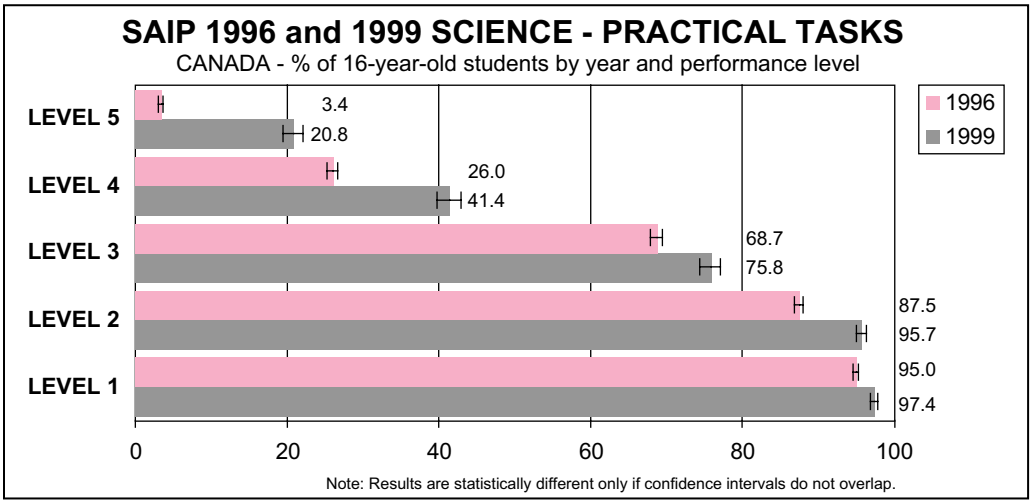


CHART 6



Achievement Differences by Gender

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

CHART 7

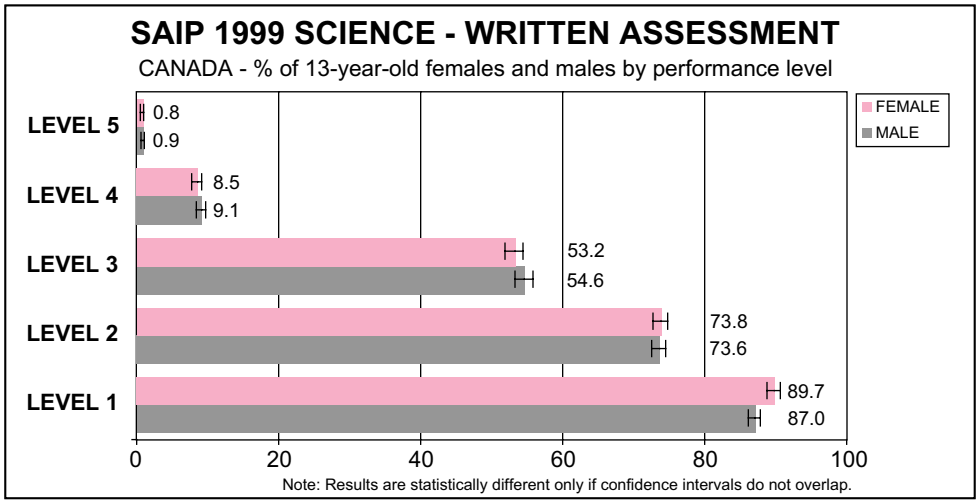
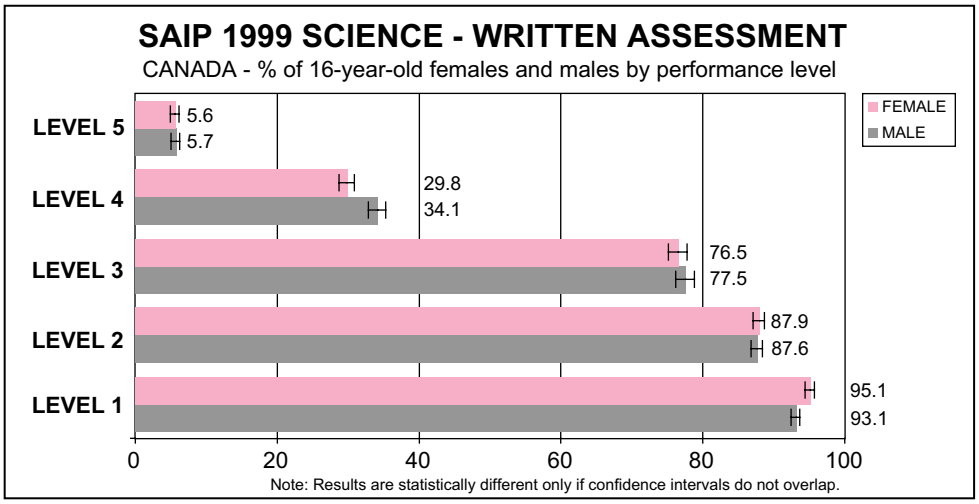


