



VALUE IN THE CLASSROOM

The quantity and quality
of South Africa's teachers

September 2011

CDE In Depth no 11

The Centre for Development and Enterprise is a leading South Africa's leading development think-tank, focusing on vital national development issues and their relationship to economic growth and democratic consolidation. Through examining South African realities and international experience, CDE formulates practical policy proposals for addressing major social and economic challenges. It has a special interest in the role of business and markets in development.

CDE In Depth Number 11 • September 2011

Series editor: Ann Bernstein

This report is based on three background research reports written for CDE. The details of the reports and their authors are listed in the text. This synthesis report was written by Dr Jeff McCarthy and Ann Bernstein, and edited by Riaan de Villiers.

The research and this publication have been funded by the Zenex Foundation and the Epoch and Optima Trusts. The funders do not necessarily agree with the views expressed in this report.

Cover: Teacher and learners, KwaZulu-Natal, 2011. Picture: Getty Images

Published in September 2011 by The Centre for Development and Enterprise
5 Eton Road, Parktown, Johannesburg 2193, South Africa
P O Box 1936, Johannesburg 2000, South Africa
Tel 2711 482 5140 • Fax 2711 482 5089 • info@cde.org.za • www.cde.org.za

All rights reserved. This publication may not be reproduced, stored, or transmitted without the express permission of the publisher. It may be quoted, and short extracts used, provided the source is fully acknowledged.

ISBN: 978-0-9869860-9-3



CENTRE FOR DEVELOPMENT AND ENTERPRISE
Informing South African Policy

VALUE IN THE CLASSROOM

The quantity and quality
of South Africa's teachers

September 2011

CDE In Depth no 11

Contents

<i>Executive summary</i>	4
Introduction	8
South Africa's teachers: basic facts in international perspective	9
The demand for teachers in certain subjects	14
Improving the performance of existing maths and science teachers	22
Key findings and insights	26
Endnotes	30

South Africa
urgently needs
more and better
teachers

EXECUTIVE SUMMARY

THE GOVERNMENT has announced bold measures to introduce accountability into the public schooling system. Launching the National Education Evaluation and Development Unit on 18 March 2011, the Minister of Basic Education, Angie Motshekga, stated: 'When we mapped the Education Roadmap in 2008, we resolved to ensure the effective evaluation of all teachers based on the extent to which learner performance improves.'

CDE welcomes this initiative, and looks forward to its effective implementation. However, teachers should not become the scapegoats for a large and struggling system. There are good teachers in our public schooling system who deliver results against the odds.

In this context, CDE has examined the situation in the country surrounding teacher supply and demand. Its overall conclusion is that South Africa urgently needs more and better teachers. The shortage of good teachers is a key reason why the education system is underperforming, particularly in scarce but vital subjects such as mathematics and science. Teachers play a central role in determining the outcome of any education system, and South Africa is no exception to this rule.

In order to explore these issues in greater depth, CDE asked four experts – Dr Roger Deacon and Professors Charles Simkins, Marissa Rollnick, and Karin Brodie – to conduct in-depth studies of the supply of, demand for, and quality of South Africa's teachers, particularly in respect of maths and science. This report summarises their work, and draws out some implications for education policy and strategy.

Teachers are poorly trained and utilised

- South Africa is producing too few teachers, especially in key subjects such as maths and science. The teacher training system is producing about a third of the country's requirement of about 25 000 new teachers a year. It needs to produce about 15 000 more teachers a year, particularly in scarce subjects (such as maths, science, commerce, and technology).
- Many of the existing teachers in these subjects are not teaching well, and are also poorly managed. This is partly because many of them have been badly trained. In one study cited by our researchers, 73 matric physical science teachers from South Africa's Dinedi schools (which are provided with extra maths and science resources) were tested on basic problem-solving skills. Only 60 per cent were able to solve the problems involved.
- South Africa's teachers are also often poorly utilised. There is a shortage of maths teachers, yet many qualified maths teachers are not teaching maths despite being willing to do so. Another study cited by our researchers found that 16 581 teachers in the Eastern Cape were qualified to teach mathematics, but only 7 090 were actually teaching mathematics, and only 5 032 of these had a mathematics qualification.
- The teacher age profile suggests a looming shortage, and a growing need for greater numbers of younger teachers. More than two thirds of South Africa's teachers are older than 40.

