Trends in International Mathematics and Science Study (TIMSS)

Population 3 Final Year of Secondary School (Ontario Grade 12/OAC)

Ontario Report

February 1998

Background

- The Third International Mathematics and Science Study (TIMSS) was the largest and most ambitious study of its kind. The assessment, which was conducted in the spring of 1995 under the auspices of the International Association for the Evaluation of Educational Achievement (IEA), compared mathematics and science achievement of students in more than 40 countries.

- The study tested randomly selected samples of 9- and 13-year-olds (TIMSS Populations 1 and 2, respectively), as well as students in their final year of secondary school (TIMSS Population 3). In Ontario, Population 3 comprised students in Grade 12 and those in their Ontario Academic Course (OAC) year. The current release provides results for students in their final year of secondary school (TIMSS Population 3).

- Samples of all students enrolled in their final year of secondary school were tested in mathematics and science literacy to determine the mathematics and science knowledge that school-leavers retained and were able to apply (non-specialist students). As an additional option, countries could test two special subgroups of students—those taking advanced courses in mathematics, and those taking advanced courses in physics (specialist students).

- Specialist students were identified by the academic mathematics and science courses they had taken, or in which they were enrolled. For example, in Ontario, mathematics specialists were students who were taking or had taken both OAC Calculus and OAC Algebra/Geometry; physics specialists were students who were taking or had taken OAC Physics.

- Twenty-two countries participated in the mathematics and science literacy test; 17 countries took part in the advanced mathematics component; and 18 countries participated in the physics component of the study. Since Israel did not comply to an appropriate extent,

with the TIMSS sampling procedures, and Italy's sample of physics students was too small to derive reliable data, their results are not presented in this report.

- Canada participated as a country in all components of the assessment. Four provinces—New Brunswick (English), Ontario (French and English), Alberta and British Columbia drew sufficient student samples (over-sampled) to derive provincial data in mathematics and science literacy. Three provinces—Ontario (French and English), Alberta and British Columbia—over-sampled in the advanced mathematics and physics studies.

- The achievement test instruments for the assessment consisted of nine booklets. Two booklets contained mathematics and science literacy items; three booklets contained physics items; three booklets contained advanced mathematics items; and one booklet contained items in physics, advanced mathematics and a reasoning and social utility component of mathematics and science literacy. The test included multiple-choice, short-answer and extended-response questions.

- Each student responded to one booklet which was designed to take about 90 minutes to complete. It was expected that multiple-choice items would require about one minute each, short-answer questions would require about two minutes apiece, and extended-response questions would require about five minutes each to complete.

- In addition to responding to the achievement test instruments, each TIMSS student completed a questionnaire that contained questions about his or her attitudes towards mathematics and science, parental expectations, and out-of-school and classroom activities.

- The mathematics and science teachers of TIMSS students completed a questionnaire containing questions about teachers' preparation, instructional practices, textbook usage, and their views on issues in mathematics and science education. In addition, the principal of each school, randomly selected to participate in TIMSS, completed a questionnaire regarding school characteristics, resources, course offerings and the community.

- The results of the other TIMSS studies were released as follows: 13-year-olds (Population 2), November 1996; 9-year-olds (Population 1), June 1997; and the "hands-on" performance assessment/practical component (9- & 13-year-olds), September 1997.

- TIMSS was designed to provide information at the national level, and in the case of Canada, at the provincial level where provinces elected to over-sample. There are no individual school or school board reports.

Refer to the Appendix for further information about TIMSS and the Population 3 assessment.

This report provides selected student achievement results for Canada and for Ontario. The Ontario data should be interpreted in light of the following provincial contextual information.

Ontario Context

Social Context

At the time of the TIMSS assessment in 1995, Ontario's school boards varied markedly in their characteristics. For example, some boards, located in large urban areas, served densely populated communities, while northern district boards served relatively small numbers of students spread over wide geographic areas. About half the school boards had minority-language sections, mainly French-language, whose schools provided parallel elementary and secondary education. There were also four French-language boards in the province.

An important challenge in the provision of education programs and services relates to the diverse ethnocultural composition of Ontario's student population and the large number of children and youth from immigrant families. For example, according to Statistics Canada, in the period 1994 to 1996, Ontario directly received approximately 53% of all immigrants to Canada, and in 1996, almost 20% of young people under 15 years of age in Toronto spoke a non-official language at home, nearly 2 ½ times higher than the national average of 8%. Especially in the urban areas, there are heavy demands on schools to provide English- and French-as-a-second-language instruction, as well as community outreach services to overcome language and cultural barriers between schools and families that could affect student learning.

Mathematics and Science Teaching

Unlike the time of the TIMSS assessment the elementary mathematics and science programs that have been restructured over the past few years, at the secondary-level programs (Grades 10 to OAC) in these subject areas had undergone no revisions since the mid to late 1980s. The Ministry of Education and Training has now restructured the secondary school education, including developing new curricula for Grades 9 to 12.