CHART 8



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

CHART 9

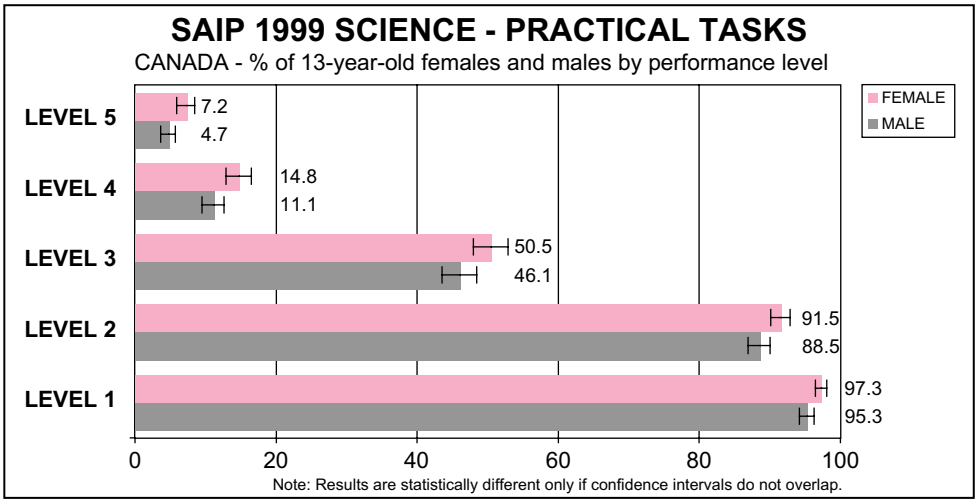
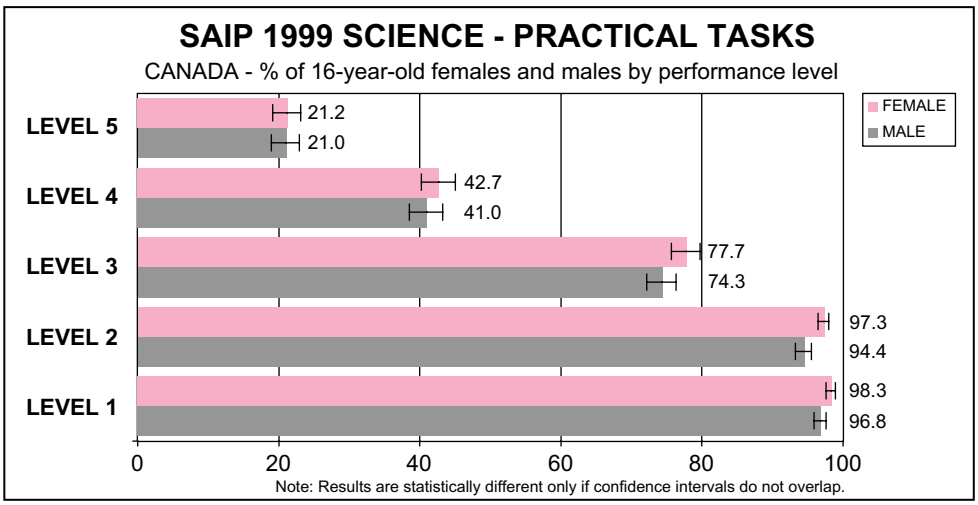