- While their formal qualifications have improved, existing teachers spend too little time in the classroom, and many teach badly when they do. According to government studies, many teachers often come late, leave early, spend only 46 per cent of their time teaching each week, and hardly teach at all on Fridays.
- According to one official evaluation, only about a third of the institutions currently training teachers should qualify for accreditation, which – of course – has implications for the quality of their graduates.
- Many talented graduate teachers either emigrate or take up other professions, resulting in a loss of thousands of teachers every year. A quarter or even more of all newly trained teachers do not take up teaching posts in South Africa's schools, deterred largely by low salaries and the poor image of the profession.
- Although the government has increased its bursaries for student teachers in the past few years, this is insufficient to meet the country's needs. Far too few bursaries are being offered to potential teachers.
- Too few candidate teachers are being trained in scarce subjects, which can only be remedied by more bursaries, and better and more diversified teacher training. Thousands more maths and science teacher trainees are needed. Special efforts are then required to retain these teachers – who have many other options in the economy and overseas – through improved working conditions and incentives.
- South Africa is already benefiting from immigrant teachers, but some policy-makers and planners do not favour this approach, with the result that the importation of teachers is not properly planned.

Based on these findings, CDE has formulated the following pointers to improved education policy and strategy:

Teachers play a key role in determining results

This study has confirmed that the poor performance of many teachers is a major reason for the dismal results achieved by large sections of South Africa's schooling system. However, aggregates often conceal important points about variations by subject, for example. South African teachers as a whole are adequately paid, but is this true of competent maths teachers? South Africa needs to produce more teachers, but should this be done in all subjects, and by all the current public institutions?

More good maths and science teachers are vital

The biggest future demand will be for teachers in languages, maths (and mathematical literacy), commerce, life sciences, and physical sciences. The projected expansion of FET colleges will also require more good teachers in technical subjects.

South Africa is at or near the bottom of the world class in terms of student performances in maths and science. There is also much scope for improvement in other subjects relevant

The country is producing too few teachers, especially in key subjects such as maths and science

Many talented graduate teachers either emigrate or take up other professions, resulting in a loss of thousands of teachers every year

to the economy, such as technology and commerce. The availability and quality of teachers in these subjects is a key factor in poor student performances.

Given the scale of the challenge (hundreds of thousands of teachers, and millions of learners), one needs to acknowledge the limitations of producing, say, 1 000 more science and mathematics teachers through existing B Ed programmes, or placing 1 000 existing teachers in professional learning communities. Such efforts might help, but would not significantly improve the average performance of South Africa's body of learners.

Carrots as well as sticks are required

This raises the issue of whether teacher training in maths, science, and other specialised subjects; teacher improvement programmes; and teacher retention should be linked to market forces.

In his State of the Nation Address in February 2011, President Jacob Zuma admonished teachers to work harder. There is little doubt that many teachers (though not all) deserve this admonition. However, in the case of mathematics, for instance, carrots may work more effectively than sticks.

International experience suggests that performance incentives for teachers can work well. For example, at a CDE Round Table on international experience of schooling reform held earlier this year, Paulo Renato Souza, former minister of education in Brazil and secretary of education in the state of São Paulo, reported that teacher upgrading and selective rewards were key to education reform in Brazil. Tom Boasberg, superintendent of the school system in Denver, Colorado, also reported on the positive results of performance pay for teachers, and similar experience has been documented in other cities and countries.

Selective rewards should be considered

CDE is not suggesting that all teachers deserve greater rewards. Many – possibly most – teachers are underperforming. Teachers in scarce subjects who are performing should be selectively rewarded. And prospective teachers in subjects most needed for economic growth and national development – selected languages, mathematics, science, commerce, and a new breed of vocational/technical teachers – should be better paid.

Teachers should not only be trained by public institutions

Another issue is which institutions should produce the teachers of tomorrow. Public tertiary institutions are currently producing about one third of the required numbers. The issue is not only whether they will be able to train many more teachers, but whether they will be able to train them well. For instance, if only a small proportion of formally trained maths and science teachers teach competently today, what does this say about quality control at the institutions that produced them?