At the time of the TIMSS assessment, all mathematics and science courses in secondary schools were being provided at three levels of difficulty (basic, general, and advanced) for Grades 10 through to graduation. In addition, students in Grade 9 were destreamed. Ontario Academic Courses (OACs), usually taken in the final year of secondary school, were at the advanced level of difficulty only, and were intended for university-bound students. Ideally, students and parents, in consultation with teachers, selected the level at which students would pursue mathematics and science programs in secondary school.

The mathematics and science experiences of students in their final year of secondary school in Ontario were extremely varied; some students would have taken only two mathematics and science courses up to and including Grade 10, while others would have completed one or more specialized courses at the senior-secondary level.

Participation and Comparability

Defining comparable populations in all jurisdictions participating in TIMSS was a complex process because of the varied forms of secondary education across countries. For example, in some cases, secondary education is comprehensive in that the majority of students are in the same general type of institution until they graduate at approximately 18 years of age. In other situations, there is a selective system in which there are different types of schools, such as academic, technical, and vocational schools, from which students graduate at different ages. Variation also occurs within some countries, including Canada.

In part because of the variability in secondary school education, TIMSS included studies of specialist and non-specialist students to facilitate inter-jurisdictional comparisons. In addition, a TIMSS Coverage Index (TCI) was constructed for each participating country. This index measured the proportions of the country's school-leaving age cohort that were still in school and who were identified as available to be sampled in the TIMSS assessment. Generally, countries with relatively high TCIs in the mathematics and science literacy component of the assessment (non-specialists) had comprehensive school systems and had most of their students still in school, while countries with relatively low TCIs had either fewer students in school, or had, for one reason or another (e.g., tracking), excluded some groups of students from the assessment. In theory, therefore, it was expected that countries with relatively low TCIs would perform better on the assessment than countries with higher TCIs. An examination of the various countries' achievement results and TCIs, however, revealed no obvious pattern. For example, some of the highest performing countries had TCIs that were similar to Canada's. Advanced Mathematics and Physics TIMSS Coverage Indexes were also computed to help interpret the results of students in specialist programs. Selected TCI data are presented in the Appendix.

Canada's TCIs are somewhat lower than expected. One possible explanation is that in Ontario (which comprised a significant proportion of the Canadian student sample), the students that graduated early, at the end of the first semester, were not available to be sampled for the TIMSS assessment, and were, in a sense, excluded. It should also be noted that if the early graduates happened to be of higher ability, then Ontario's and Canada's scores may have been lowered as a result.

It should also be noted that none of the Asian countries that outperformed Canada in the TIMSS mathematics and science achievement tests of 9- and 13-year-old students participated in the "final year of secondary school" assessment.

The following pages provide student achievement results for Ontario, as well as selected comparisons with other jurisdictions.

Ontario Achievement Results

Mathematics and Science Literacy:

- In mathematics and science literacy, Ontario (English) students scored the same as the Canadian, and higher than the international average.
- In mathematics and science literacy, Ontario (French) students scored lower than the Canadian average. In mathematics literacy, they scored the same as the international average; in science literacy, they scored lower than the international average.
- In mathematics and science literacy overall, only three jurisdictions (Netherlands, Sweden and Iceland) scored higher than Ontario.

Advanced Mathematics:

- In advanced mathematics overall, Ontario (English and French) students scored the same as the Canadian, and higher than the international average.
- In advanced mathematics overall, only one jurisdiction (France) scored higher than Ontario.
- In *numbers and equations*, Ontario (English and French) students scored the same as the Canadian, and higher than the international average.
- In *calculus*, Ontario (English) students scored higher than the Canadian and international averages; Ontario (French) students scored the same as the Canadian and international averages.
- In *geometry*, Ontario (English and French) students scored the same as the Canadian and international averages.

Advanced Physics:

- In advanced physics overall, Ontario (English and French) students scored the same as the Canadian, and lower than the international average.

All of the statements made in the "Ontario Achievement Results" section of this report take standard errors and confidence intervals into account. Refer to the Appendix for a description of the terms "standard error," "statistical significance," and "confidence interval".

- In advanced physics overall, seven jurisdictions (Norway, Sweden, Denmark, Russian Federation, Germany, Australia and British Columbia) scored higher than Ontario.
- In *mechanics*, Ontario (English and French) students scored the same as the Canadian average. Ontario (English) students scored the same as, and Ontario (French) students scored lower than the international average.
- In *electricity and magnetism*, Ontario (English and French) students scored the same as the Canadian average. Ontario (French) students scored the same as, and Ontario (English) students scored lower than the international average.
- In *heat*, Ontario (English and French) students scored the same as the Canadian average. Ontario (French) students scored higher than, and Ontario (English) students scored the same as the international average.
- In *wave phenomena*, Ontario (English and French) students scored the same as the Canadian and international averages.
- In *modern Physics*, Ontario (English & French) students scored the same as the Canadian and international averages.