CHART 10



Achievement Differences by Language

Written Assessment

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

CHART 11

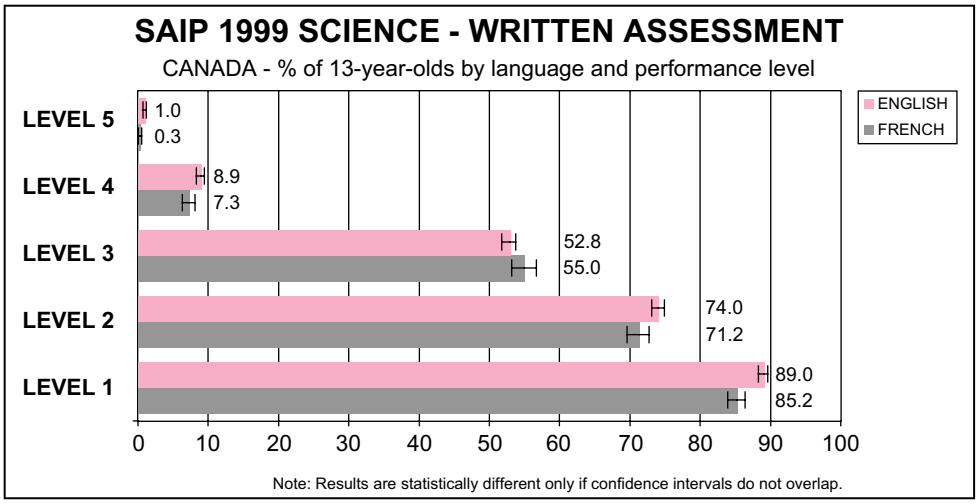
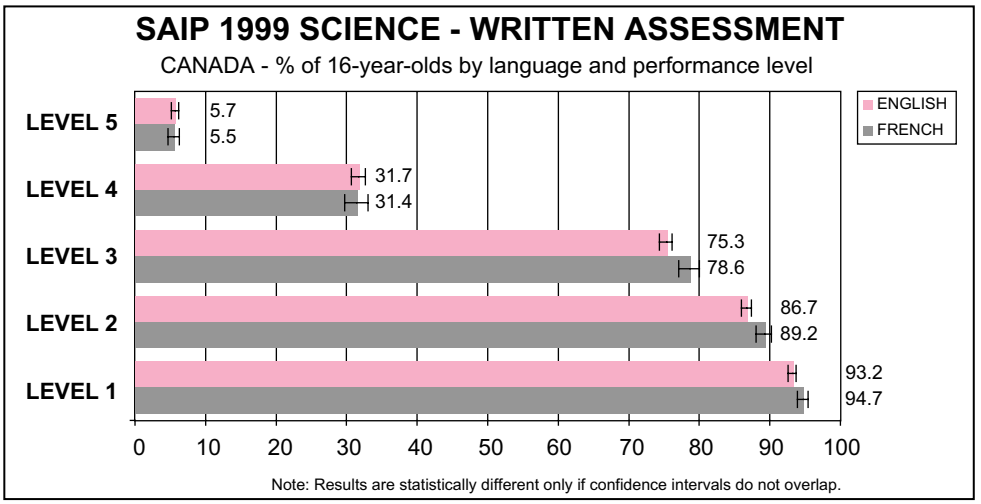