The Department of Higher Education and Training is aware of the need to produce more teachers, and the pressure on universities in this regard is reportedly building. But can

we rely solely on these institutions to increase the output of good science, mathematics and vocational teachers to the required levels? And can we rely solely on state-supported enhancement programmes to improve the quality of existing teachers?

The short answer is that we cannot. Moreover, many of the most talented graduates will continue to emigrate, opt for jobs at private or former 'Model C' schools, or opt for other careers altogether.

Therefore, the challenge of providing enough good teachers to meet South Africa's current and future needs will not be resolved simply by bringing political will to bear on public institutions.

Market forces should be harnessed

Besides improving the output and performance of public sector teacher training institutions, market forces need to be harnessed. Much more work is required to determine how this could or should be done, but three principles stand out even at this early stage:

- South Africa is spending enough on education; the problem is that this expenditure is poorly utilised.
- If we are to get better value for our education spend, the economic laws of supply and demand, and associated pricing signals, should be brought to bear on this sector as well. We argue in favour of increased competition in other areas of state expenditure. Why not apply it to this sector, where it is sorely needed?
- Teacher training and retraining should be opened up to market forces. Private players and public institutions should compete for public funds.

Conclusion

Teachers are at the centre of South Africa's struggling school system. This report has examined the supply of and demand for teachers from a number of angles. It is clear that South Africa cannot continue to rely solely on current systems to train more and better teachers. Government as a whole, and the departments of Basic and Higher Education, have acknowledged that South Africa lacks sufficient good teachers, and have begun initiatives to fill this gap. However, given the nature and scale of the challenge, the public sector alone cannot address this national need with sufficient scale, quality and speed. A new response is required, drawing upon the best of global experience as well as all our national resources, both public and private.

Teacher training and retraining should be opened up to market forces

There are good teachers in our public schooling system who deliver results against the odds

INTRODUCTION

THE SOUTH African education system is underperforming, particularly in terms of mathematics and science results in the National Senior Certificate (NSC) examinations. Compared to many other developing countries, South Africa's expenditure on education is not being matched by results.

Maths and science are vital for skilled jobs, economic growth, and national development, and improving the country's output of sound maths and science graduates is a national imperative. Central to achieving this goal is producing, using, and retaining good teachers.

At the level of results, the situation is depressing. The 2011 Annual National Assessment results were released by Basic Education Minister Angie Motshekga in late June 2011. The figures indicated that on average students had not achieved the competencies specified in the curriculum. For example in grade 6, the national average performance in mathematics was 30 per cent. Despite areas of improvement, NSC results in mathematics have declined in recent years.

Numerous major studies – including the 2007 McKinsey study of the best performing schooling systems in the world¹ – have concluded that no schooling system can rise above the limits imposed by the quality of its teachers. If this is so, South Africa's science and mathematics teachers are worrying variables.

For example, a recent study has shown that most science teachers in South Africa's Dinaledi schools (which are provided with extra resources in mathematics and science) lack basic problem-solving skills. A total of 73 matric physical science teachers from about 50 Dinaledi schools in North West and KwaZulu-Natal were tested in five intellectual strategies: the clear representation of problems, identifying and focusing on the goal, the identification and use of relevant principles, the use of equations for deductions, and proceeding step-by-step with the solution. The teachers' competence was poor in all the intellectual strategies tested. About 60 per cent of teachers tested were unable to solve the questions correctly.²

Against this background, CDE asked four experts to conduct in-depth studies of various aspects of the supply of, demand for, and quality of South Africa's teachers, particularly in respect of maths and science (see box, next page).

This paper summarises their work, and draws out some implications for education policy and strategy. We start by looking at some basic facts about South African teachers, their utilisation, quality and actual rate of production; continue by comparing this with a model of projected teacher requirements in different fields and at different levels; and conclude by examining the policy implications for the upgrading of existing maths and science teachers and the training of new ones.

BACKGROUND RESEARCH REPORTS

This paper is based on the following background research reports written for CDE:

- R Deacon, Teacher Demand, Supply and Quality in South Africa and in International Perspective: A Review of the Literature (2010).
- M Rollnick and K Brodie, International Best Practice of Specialist Mathematics and Science Public School Initiatives / Programmes (2011).
- C Simkins, Demand for and Supply of Teachers, 2010 to 2050 (2010).