Gender Differences:

- In mathematics and science literacy, Ontario (English and French) males outperformed females. This was also true at the national and international levels.
- In advanced mathematics, the same trend was evident; however, in *geometry*, although Ontario (French) males scored higher than females, the results were not different when statistical significance was taken into account.

- In advanced physics, Ontario (English and French) males outperformed females. This was also true at the national and international levels; however, in *electricity and magnetism* and *heat*, although Ontario (French) males scored higher than females, the results were not different when statistical significance was taken into account.

- In the *wave phenomena* component of physics, Ontario (English and French) males scored higher than females; however, the results were not different when statistical significance was taken into account. This trend was true for Canada, but not at the international level.

- Refer to the following tables for information about how the achievement of Ontario students compared with those in other jurisdictions.

Note: Canadian, provincial and overall international data are presented in the Appendix.

Tables Notes: *The mean scores, presented above, are not percentages; they are derived from internationally established scale scores, centred on a mean of 500 and a standard deviation of 100, divided by 10.*
The below groupings take standard errors (in parentheses) and confidence intervals into account. Refer to the Appendix for a description of the terms "standard error," "statistical significance," and "confidence interval."
Jurisdictions where student samples failed to meet international guidelines for participation are shown in italics. Canada and the provinces that drew sufficient student samples to report provincially are shown in bold type.
"(E)" and "(F)" refer to English and French, respectively.
Canadian, provincial and overall international data, by gender, are presented in the Appendix.

Mathematics and Science Literacy Overall

Jurisdictions scoring **higher** than Ontario	Jurisdictions scoring the **same** as Ontario	Jurisdictions scoring **lower** than Ontario
Sweden 55.5 (0.4)	**Ontario (E) 52.5 (0.5)**	**Ontario (F) 48.8 (0.3)**
Iceland 54.1 (0.2)	**New Brunswick (E) 50.1 (0.8)**	Hungary 47.7 (0.3)
Netherlands 55.9 (0.5)	**Alberta 52.7 (1.4)**	Russian Federation 47.6 (0.6)
	British Columbia 51.7 (0.4)	Czech Republic 47.6 (1.1)
	***Canada* 52.6 (0.3)**	Lithuania 46.5 (0.6)
	Switzerland 53.1 (0.5)	Cyprus 44.7 (0.3)
	New Zealand 52.5 (0.5)	*France* 50.5 (0.5)
	Australia 52.5 (1.0)	*Italy* 47.5 (0.5)
	Austria 51.9 (0.5)	*United States* 47.1 (0.3)
	Norway 53.6 (0.4)	*Germany* 49.6 (0.5)
	Denmark 52.8 (0.3)	*South Africa* 35.2 (0.9)
	Slovenia 51.4 (0.8)	

Average	
International	**50.0 (0.1)**
Canadian	**52.6 (0.3)**
Ontario Overall	**52.4 (0.4)**

Mathematics Literacy

Jurisdictions scoring higher than Ontario	Jurisdictions scoring the same as Ontario	Jurisdictions scoring lower than Ontario
Sweden 55.2 (0.4)	**Ontario (E) 52.1 (0.5)**	**Ontario (F) 49.2 (0.4)49**
Denmark 54.7 (0.3)	**Alberta 51.5 (1.6)**	**New Brunswick (E)48.9 (0.8)**
Netherlands 56.0 (0.5)	**British Columbia 50.9 (0.4)**	Hungary 48.3 (0.3)
	***Canada* 51.9 (0.3)**	Russian Federation 47.1 (0.6)
	Switzerland 54.0 (0.6)	Lithuania 46.9 (0.6)
	New Zealand 52.2 (0.5)	Czech Republic 46.6 (1.2)
	Australia 52.2 (0.9)	Cyprus 44.6 (0.3)
	Austria 51.8 (0.5)	*Italy* 47.6 (0.6)
	France 52.3 (0.5)	*United States* 46.1 (0.3)
	Iceland 53.4 (0.2)	*Germany* 49.5 (0.6)
	Norway 52.8 (0.4)	*South Africa* 35.6 (0.8)
	Slovenia 51.2 (0.8)	

Average	
International	**50.0 (0.2)**
Canadian	**51.9 (0.3)**
Ontario Overall	**52.0 (0.5)**

Science Literacy

Jurisdictions scoring **higher** than Ontario	Jurisdictions scoring the **same** as Ontario	Jurisdictions scoring **lower** than Ontario
Sweden 55.9 (0.4)	**Ontario (E) 52.9 (0.5)**	**Ontario (F)48.4 (0.3)**
Iceland 54.9 (0.2)	**New Brunswick (E) 51.2 (0.7)**	Czech Republic 48.7 (0.9)
Netherlands 55.8 (0.5)	**Alberta 53.8 (1.3)**	Russian Federation 48.1 (0.6)
	British Columbia 52.4 (0.4)	Hungary 47.1 (0.3)
	***Canada* 53.2 (0.3)**	Lithuania 46.1 (0.6)
	New Zealand 52.9 (0.5)	Cyprus 44.8 (0.3)
	Switzerland 52.3 (0.5)	*France* 48.7 (0.5)
	Australia 52.7 (1.0)	*Italy* 47.5 (0.5)
	Austria 52.0 (0.6)	*United States* 48.0 (0.3)
	Norway 54.4 (0.4)	*Germany* 49.7 (0.5)
	Slovenia 51.7 (0.8)	*Denmark* 50.9 (0.4)
		South Africa 34.9 (1.1)

