CHAPTER 7

Grade 9 mathematics and science achievement in TIMSS 2003

The South African school curriculum is based on a band qualification. There are four phases to the curriculum's structure: the foundation phase (Grades 1–3); intermediate phase (Grades 4–6); senior phase (Grades 7–9); and secondary phase (Grades10–12). The curriculum statements outline the topics for the band and the sequence of topics taught is decided by the class teacher.

The HSRC decided to administer the instruments to both Grade 8 learners (as per the requirements of TIMSS) and to Grade 9 learners to investigate whether the sequence of topics taught would make a difference to the performance. When the instruments were administered to Grade 8 learners, the same sample of schools was used to select a Grade 9 class. As in the Grade 8 classes, an intact Grade 9 class was randomly selected. Within that class unit, instruments were administered for two HSRC studies. Half the class (with learners randomly selected) took the TIMSS tests and the other half answered the instruments for a HSRC longitudinal study.

In the TIMSS Grade 9 study, 4 261 learners from 238 schools participated (see Appendix 4). There were fewer schools participating in the Grade 9 study compared to the Grade 8 study; this because the instruments were administered at a time of year when there were many other ongoing activities in the school (for example, getting ready for matric examinations and administering the Common Task of Assessment).

The results for the Grade 9 study closely paralleled the results of the Grade 8 study. This chapter provides a brief description of performance in mathematics and science.

Mathematics and science achievement scores at the Grade 9 level

The average mathematics and science scale scores for South African learners at the Grade 8 and 9 levels, and the average age of the groups, are indicated in Table 7.1.

Table 7.1: Table of average scores in mathematics and science for Grades 8 and 9

	Mathematics scale score (SE)	Science scale score (SE)	Average age
Grade 8 (n = 8 952)	264 (5.5)	244 (6.7)	15.1 yrs
Grade 9 (n = 4 261)	285 (4.2)	267 (5.4)	16.1 yrs
Difference between Grade 8 and 9 scores	21	23	

The performance on TIMSS 2003 at the Grade 9 level is still very low, even though there is a 20-point score improvement on Grade 8 in both subjects. Such a small improvement is disappointing. Given that these learners would have had an extra year's education, one assumes that they would perform at a much higher level than the Grade 8 learners – that they do not is cause for concern.

Performance by province

Table 7.2 indicates the average mathematics and science scale score for each of the provinces at the Grade 9 level, as well as the point difference between these results and the Grade 8 scores.

Table 7.2: Provincial mathematics and science Grade 9 scale scores and point difference to Grade 8 performance

Province	Mathematics		Science	
	Grade 9 average scale score (SE)	Difference to Grade 8 score	Grade 9 average scale score (SE)	Difference to Grade 8 score
Western Cape	414 (20.9)	25	421 (22.4)	35
Northern Cape	340 (17.8)	7	357 (18.3)	23
Gauteng	303 (10.9)	-1	301 (14.6)	-8
Free State	291 (13.1)	26	280 (15.4)	35
National average	285 (4.2)	21	267 (5.4)	23
Mpumalanga	287 (16.1)	26	266 (18.6)	27
KwaZulu-Natal	278 (11.7)	23	253 (13.4)	26
North West	280 (11.9)	29	260 (15.1)	29
Eastern Cape	250 (10.4)	27	222 (13.5)	32
Limpopo	244 (6.8)	27	216 (9.4)	25

The rank order of provincial scores for mathematics and science at the Grade 9 level mirrored the rank order at the Grade 8 level. In most provinces there was a score increase of around 25 points from Grade 8 to Grade 9. The surprising result was Gauteng, which registered a decrease in both the mathematics and science scores.

Performance at the different benchmarks

The scores of the Grade 9 learners were categorised at the different performance benchmarks to provide a picture of the number of learners achieving the higher scores. For mathematics, 9.6 per cent of the learners achieved scores higher than 400; for science 12.4 per cent of learners achieved this. These results were similar to the results for Grade 8. Again, it is of concern that the Grade 9 learners achieved at the same level as the Grade 8 learners – one would have expected them to attain higher scores.

Participation and performance by gender

There were almost equal numbers of girls and boys in the TIMSS Grade 9 sample (50.6 per cent girls and 49.4 per cent boys). The average scale scores of the boys in mathematics and science was a few points higher, but this difference is not statistically significant.

Table 7.3: Performance of girls and boys in mathematics and science at Grade 9 level

	Girls	Boys	Difference: boy–girl score
Science scale score (SE)	261 (7.0)	274 (6.1)	13
Mathematics scale score (SE)	283 (5.4)	287 (5.4)	4

Performance by ex-racial department of schools

The average scale scores for mathematics and science for schools classified by the ex-racial departments was calculated in the same manner as the Grade 8 study. Table 7.4 indicates the achievement scores in mathematics and science by the different school type.[1]

Table 7.4: Average mathematics and science scale scores of learners from the different school types

	Average science scale score (SE)	Average mathematics scale score (SE)
Ex-DET schools (n = 3 314)	234 (4.4)	257 (2.8)
Ex-HoR schools (n = 496)	345 (10.1)	339 (8.0)
Ex-HoD schools (n =137)	380 (23.5)	373 (18.0)
Ex-HoA schools (n = 314)	512 (17.0)	499 (16.6)
National average (Grade 9)	267 (5.4)	285 (6.5)

As at the Grade 8 level, the average scores for the ex-HoA schools were the highest, followed by scores for ex-HoD and ex-HoR schools. The average score for the ex-DET schools was the lowest.

Performance by content area

The average scale scores of learners in the science and mathematics content areas were calculated. These scale scores are provided in Tables 7.5 and 7.6.

Table 7.5: Relative mathematics scale scores (and SE) in the content domains

Number	Algebra	Measurement	Geometry	Data
283 (4.5)	284 (4.1)	305 (4.1)	257 (5.3)	312 (4.0)

As at the Grade 8 level, the Grade 9 learners performed best on measurement and data and were weakest in geometry.

1 The sample size for the ex-HoR, ex-HoD and ex-HoA schools are not adequate for providing a score representative of this category of schools. These scores should be considered as indicative.

Table 7.6: Relative science scale scores (and SE) in the content domains

Life science	Chemistry	Physics	Earth science	Environmental science
277 (5.2)	287 (4.7)	269 (5.2)	253 (5.2)	294 (5.7)

Relative to the other content areas, the Grade 9 learners performed better on questions relating to environmental science and chemistry, while the weakest performance was in the physics domain. A similar pattern was observed at the Grade 8 level.

Summary

The Grade 9 performance in mathematics and science mirrors the Grade 8 performance. A disappointing feature of the results is that the average scores for Grade 9 learners are only around 20 points higher than the Grade 8 scores.