All three reports are available from the Centre for Development and Enterprise.

CDE 2011

SOUTH AFRICA'S TEACHERS: BASIC FACTS IN INTERNATIONAL PERSPECTIVE

THIS SECTION is based on a review of the literature on teacher demand, supply and quality in South Africa and elsewhere by Dr Roger Deacon, an independent education researcher with extensive experience.³ His study yielded five themes – basic dimensions, teacher utilisation, quality, the sourcing of teachers, and management systems – which are summarised below.

Basic dimensions

Table 1 reflects the number of teachers in schools in South Africa in 2010.⁴ Their distribution is broadly consistent with provincial population profiles, with KwaZulu-Natal, Gauteng, and the Eastern Cape accounting for more than half of all teachers.

Table 1: Teachers working in schools by province, 2010

Province	Teachers	Province	Teachers
Gauteng	70 340	Eastern Cape	69 018
Mpumalanga	34 575	KwaZulu-Natal	91 926
Limpopo	58 194	Free State	23 850
Northern Cape	8 846	North West	26 006
Western Cape	35 354	Total	418 109

Source: Department of Basic Education, School Realities Pretoria, 2010.

Many (perhaps most) science teachers in SA's Dinaledi schools lack basic problem-solving skills

It shows that, as in many other countries, South Africa's teaching corps comprises a large number of people – far bigger than the workforce of any major South African corporation. It differs from the average corporate (or even government department) workforce in demographic terms, although it is perhaps closer to national population norms. South African teachers are largely female (67 per cent), mostly African (77 per cent), older than 40 (67 per cent), generally qualified (95 per cent), and have more than 15 years' experience on average (53 per cent).

The attrition rate among teachers is about 5 per cent a year, which translates into a need for about 20 500 new teachers a year. However, when other factors, including growth in the number of learners are factored in, the need rises to about 25 000.

Researchers agree that the greatest needs are for teachers in mathematics, science, technology, languages, the Foundation Phase (grades R-3), the Intermediate Phase (grades 4-6), special needs teachers, and teachers in rural schools. They are still debating the extent of these shortages, and which need to be addressed most urgently, but CDE's model of scale and order is presented later in this report.

Teacher utilisation

Reported shortages of teachers in scarce subjects (see below) are exacerbated by the fact that existing teachers are not being optimally utilised. Deacon's review cites a team of economists from the University of Stellenbosch recent finding that teaching time was poorly scheduled and utilised, and that class sizes could be substantially reduced if existing teaching time was used more effectively.⁵

Many teachers who are qualified to teach certain subjects, including scarce subjects such as mathematics, do not actually teach those subjects. Many teachers of mathematics are not qualified to do so, and many of those who are qualified are not teaching mathematics. In 2005 the Department of Education itself found that 44 per cent of teachers who were qualified to teach an identified scarce subject (e.g. mathematics) were actually teaching other, non-scarce subjects.⁶

Teacher quality

The quality of teachers, measured in terms of formal qualifications, appears to have improved significantly since 1990, with many teachers having upgraded their education (but not necessarily their subject-speciality) qualifications (see table 2).

Table 2: Proportion of qualified teachers: 1990, 1994, 2005–2010

	1990	1994	2005	2006	2007	2008	2009	2010	Change: 1990 –2010	Change: 2005 –2010
Proportion qualified	53.0 %	64.0 %	91.6 %	92.9 %	93.8 %	94.4 %	93.7 %	95.1 %	79.4 %	3.8 %

Source: Department of Basic Education, Macro Indicator Trends in Schooling: Summary Report, Pretoria, 2011.

CDE 2011

Many teachers who are qualified to teach in certain subjects – including mathematics – do not actually teach those subjects, while many maths teachers are not qualified.