Average	
International	**50.0 (0.2)**
Canadian	**53.2 (0.3)**
Ontario Overall	**52.8 (0.5)**

Advanced Mathematics Overall

Jurisdictions scoring higher than Ontario	Jurisdictions scoring the same as Ontario	Jurisdictions scoring lower than Ontario
France 55.7 (0.4)	**Ontario (E) 52.8 (0.8)** **Ontario (F) 51.3 (0.5)** **Alberta 52.5 (0.9)** **Canada 50.9 (0.4)** Russian Federation 53.3 (1.1) Switzerland 53.3 (0.5) Cyprus 51.8 (0.4) Lithuania 51.6 (0.3) Greece 51.3 (0.6) Sweden 51.2 (0.4) *Australia*52.5 (1.2) *Denmark* 52.2 (0.3)	**British Columbia 47.1 (0.6)** Czech Republic 46.9 (1.1) Germany 46.5 (0.6) *Austria* 43.6 (0.7) *Italy* 47.4 (1.0) *United States* 44.2 (0.6) *Slovenia* 47.5 (0.9)

Average	
International	**50.0 (0.1)**
Canadian	**50.9 (0.4)**
Ontario Overall	**52.8 (0.8)**

Advanced Physics Overall

Jurisdictions scoring **higher** than Ontario	Jurisdictions scoring the **same** as Ontario	Jurisdictions scoring **lower** than Ontario
British Columbia 51.2 (0.6)	**Ontario (E) 48.5 (0.5)**	Czech Republic 45.1 (0.6)
Norway 58.1 (0.7)	**Ontario (F) 48.0 (0.6)**	*Austria* 43.5 (0.6)
Sweden 57.3 (0.4)	**Alberta 49.7 (0.7)**	*United States* 42.3 (0.3)
Russian Federation 53.2 (1.5)	**Canada 48.5 (0.3)**	
Germany 52.2 (1.2)	Cyprus 49.4 (0.6)	
Australia 51.8 (0.6)	Latvia 48.8 (2.2)	
Denmark 53.4 (0.4)	Switzerland 48.8 (0.4)	
	Greece 48.6 (0.6)	
	France 46.6 (0.4)	
	Slovenia 52.3 (1.6)	

Average	
International	**50.0 (0.1)**
Canadian	**48.5 (0.3)**
Ontario Overall	**48.4 (0.5)**

Appendix

Questions and Answers

What is TIMSS?

TIMSS, the Third International Mathematics and Science Study, was the largest and most ambitious study of its kind. It was conducted in the spring of 1995 under the auspices of the International Association for the Evaluation of Educational Achievement (IEA).

Why is TIMSS important?

The study is important because it compared mathematics and science achievement in different countries. It also described how countries differ in teaching methods and curricula, and provided valuable information to form the basis for improvement.

What countries and provinces participated in the study?

Altogether, TIMSS tested more than half a million students in 15 000 schools in 40 countries worldwide. In Population 3 (the assessment of students in their final year of secondary school), 22 countries participated in the mathematics and science literacy test; 17 countries participated in the advanced mathematics component; and 18 countries took part in the physics component of the study. However, since Israel did not comply, to an appropriate extent, with the TIMSS sampling procedures, and Italy's sample of physics students was too small to derive reliable data, their results are not presented in this report.

Canada participated as a country in all components of the assessment. Four provinces— New Brunswick (English), Ontario (French and English), Alberta and British Columbia drew sufficient student samples (over-sampled) to derive provincial data in mathematics and science literacy. Three provinces—Ontario (French and English), Alberta and British Columbia—over-sampled in the advanced mathematics and physics studies.

Who took the TIMSS tests?

The tests were completed by randomly selected samples of 9-year-old students in Grades 3 and 4 (Population 1), 13-year-old students in Grades 7 and 8 (Population 2) and students in their final year of secondary school—in Ontario, Grade 12/OAC (Population 3).

For Population 3, samples of all students enrolled in their final year of secondary school were tested in mathematics and science literacy to determine the mathematics and science knowledge school-leavers retained and were able to apply (these were considered to be non-specialist students). As an additional option, countries could test two special subgroups of students—those taking advanced courses in mathematics, and those taking advanced courses in physics (these were considered to be specialist students).

How was the test developed?

The TIMSS tests were developed in a collaborative effort involving all of the countries' national research coordinators. All participating countries were given an opportunity to submit test questions/items which were reviewed by subject specialists. Where necessary, additional items were written to ensure that the desired mathematics and science topics were covered adequately. The test materials were then pilot tested, modified and re-tested to ensure they were of high technical quality.

