

EDUCATION/Vijay Reddy

The difficult geometry of change

SINCE 1994, the public and private sectors, nongovernmental organisations and academia have emphasised the centrality of mathematics and science to the success of SA's human development strategy. With the matric exams upon us again, both the education department and the general public will be paying keen interest to pass rates in these two areas. So, how have we been doing?

One of the goals of the mathematics and science strategy of the new government has been to ensure that participation rates, especially of black pupils, in these subjects increased. In the early 1990s, about one-third of all matriculants enrolled for mathematics. Now, about 60% of matriculants take mathematics. In the new curriculum, which will be introduced next year, all students will be required to take either mathematics or mathematics literacy as a subject.

This increased participation rate is laudable but it must be measured against the fact that in the same period there has been a drastic reduction in mathematics higher-grade participation rates.

In these two crucial areas SA's performance is poor by international, regional and national assessment standards. Performance across the education system varies widely, and disaggregation of the performance scores of learners by schools formerly divided along racial

lines illustrates this difference. In those areas where most Africans live and where most African schools are located, performance rates are lowest.

Mathematics and science require formal instruction and schools are the platforms for that. In conditions of poverty, schools have an even greater importance as they are the only resource that most learners can access, and school achievement gives disadvantaged children their best chance of escaping the poverty trap. But performance rates show the former white and Indian schools are the better performers. Educational inequalities continue to plague SA. Access for individuals to learning opportunities is determined by their access to economic resources.

Below are some strategies that could improve the mathematics and science education system.

First, our policy frameworks (eg curricula) are in place for quality science and mathematics education. But implementation has not proceeded according to the initial intention. The human resources needed for the implementa-

tion of those policies have been scarce. In the next decade we have to meet the parallel challenges of developing human resources to manage the education system and ensuring there is quality support for the implementation of the policies.

Second, in the past decade there have been many interventions to improve mathematics and science education. These programmes provided creative plans but often lacked a detailed implementation strategy to effect the innovation and so, after a few years, were abandoned.

When an intervention is introduced, it is important to have a clear implementation plan; provide adequate resources to support the intervention; set realistic timetables regarding when we expect to see the effect of the intervention; and study the intervention and implementation process to derive lessons for ways to improve the process.

Third, given the problems of teacher shortages and teacher quality, it is important to develop high-quality structured learning materials (textbooks) to pupils. Given the cumulative nature of

scientific knowledge, textbooks can provide a way to acquire this knowledge even if there is no teacher. They also allow communication between the school and the community so that other individuals can assist in the learning process.

Finally, we must target those African schools that have achieved some successes and invest in them preferentially so that they consistently produce quality results. At the moment, African schools have to contend with the disadvantages of apartheid as well as the migration of the more resourced and probably better performing pupils to schools from the other former departments.

We cannot produce the skilled African mathematicians and scientists the economy requires by relying on those African students lucky enough to be able to go to private and former white schools. We have also to look for those largely or exclusively African schools and give them the means to increase the outflow of African learners graduating with exemptions in mathematics and science.

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