CHART 12



Practical Tasks

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

CHART 13

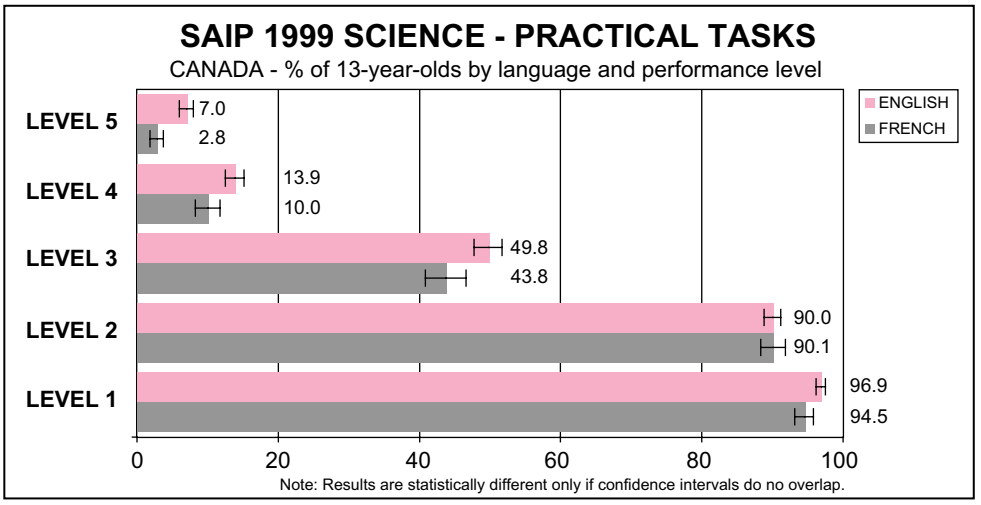
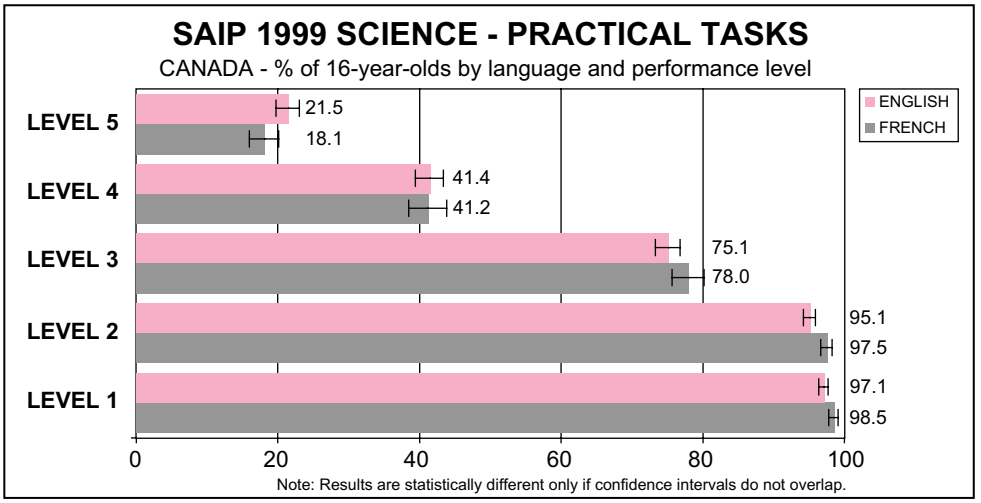