What was the Population 3 test like?

The achievement test instruments for the assessment consisted of nine booklets. Two booklets contained mathematics and science literacy items; three booklets contained physics items; three booklets contained advanced mathematics items; and one booklet contained items in physics, advanced mathematics and a reasoning and social utility component of mathematics and science literacy. The test included multiple-choice, short-answer and extended-response questions.

Each student responded to one booklet which was designed to take about 90 minutes to complete. It was expected that multiple-choice items would require about one minute each, short-answer questions would require about two minutes apiece and extended-response questions would require about five minutes each to complete.

In addition to responding to the achievement test instruments, each TIMSS student completed a questionnaire that contained questions about his or her attitudes towards mathematics and science, parental expectations, and out-of-school and classroom activities. The mathematics and science teachers of TIMSS students also completed a questionnaire containing questions about teachers' preparation, instructional practices, textbook usage and their views on issues in mathematics and science education. In addition, the principal of each school, randomly selected to participate in TIMSS, completed a questionnaire regarding school characteristics, resources, course offerings and the community.

How many Ontario schools and students participated in the TIMSS study?

The numbers of Ontario students and schools that participated were as follows:

ONTARIO PARTICIPANTS IN THE TIMSS TEST						
Language	Grades 3 and 4		Grades 7 and 8		Final Secondary	
	Students	Schools	Students	Schools	Students	Schools
English	5,029	120	5,437	120	3,074	108
French	3,480	94	2,954	80	1,120	60

A total of 21,094 students participated.

For the performance assessment component (which was administered to Populations 1 & 2 only), 33 English-Language schools (1,188 students) and 26 French-Language schools (858 students) participated.

Was the test fair for Ontario students?

All countries had an opportunity to submit test items, and to review the test items for curriculum appropriateness. Every attempt was made to develop a test that was as fair as possible. However, having said this, there was some negotiating of test items, and not all items were curriculum-appropriate for all jurisdictions.

TIMSS conducted a curriculum-test-match analysis whereby the test was examined to identify items that measured topics not addressed in countries' curricula. An analysis of these data together with achievement scores showed that omitting such items for each country had little effect on the overall pattern of achievement results across all countries.

It is important to note, however, that the curriculum-test match was conducted by each country/province independently, and that the criteria applied may have varied from one jurisdiction to another.

Curriculum-test-match data for advanced mathematics and physics are presented below. A curriculum-test match was not conducted for the mathematics and science literacy component, since it was not intended to be linked to formal curricula.

CURRICULUM-TEST MATCH (Number of Items Matching the Curricula)		
	Advanced Mathematics	Physics
Total Number of Items	65	65
Canada	54	49
Ontario	60	51
Alberta	52	59
British Columbia	45	45

What is meant by the terms "standard error" and "confidence intervals"?

The TIMSS data are based on the achievement results of samples of students. Therefore, just like in a poll, the TIMSS results are estimates of how the province would perform if all students at the particular age/grade level attempted the assessment. This means that every result has a published standard error of measurement that has been taken into account when we say provinces' or countries' scores are higher, lower, or the same as Ontario's.

To calculate the confidence interval (or the range of scores within which the actual score is expected to fall 19 times out of 20), one must add and subtract 2 (1.96) standard errors from every result. If jurisdictions' confidence intervals overlap, this means there is no statistically significant difference in student performance.

Were student samples drawn the same way in all participating countries?

Having valid and efficient samples of students in each country is crucial to the quality and reliability of any international comparative study. The accuracy of the results depends on the quality of sampling. TIMSS developed procedures and guidelines to ensure that the national/provincial samples were of the highest possible quality. Standards for coverage of the target population, participation rates and age of students were established, as were clearly documented procedures on how to obtain the samples. For the most part, national samples were drawn in accordance with the TIMSS standards, and achievement results can be compared with confidence. However, despite efforts to meet the TIMSS specifications, some countries did not do so. In these cases, countries are specially annotated as not conforming to sampling procedures and their data must be interpreted with caution. In extreme cases, countries' achievement data have not been reported.

What was the schedule for the release of the TIMSS results?

The 13-year-old results (Grades 7 and 8 written component) were released internationally in November, 1996; the 9-year-old results (Grades 3 and 4 written component) were released in June, 1997; the performance assessment results (9- and 13-year-olds) were released in September, 1997; and the final year of secondary results were released in February, 1998.

Will there be results for schools and school boards?

TIMSS is designed to provide information at the national level only, and in the case of Canada, at the provincial level, where provinces opted to over-sample. There are no individual school or school board reports.

Can the French and English results be compared?

In Ontario, results are reported for the province as a whole, and for French and English separately. It is possible to compare the results. All items used in the study were written in English first, then translated into the various languages. When the student responses were scored, there was extensive quality control to ensure marking was conducted consistently in English and in French.

Were expectations established for student performance?

