Challenges to meet international maths and science standards

In the 2005 matric exams, the pass rate for mathematics higher grade was 26 383. President Mbeki's State of the Nation (2006) address indicated that this number is targeted to increase to 50 000 in 2008 through the Dinaledi Initiative. But, says VIJAY REDDY, there are ways to achieve this.

Mathematics and science are central to the success of South Africa's human development strategy. One of the goals of the government's mathematics and science strategy has been to ensure an increase in these subjects' participation rates, especially of black learners. In the early 1990s, about one-third of all matriculants enrolled for mathematics; now, around 60% do.

In the new curriculum, which will be introduced this year, all students are required to take either mathematics or mathematics literacy as a subject. This increased participation rate is commendable, but it has to be measured against the fact that there has been a drastic reduction in mathematics highergrade participation rates. In the early 1990s, about 13% of matriculants (around 55 000) took maths at the higher grade. Today, the figure has dipped to around 9%.

This highlights how poor South Africa's performance is – by international, regional and national assessment standards – in these two key areas.

However, performance across the educational system varies widely. Disaggregation of learners' performance scores are further analysed according to their location.The harsh reality is that performance rates are lowest in those areas where most Africans live and where most African schools are located.

Mathematics and science require formal instruction and schools provide the platforms for this instruction. In conditions of poverty, schools assume even greater importance as the only resource that most learners are able to access, and school achievement still provides disadvantaged children with the best opportunity to escape the poverty trap.

Current performance rates demonstrate that the former white and Indian schools are the better performers. There is some improvement in African schools, but the gap in the performance of

different types of schools has not changed over the last six years. Educational inequalities, along with other inequalities, continue to plague the new South Africa.

Where do we go from here? Although this question has been posed many times over the last decade, there are in fact strategies that could improve the mathematics and science education system:

- Our policy frameworks (for example, the curriculum) are already in place for a quality science and mathematics education. Unfortunately, as with other sectors of the society, implementation has not proceeded according to the initial intention. Importantly, the human resources needed for the implementation of these policies are scarce. We have, therefore, to meet the parallel challenges of developing human resources to manage the educational system whilst ensuring that there is quality support for the implementation of the policies, especially at school level.
- In the past decade, there have been many interventions to improve mathematics and science education. These interventions provided creative programme plans, but often lacked a detailed strategy to implement the innovation and so, after a few years, they were abandoned in favour of something different. We need to be realistic about timetables and accept that change takes time. There are a number of important prerequisites for introducing interventions into the system:

  - clear implementation plans;
  - the provision of adequate resources for support;
  - the setting of realistic expectations regarding the intervention's impact; and
  - the careful study of lessons learned from the whole process to improve it.

  For this second strategy to be successful, we must stop hopping from one new intervention to the next, becoming 'serial innovators' in the process.
- Given the problems of teacher shortages and teaching quality, it is important to develop high-quality and structured learning materials (textbooks) for learners. Good learning materials, especially in poorer learning environments, can provide a fail-safe mechanism for learners to acquire knowledge.

  Given the cumulative nature of mathematics and science knowledge, good textbooks can provide a way of acquiring this knowledge, even when there is no teacher present. These materials can also facilitate communication between the school and the community, thereby allowing other individuals to assist in the learning process.
- 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 better resourced and better performing learners to schools from the other former education departments.

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

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