CHART 14



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

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

Pan-Canadian Expectations for Performance in Science in 1999

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

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

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

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

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

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

CHART 15

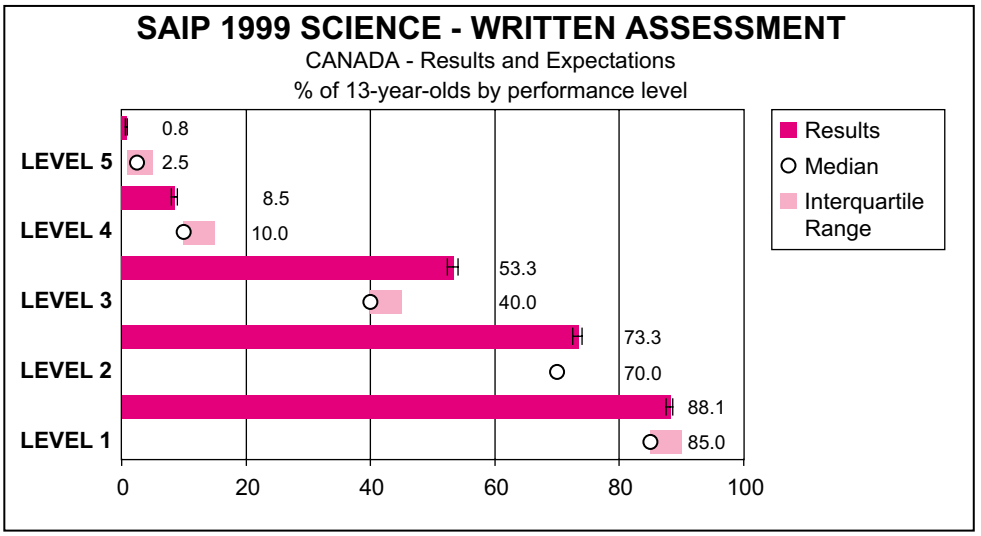


CHART 16

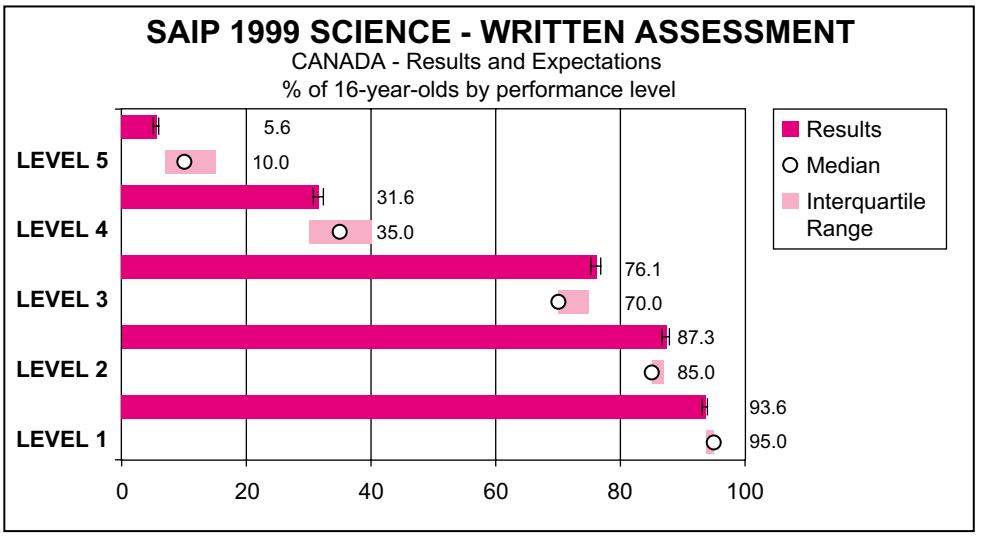


CHART 17

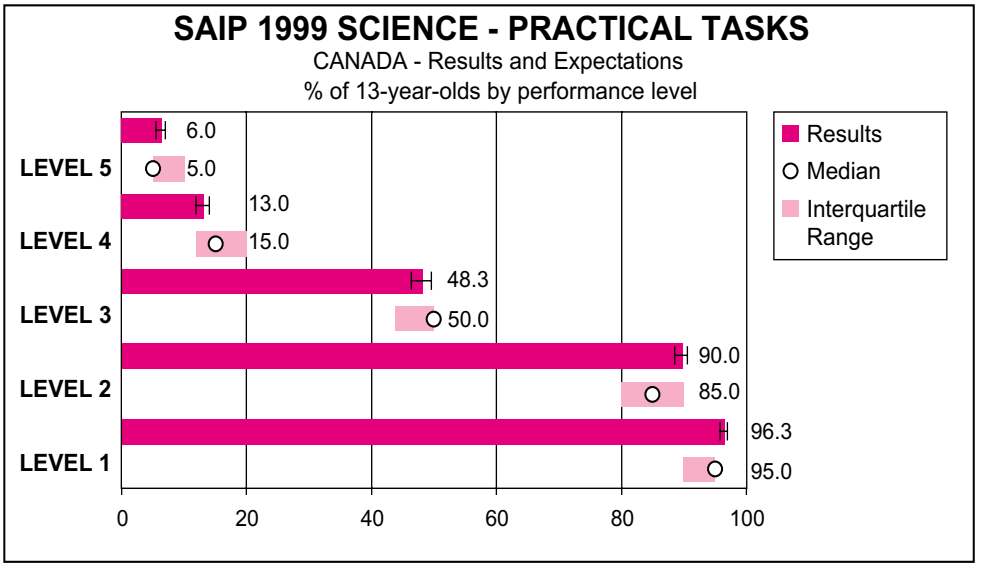


CHART 18