Unlike the Council of Ministers of Education, Canada's (CMEC) School Achievement Indicators Project (SAIP) national assessments of 13- and 16-year-old students in mathematics, reading and writing, and science, expectations (e.g., proportions of students attaining various levels of achievement) were not established for student performance in the TIMSS Project.

How will the results be used?

The education community, including ministries of education, school boards and teachers will reflect on the implications of TIMSS results for their mathematics and science programs. The findings have the potential to provide direction for the development and modification of curriculum in mathematics and science, and for improvement of teaching practices and teacher education.

Through comparisons within Canada and with other countries, a perspective can be gained on the extent to which the systems function well in meeting their goals for mathematics and science education. By analyzing all the background information and relating it to student achievement, information can be deduced about why student performance is strong or weak in certain areas.

Following the release of the Population 2 (13-year-old written component) data in November 1996, EQAO made numerous recommendations to organizations such as the Ministry of Education and Training and Ontario's faculties of education. In addition, as a follow-up to that same release, EQAO commissioned research on topics such as curriculum content, teaching practices, teacher education, curriculum-test match, background variables associated with student performance and the Francophone results. Data and recommendations from these studies will be disseminated to appropriate Ontario groups and organizations so that improvements can be made.

Can the TIMSS results be compared with the national SAIP results in mathematics and science?

It is difficult to make direct comparisons between the 1995 TIMSS and 1996 SAIP Science and 1997 SAIP mathematics assessments because the test items differed, and one project (TIMSS) reported student performance using percent correct and scale scores, while the other project (SAIP) reported the proportions of students achieving at each of five performance levels. However, the provinces that over-sampled in the TIMSS project will be able to compare their relative performance on the test with their performance on the SAIP assessment.

Data Tables

Notes: *N/A = Data not available*

The TCI is an estimate of the percentage of the school-leaving age cohort covered by the TIMSS final-year student sample. It is computed by forming a ratio of the size of the student population covered by the TIMSS sample and the size of the school-leaving age cohort which was obtained from official population census figures supplied by each jurisdiction.

TIMSS Coverage Index (TCI)
Mathematics and Science Literacy

Country	TCI	Country	TCI	Province	TCI
Sweden	71%	France	84%	New Brunswick (E)	74%
Switzerland	82%	Iceland	55%	**Ontario**	**78%**
New Zealand	70%	Italy	52%	Alberta	77%
Hungary	65%	Norway	84%	British Columbia	81%
Russian Federation	48%	United States	63%		
Czech Republic	78%	Germany	N/A		
Lithuania	43%	Denmark	58%		
Cyprus	48%	Netherlands	78%		
Australia	68%	Slovenia	88%		
Austria	76%	South Africa	49%		
Canada	**70%**				

Mathematics TIMSS Coverage Index (MTCI)
Advanced Mathematics

Country	TCI	Country	TCI	Province	TCI
France	20%	Czech Republic	11%	**Ontario**	**15%**

Russian Federation	2%	Germany	N/A	Alberta	12%
Switzerland	14%	Australia	16%	British Columbia	35%
Cyprus	9%	Austria	33%		
Lithuania	3%	Italy	14%		
Greece	10%	United States	14%		
Sweden	16%	Denmark	21%		
Canada	**16%**	Slovenia	75%		

Physics TIMSS Coverage Index (MTCI)
Advanced Physics

Country	TCI	Country	TCI	Province	TCI
Norway	8%	**Canada**	**14%**	**Ontario**	**15%**
Sweden	16%	France	20%	Alberta	16%
Russian Federation	2%	Czech Republic	11%	British Columbia	13%
Germany	N/A	Australia	33%		
Cyprus	9%	Austria	13%		
Latvia (Latvian-speaking schools)	3%	United Sates	14%		
Switzerland	14%	Denmark	3%		
Greece	10%	Slovenia	39%		

Population 3

Notes: *Standard error statistics are reported in parentheses.*

The mean scores are not percentages; they were derived from internationally established scale scores, centred on a mean of 500 and a standard deviation of 100, and divided by 10.

Mathematics and Science Literacy Overall (Canadian, provincial, and international results)

Jurisdiction	All Students (mean score)	Females (mean score)	Males (mean score)
New Brunswick (E)	50.1 (0.8)	49.1 (0.9)	51.0 (0.9)
Ontario (Overall) **(French)** **(English)**	**52.4 (0.4)** **48.8 (0.3)** **52.5 (0.5)**	**50.5 (0.5)** **47.2 (0.5)** **50.6 (0.6)**	**54.6 (0.5)** **50.5 (0.5)** **54.8 (0.5)**
Alberta	52.7 (1.4)	49.9 (2.3)	55.8 (0.6)
British Columbia	51.7 (0.4)	50.7 (0.5)	52.6 (0.4)
Canada	52.6 (0.3)	51.1 (0.3)	54.4 (0.3)
International	50.0 (0.1)	48.3 (0.2)	51.9 (0.2)

