

For whom the SCHOOL BELL TOLLS

By Michael Kahn



Measuring disparity in school Science and Mathematics in the African community

The history of schooling in South Africa is a history of racial discrimination. While redress in education is a central tenet of Government policy in our new democracy, no procedure was in place to monitor the demographics of schooling and hence to track redress at an individual level between 1994 and 2002.

Race-based data were last collected in 1992 in the dying days of apartheid, and capture of racial statistics was, until very recently, anathema to the education authorities.

With the enactment of the Employment Equity Act (No 55 of 1998), however, and its institutionalisation in 1999, all employers had to compile and return demographic data on their workforce. This promoted a climate in which it became generally acceptable to make use of the old racial categories in gathering data that would advance the general good.

In terms of measuring the inherited disparities in the education system, the main instrument introduced by the new Department of Education was the School Register of

Needs (SRN) of 1996. SRN is the major tool Government uses to attempt to level out educational resource disparities at school level. It was as late as the year 2000, however, before someone thought to ask the question in Parliament: "How many African students pass Mathematics at higher grade?" As the then adviser to the Minister of Education, it befell to my lot to provide an answer.

At that juncture, the data lacuna meant that one was limited to making rough extrapolations from the data of the early 1990s.

Such extrapolation suggested a figure somewhere around 3 000 for the number of Africans that passed Mathematics Higher Grade (HG). Without data being captured according to racial groups no greater accuracy was possible. Or was it?

I believed that it might be possible to obtain a better estimate of the number of

important role in shaping the National Strategy for Science, Mathematics and Technology Education of the Department of Education. This led to the 102 Focus Schools Project which saw Dinaledi Science and Mathematics Centres established in 2001/02.

In 2002 the Department, for the first time, required matriculation candidates to declare

the NLA boys.

- ▶ NLA girls out-perform the NLA boys in five provinces and narrow the gap in the other four.

It is worth noting that the national entry for Mathematics HG was 35 500 and the national pass rate was 57.8%.

Why the NLA difference? The next conjecture was to guess that the NLA candidates were at schools where they could not readily take an African language, namely ex-Model C, Delegates and Reps, or independent schools. This assertion was checked by going back to the database to match candidates to their schools. It checked. The fact that these learners attended well-resourced schools explained the increased pass rate. Since these are mainly suburban schools this may explain why the gender gap, if it is culturally driven, closes or disappears.

The LPM thus turned out to be a highly effective proxy that yielded policy insights far beyond its original design. The policy implications of these findings are considerable and include the following:

- ▶ Gender inequality in Mathematics performance (and Science) is real and persistent. A national study to understand the variation is long overdue.
- ▶ Building quality education in disadvantaged schools requires a much stronger effort.
- ▶ Quality schooling (teaching) in suburban schools is a resource that might be leveraged for greater advantage than at present.
- ▶ Growth in the stock of learners with Mathematics HG will mainly come from the African and coloured communities (saturation has largely been achieved in the white and Indian communities).
- ▶ Introduction of the group identifiers from 2002 onward was a necessary step in monitoring and promoting redress.

African candidates now make up 50% of the Mathematics HG candidates. If Mathematics HG is taken as a benchmark, the dismantling of formal apartheid, by ending legal exclusion, in effect doubled the pool of those available to enter the ranks of the highly-skilled. That their pass numbers still constitute below 30% of the total is unacceptable. •

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African learners writing and passing the various matriculation subjects by means of a proxy. The proxy was based on the assumption that the majority of African candidates took an African language for matric, and conversely that the majority of non-Africans did not.

Accordingly, to determine the number of African learners taking any matriculation subject, for example Mathematics HG, all that was needed was to query the examination database: "provide headcount – candidate takes an African language and Mathematics HG". This so-called language proxy method (LPM) was introduced in 1999 and provided the only means of tracking African matriculation performance until 2002.

What LPM showed for the 2002 African Mathematics HG candidates was that:

- ▶ The total number of candidates was 14 389 and 3 335 passed the subject (i.e. symbol of E or higher).
- ▶ LPM girls were under-enrolled relative to boys across the provinces.
- ▶ LPM girls consistently under-performed relative to boys across the provinces.
- ▶ An identical gender pattern occurred for Physical Science HG, and both Mathematics and Physical Science at Standard Grade (SG).

The gender finding is statistically significant with a random occurrence of 1 in 235. LPM made it possible, for the first time in forty years, to obtain a countrywide overview of the performance of African learners in these subjects. In principle the study could have been extended to monitor other subjects as well as individual performance.

The LPM data served to confirm the small proportion of African HG passes in the gateway subjects that restrict access to university programmes of study that lead to science-based careers. As such, the data played an

important role in shaping the National Strategy for Science, Mathematics and Technology Education of the Department of Education. This led to the 102 Focus Schools Project which saw Dinaledi Science and Mathematics Centres established in 2001/02.

The full data set for the 2002 African Mathematics HG candidates showed the following:

- ▶ The number of candidates was 16 663 and 4 688 passed the subject.
- ▶ Girls were under-enrolled relative to boys across the provinces.
- ▶ Girls consistently under-performed relative to boys across the provinces.
- ▶ An identical gender pattern occurred for Physical Science HG, and both Mathematics and Physical Science SG.

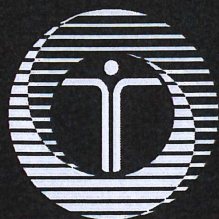
This validity check turned up both anticipated and unanticipated information.

- ▶ The gender pattern identified by LPM was confirmed.
- ▶ LPM identified African Mathematics HG candidates with 86% accuracy, and identified 71% of passes (accuracy was considerably higher at 90% for Mathematics SG and Physical Science HG and SG). In other words, LPM provided a reliable floor level that was sufficiently accurate for policy decisions to be taken. The reason why the number of passes detected was lower than the entry figure is explained below.

The unanticipated information concerns the African candidates for Mathematics HG that did not take an African language. This non-language African (we term these NLA) group demonstrates features that are quite different to the African group (and LPM group).

- ▶ The NLA pass rate was 59.5%; African 28.1%; LPM 23.2%.
- ▶ NLA girl enrolment is higher than

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Halving unemployment by 2014:
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