The Third International Mathematics and Science Study

The achievement of Canada's high school students is fairly strong.

By Thomas Schweitzer

The results for the final year of high school in the Third International Mathematics and Science Study (TIMSS), conducted in 1995 and reported in 1998, are of particular interest to Canada. Our country has participated in numerous international studies of educational achievement, but most of these related to younger age groups.

International comparisons of student achievement are difficult, due to the voluntary nature of participation and the difficulty of obtaining statistically-appropriate samples of students. Thus, the results of any single study should be treated with great caution.

Following the SIMS and SISS, there was some debate as to whether all participating countries had followed the approved sampling procedures. In the TIMSS, particular attention was paid to this contentious issue and, in the rest of this report, I restrict my investigation to the countries which adopted approved sampling procedures.

In the Second Mathematics and Science Studies (SIMS and SISS) which was carried out about 15 years ago, Canada did poorly, even after adjustment for the relatively high retention rates of our schools. Only two provinces participated in SIMS, and out of 14 industrialized jurisdictions, one placed 10th (Ontario) and one 12th (BC). In SISS, Canada placed 11th out of 13 jurisdictions.

Until recently, this was the only information we had on the international performance of our final year students in math and science. The TIMSS, fortunately, paints a rosier picture.

One of the problems of testing school-leavers concerns the issue of selectivity. In Austria, 33% of the school-leaving cohort takes advanced math; in the Russian Federation, only 2% does. It is quite likely that this top 2% receives a more intensive and enriched curriculum than countries with less selective policies. (Canada is very close to the international average of 15%.)

In order to obtain more validly comparable international figures, TIMSS calculated the average achievement of the best 10% of each qualifying country's school-leaving age cohort. Only 11 countries met the sampling requirements and had at least 10% of their young people still in school **and** taking advanced math.

Advanced Mathematics
Mean Score of the Top 10%

1.	France	612
2.	Australia	589
3.	Switzerland	575
4.	Canada	567
5.	Sweden	564
6.	Germany	550
7.	Austria	537
8.	Italy	520
9.	Greece	513
10.	United States	485
11.	Czech Republic	485

SISS tested the school-leaving age students in physics, chemistry and biology. TIMSS tested only in physics. Here again, the coverage of the school-leaving age cohort varies widely, with Canada close to the international average of 13%. Only nine countries had enough students in physics to enable TIMSS to calculate the achievement of the top 10%.

Physics
Mean Score of the Top 10%

1.	Sweden	630
2.	Australia	547
3.	Austria	532
4.	Switzerland	528
5.	Canada	522
6.	France	518
7.	Greece	486
8.	Czech Republic	464
9.	United States	451

In addition to the advanced mathematics and physics testing, a sample of all students in their final year was also tested on their mathematics and science literacy. Once more, the selectivity of the various school systems varies widely. TIMSS estimates that the coverage of the school-leaving age cohort varied from a low of 48% in the case of Cyprus to a high of 84% in the case of Norway and France. (Canada's rate was 70%, slightly above the international rate of 66%.)

Math and Science Literacy
Mean Score of the Top 25%

1.	Sweden	654
2.	Norway	641
3.	Switzerland	633
4.	New Zealand	621
5.	Australia	620
6.	Canada	613
7.	Austria	610
8.	Iceland	609
9.	France	592
10.	Czech Republic	584
11.	Hungary	563
12.	United States	559
13.	Italy	543
14.	Russian Federation	539
15.	Lithuania	519
16.	Cyprus	501

On the whole, Canada's performance in TIMSS was considerably better than it was in SIMS and SISS. Of course, we must remember that Japan, Hong Kong and Singapore, who led the pack in the previous studies, chose not to participate in this part of TIMSS. It should also be noted that the students of most countries participating in TIMSS had received 11 or 12 years of school. Ontario and Quebec (that is, more than half of Canada's participating students) had had 13 years of schooling (OAC and the second year of CEGEP).

(Dr. Schweitzer was Senior Economist with the Economic Council of Canada from 1964 to 1992. He is the author of* The State of Education in Canada, *as well as OQE's backgrounders #3 and #4 which provide information on international and inter-provincial comparisons of student achievement.)