Mathematics Literacy (Canadian, provincial, and international results)

Jurisdiction	All Students (mean score)	Females (mean score)	Males (mean score)
New Brunswick (E)	48.9 (0.8)	48.1 (1.1)	49.8 (1.0)
Ontario (Overall) **(French)** **(English)**	**52.0 (0.5)** **49.2 (0.4)** **52.1 (0.5)**	**49.9 (0.6)** **47.5 (0.6)** **50.0 (0.6)**	**54.5 (0.6)** **51.0 (0.6)** **54.6 (0.6)**
Alberta	51.5 (1.6)	48.7 (2.5)	54.7 (0.7)
British Columbia	50.9 (0.4)	50.1 (0.5)	51.7 (0.5)
Canada	51.9 (0.3)	50.4 (0.3)	53.7 (0.4)
International	50.0 (0.2)	48.5 (0.2)	51.8 (0.2)

Science Literacy (Canadian, provincial, and international results)

Jurisdiction	All Students	Females	Males

	(mean score)	(mean score)	(mean score)
New Brunswick (E)	51.2 (0.7)	50.1 (0.8)	52.3 (0.9)
Ontario (Overall) **(French)** **(English)**	**52.8 (0.5)** **48.4 (0.3)** **52.9 (0.5)**	**51.1 (0.6)** **46.8 (0.5)** **51.2 (0.6)**	**54.8 (0.5)** **50.0 (0.6)** **55.0 (0.6)**
Alberta	53.8 (1.3)	51.1 (2.1)	56.8 (0.5)
British Columbia	52.4 (0.4)	51.4 (0.5)	53.5 (0.4)
Canada	53.2 (0.3)	51.8 (0.4)	55.0 (0.4)
International	50.0 (0.2)	48.2 (0.2)	52.1 (0.2)

Advanced Mathematics Overall
(Canadian, Provincial, and International Results)

Jurisdiction	All Students (mean score)	Females (mean score)	Males (mean score)
Ontario (Overall) **(French)** **(English)**	**52.8 (0.8)** **51.3 (0.5)** **52.8 (0.8)**	**50.1 (0.7)** **48.9 (1.1)** **50.2 (0.8)**	**54.5 (1.0)** **53.0 (0.6)** **54.6 (1.1)**
Alberta	52.5 (0.9)	50.6 (0.8)	54.4 (1.3)
British Columbia	47.1 (0.6)	45.7 (0.7)	48.5 (0.9)
Canada	50.9 (0.4)	48.9 (0.4)	52.8 (0.6)
International	50.0 (0.1)	48.2 (0.2)	51.8 (0.2)

Advanced Mathematics Numbers and Equations
Canadian, Provincial, and International Results)

Jurisdiction	All Students (mean score)	Females (mean score)	Males (mean score)
Ontario (Overall) **(French)** **(English)**	**52.8 (0.7)** **51.4 (0.4)** **52.9 (0.7)**	**50.5 (0.7)** **49.5 (0.7)** **50.5 (0.7)**	**54.4 (0.9)** **52.8 (0.5)** **54.4 (1.0)**
Alberta	52.9 (0.6)	51.4 (0.6)	54.3 (1.0)
British Columbia	47.8 (0.6)	46.8 (0.7)	48.7 (0.9)
Canada	51.2 (0.4)	49.6 (0.4)	52.6 (0.6)
International	50.0 (0.2)	48.5 (0.2)	51.6 (0.2)

Advanced Mathematics Calculus (Canadian, Provincial, and International Results)			
Jurisdiction	All Students (mean score)	Females (mean score)	Males (mean score)
Ontario (Overall) **(French)** **(English)**	**52.5 (0.6)** **51.3 (0.5)** **52.5 (0.6)**	**50.1 (0.7)** **49.3 (0.9)** **50.1 (0.7)**	**54.1 (0.9)** **52.7 (0.7)** **54.1 (0.9)**
Alberta	53.1 (0.6)	51.1 (0.6)	55.1 (1.0)
British Columbia	47.0 (0.7)	45.8 (0.8)	48.3 (1.0)
Canada	50.3 (0.4)	48.4 (0.5)	52.1 (0.5)
International	50.0 (0.2)	48.6 (0.2)	51.5 (0.2)

Advanced Mathematics Geometry (Canadian, Provincial, and International Results)			
Jurisdiction	All Students (mean score)	Females (mean score)	Males (mean score)
Ontario (Overall) **(French)** **(English)**	**51.4 (0.6)** **50.3 (0.6)** **51.4 (0.6)**	**49.2 (0.7)** **48.4 (0.9)** **49.2 (0.8)**	**52.9 (0.9)** **51.7 (0.8)** **52.9 (0.9)**
Alberta	49.6 (0.7)	48.4 (0.8)	50.9 (1.1)
British Columbia	47.0 (0.6)	45.8 (0.8)	48.2 (0.8)
Canada	49.9 (0.4)	48.0 (0.5)	51.6 (0.5)
International	50.0 (0.2)	48.4 (0.2)	51.6 (0.2)

