



FROM LAGGARD TO WORLD CLASS

Reforming maths and science education in South Africa

CDE research report no 13, November 2004

EXECUTIVE SUMMARY

THERE is a national crisis in higher-grade maths and science education in South Africa's schools. This places a huge obstacle in the way of achieving almost all the government's ambitions to open up new areas of opportunity for black South Africans. Poor maths and science education is probably the single biggest obstacle to African advancement in South Africa today.

The nature of the crisis is illustrated by the following facts:

- South Africa performed worst of all 38 participating countries in the Third International Maths and Science Study (TIMMS-R), conducted in 1998–9.
- Between 1991 and 2003, while enrolment for SC maths increased by 90,4 per cent, enrolment for HG maths plummeted by 32,95 per cent.
- In 2003, only 23,42 per cent (4 637) of all HG maths graduates were African.
- One fifth of secondary schools do not offer SC maths at all, and only half offer HG maths. One third of schools offering maths achieve pass rates of 0-19 per cent.
- The trends are similar, if slightly better, for SC science.
- The entry of newly qualified maths and science educators is not keeping pace with retirements, retrenchments, and losses to other sectors, let alone increasing the country's resources in these subjects. In 2000 there were 50 per cent fewer students at teacher training colleges than in 1994.

In the midst of a national crisis, it is important to see what is working, or what might have potential. For example, a statistical analysis of the overall SC results in 1998 and 2000 shows that thousands of learners who could have succeeded in one or both subjects failed to study them at all, or failed to enter the exam. The numbers are significant: some 50 000 more learners could have passed SC maths, 3 700 of these in the HG.

While a number of initiatives to improve maths and physical science education have been launched, funded by the government as well as the private sector, they have had no discernible effect on the maths and science education system as a whole. The system is still failing to deliver enough school-leavers equipped with HG maths and science to meet its own needs, let alone the needs of the economy or the country as a whole.

Implications

South Africa is devoting significant resources to large numbers of learners who, under current circumstances, have little chance of passing SC maths and science. At the same time, a large number of learners with the potential to



succeed in maths and science are not getting the opportunity to study these subjects. We need to achieve a far better match between good learners, good educators, and effective schools if we want results over the next five years.

A small number of schools are providing high-quality education in maths and science. This means that the system is skewed, and vulnerable to any problems that may arise in this limited number of schools. More than half of the schools offering HG maths produce just 5 per cent of the total number of passes, and 24 per cent produce no less than 63 per cent of the total passes.

South Africa's education system is too large and too diverse for a 'one size fits all' approach to reform. We have to devise interventions based on particular schools and particular groups of learners.

Resources are very limited. Only 14,7 per cent of educators teaching maths and science have the minimum prescribed qualifications to do so. We do not have the capacity to introduce a bottom-up reform initiative, starting in primary schools. Resources must go to top-performing schools to ensure that they maintain their performance and that the largest possible number of learners can benefit from their capacity to deliver; and to the next band of schools, to help them to improve.

We require targeted, focused initiatives that will build systematically on the existing 'virtues' in the schooling system. In a situation of limited capacity in government, provinces, schools, the educator community, and the private sector, only a few priority areas can be addressed, but these must be the key priorities.

Recommendations

Over the next five years South Africa should aim to double the number of HG SC maths and science passes, and double the number of qualified and capable teachers in the public school system.

How can this be achieved? By building on what is working in the system, and focusing on limited but achievable aims that will lay the foundation for improving the entire system over time.

South Africans need to:

1. Mobilise for a national effort: Pull together the energy and commitment of leaders in both the public and private sectors to achieve a dramatic increase in performance, through a new and strategic framework for intervention. The reasons for a targeted and phased approach need to be accepted by all parties, and communicated effectively.
2. Increase the pool of capable and qualified maths and science educators: Identify those we have, and how we can retain them in the teaching profession. Provide incentives to encourage more people to teach maths and science. Adopt a new approach to the professional development of maths and science educators; there are successful models overseas. If necessary, bring in educators with excellent language skills from abroad.
2. Build on the existing potential of our schooling system: Support all performing schools, and investigate ways in which they could play a bigger role. For example, can they deal with larger classes, can they expand their maths and science departments, can they share their expertise with other schools, or can a city run a programme to encourage performing schools to adopt weaker maths and science schools? Identify the next band of schools that could improve their performance, and assist them in different ways. Link incentives to specific goals, so that we are incrementally improving and expanding access to effective teaching.
3. Identify all learners with potential in maths and science so that 'no child is left behind' because he or she does not have an effective school nearby. Introduce a nation-wide aptitude test to identify learners with



talent who are then provided with financial support to attend an effective school. This could be a neighbouring school or a boarding school, public or private. Money should follow learners, thus benefiting their new school, and introducing healthy competition among schools.

4. Maths and science education initiatives should include appropriate language components. All the research indicates that learners' proficiency in the language of instruction and examination plays a very significant role in their performance in maths and science.
5. The government's Dinaledi programme should be restructured. This is an excellent concept, involving support to 102 schools specialising in maths and science. However, while the programme deserves to be supported, it needs to be reconceptualised, restructured, and expanded.
6. Review all other educational policies for their effect on maths and science. Improving maths and science is the country's top educational priority, and we must ensure that other educational reforms do not undermine our ability to achieve the improvements in the number of HG passes that we desperately need.
7. The private sector, NGOs, and international donors should review the support they have given to maths and science education with a view to aligning with this new national thrust.

These goals will not be achieved unless an accountable body is created to focus and direct this new effort in maths and science. Energetic work is being undertaken by both the government and other actors – but this is not achieving the dramatic change in delivery that South Africa urgently needs.

Therefore, the cabinet should establish a National Task Force for improving school-based maths and physical science education. This should represent a national partnership between the public and private sectors, aimed at dramatically changing the future of maths and science schooling in South Africa. The task force should be co-chaired by a cabinet minister and a private sector leader, should report annually to parliament, and should be held accountable for results.

The CDE report provides the government with a moment of opportunity. Key private sector organisations and interests are willing to help make a significant difference – hence their support for this privately funded initiative, which has also received enthusiastic support from beyond its original donor group.

A bold response by the government is required. If this happens, a dramatic increase in performance is achievable within a five-year period.

A national resource

Extensive research was conducted for this project. Twenty nine background research reports were written, and hundreds of interviews were conducted with national and provincial education officials, academics and other analysts involved in education, representatives of NGOs active in education, school principals, educators, learners, and others. We now have reliable information on performance in the SC examination over time, and in each of the provinces; the status of individual schools by name, location, and facilities; a profile of individual school performance year on year, and in comparison to all other schools; and information on individual learners, even the specifications of groups whose members could pass either or both subjects at HG but do not enrol for these subjects.

The body of material produced in the course of our research is a valuable national resource, which has been made available to the government and other interested parties. The analytical tools developed could play a valuable role in helping policy-makers and planners to design new policy initiatives and programmes, and monitor and assess their progress.



Funders

This study has been funded by the following donors:

The Anglo American Chairman's Fund

The AngloGold Ashanti Fund

The BHP Billiton Development Trust

The De Beers Education Trust

The FirstRand Foundation

The Joint Education Trust

The Liberty Foundation

Murray & Roberts Holdings Limited

The Shuttleworth Foundation

The Zenex Foundation



THE CENTRE FOR DEVELOPMENT AND ENTERPRISE

Pilrig Place, 5 Eton Road, Parktown, Johannesburg, SA • P O Box 1936, Johannesburg 2000

Tel 27-11-4825140 • Fax 27-11-4825089 • info@cde.org.za • www.cde.org.za