Advanced Physics Overall (Canadian, Provincial, and International Results)			
Jurisdiction	All Students (mean score)	Females (mean score)	Males (mean score)
Ontario (Overall) **(French)** **(English)**	**48.4 (0.5)** **48.0 (0.6)** **48.5 (0.5)**	**45.2 (0.6)** **45.7 (0.9)** **45.2 (0.6)**	**50.4 (0.7)** **49.5 (0.7)** **50.4 (0.7)**
Alberta	49.7 (0.7)	46.7 (0.7)	51.4 (1.0)
British Columbia	51.2 (0.6)	48.2 (0.7)	52.8 (0.7)
Canada	48.5 (0.3)	45.9 (0.6)	50.6 (0.6)

International	50.0 (0.1)	46.8 (0.2)	52.2 (0.2)

Advanced Physics Mechanics
(Canadian, Provincial, and International Results)

Jurisdiction	All Students (mean score)	Females (mean score)	Males (mean score)
Ontario (Overall) **(French)** **(English)**	**48.3 (0.6)** **46.1 (0.5)** **48.4 (0.6)**	**44.5 (0.6)** **43.0 (0.8)** **44.6 (0.6)**	**50.7 (0.9)** **48.2 (0.6)** **50.8 (0.9)**
Alberta	48.3 (0.6)	44.6 (0.7)	50.4 (0.9)
British Columbia	51.1 (0.6)	47.7 (0.9)	52.8 (0.6)
Canada	47.3 (0.4)	44.0 (0.6)	49.9 (0.7)
International	50.0 (0.2)	46.5 (0.3)	52.4 (0.2)

Advanced Physics Electricity and Magnetism
(Canadian, Provincial, and International Results)

Jurisdiction	All Students (mean score)	Females (mean score)	Males (mean score)
Ontario (Overall) **(French)** **(English)**	**47.4 (0.5)** **48.8 (0.5)** **47.4 (0.5)**	**45.1 (0.6)** **47.3 (0.8)** **45.0 (0.6)**	**48.8 (0.7)** **49.7 (0.7)** **48.8 (0.7)**
Alberta	48.6 (0.6)	46.8 (0.8)	49.7 (0.9)
British Columbia	50.6 (0.5)	47.9 (0.7)	52.0 (0.6)
Canada	48.5 (0.4)	46.8 (0.6)	49.7 (0.6)
International	50.0 (0.2)	48.2 (0.2)	51.4 (0.2)

Advanced Physics Heat
(Canadian, Provincial, and International Results)

Jurisdiction	All Students (mean score)	Females (mean score)	Males (mean score)
Ontario (Overall) **(French)** **(English)**	**50.5 (0.6)** **52.3 (0.7)** **50.4 (0.6)**	**48.5 (0.6)** **50.9 (0.9)** **48.4 (0.6)**	**51.7 (0.8)** **53.2 (0.9)** **51.6 (0.9)**
Alberta	52.4 (0.7)	51.2 (0.9)	52.9 (0.7)
British Columbia	52.4 (0.4)	50.5 (0.7)	53.3 (0.4)

Canada	50.8 (0.4)	49.2 (0.8)	52.0 (0.5)
International	50.0 (0.2)	47.8 (0.3)	51.5 (0.2)

Advanced Physics Wave Phenomena
(Canadian, Provincial, and International Results)

Jurisdiction	All Students (mean score)	Females (mean score)	Males (mean score)
Ontario (Overall) **(French)** **(English)**	**48.7 (0.5)** **48.8 (0.4)** **48.7 (0.5)**	**47.4 (0.6)** **48.0 (0.7)** **47.4 (0.6)**	**49.4 (0.7)** **49.3 (0.6)** **49.4 (0.8)**
Alberta	50.0 (0.6)	48.0 (0.7)	51.1 (0.9)
British Columbia	49.4 (0.5)	46.9 (0.6)	50.7 (0.5)
Canada	48.8 (0.3)	47.7 (0.6)	49.7 (0.4)
International	50.0 (0.2)	47.2 (0.2)	51.9 (0.2)

Advanced Physics Modern Physics
(Canadian, Provincial, and International Results)

Jurisdiction	All Students (mean score)	Females (mean score)	Males (mean score)
Ontario (Overall) **(French)** **(English)**	**49.5 (0.4)** **48.6 (0.5)** **49.6 (0.4)**	**47.0 (0.5)** **46.2 (0.8)** **47.0 (0.5)**	**51.1 (0.5)** **50.4 (0.7)** **51.2 (0.5)**
Alberta	51.3 (0.6)	48.5 (0.7)	52.8 (0.9)
British Columbia	51.6 (0.6)	49.2 (0.8)	52.8 (0.6)
Canada	49.4 (0.3)	47.1 (0.5)	51.3 (0.6)
International	50.0 (0.2)	47.6 (0.3)	51.7 (0.2)