Unfortunately, this positive trend is offset by a number of others. According to Deacon, the research has shown consistently that many South African teachers fall well short of national and international norms and standards in respect of subject knowledge, teaching methods and productivity. More recent evidence, for example of the competencies of science teachers even at the so-called elite Dinaledi schools suggests that most would be unable to teach that subject effectively.⁷

A look at some outcomes is instructive. In 2003, grade 3 learners averaged 54 per cent for literacy and 30 per cent for numeracy in a national systemic evaluation conducted by the Department of Basic Education.⁸ In 2004, grade 6 learners averaged 38 per cent for languages, 27 per cent for mathematics, and 41 per cent for natural sciences.⁹ The Western Cape, Northern Cape and Gauteng were the best performing provinces, while Limpopo, the Eastern Cape and North West were the worst. In general, learners in rural schools achieved lower scores than learners in urban schools. The 2011 Annual National Assessment by the Department of Basic Education – which was benchmarked against international standards – suggests that matters have not improved. In grade 6, the national average scores in language and mathematics were 28 per cent and 30 per cent respectively, which was well below international norms.

In 1999, South African grade 4 learners achieved the lowest average in numeracy, the fifth lowest average in literacy, and the third lowest average in life skills among learners in 12 African countries.¹⁰ Comparative studies since then have shown a similar pattern.¹¹

These problems stem largely from teachers' behaviour as well as poor school management. Research by the HSRC and the Department of Basic Education based on interviews with thousands of teachers shows that teachers commonly do not complete the curriculum, teach too slowly, make insufficient cognitive demands of learners, do not develop concepts, set insufficient written work, and provide students with few opportunities to read. Moreover, many teachers often come late to school, leave early, spend only 46 per cent of their time teaching each week, and hardly teach at all on Fridays. They also seldom explain or provide feedback on homework assignments.¹²

Research also shows that many teachers have been disoriented by needless and sometimes repeated changes to wider teaching systems (such as Outcomes-Based Education).¹³

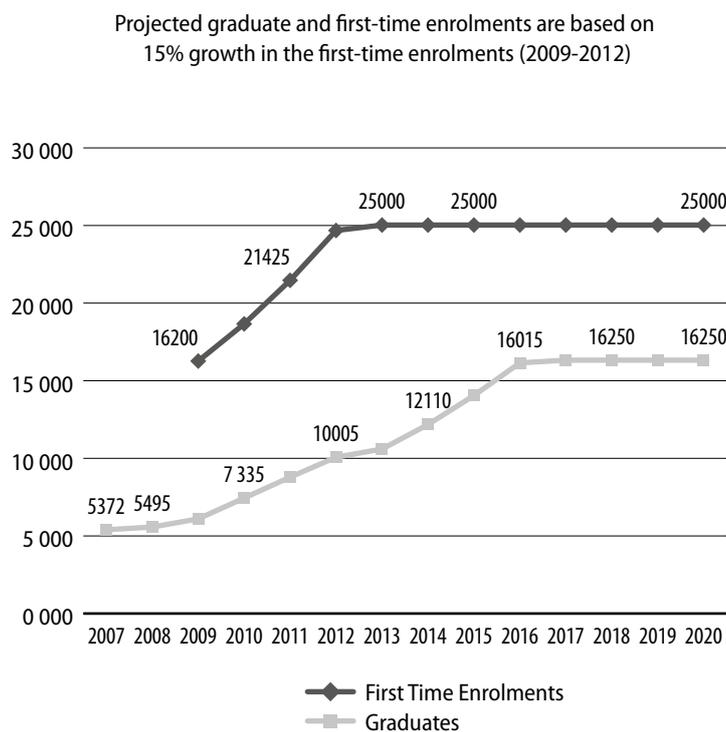
Sourcing teachers

The government is attempting to improve the supply of teachers by encouraging enrolment in teachers' courses at universities, inter alia by supplying bursaries for students.¹⁴

Figure 1 projects the growth in newly qualified teachers (teaching degree and/or diploma) based on a 15 per cent growth in enrolments.

SA teachers fall well short of national and international norms and standards in respect of subject knowledge, teacher methods and productivity

Figure 1: Actual and projected enrolment and graduation, 2009–2012



Source: R Deacon, *Teacher Demand, Supply and Quality in South Africa*, CDE, 2010

CDE 2011

South Africa is spending enough on education, the problem is that this expenditure is poorly utilized

It shows that if enrolments increased by 15 per cent a year, by 2016 or 2017 enough new teachers would graduate to compensate for normal attrition.¹⁵ However, as Deacon points out, this projection is based on several assumptions, namely that universities are supplied with the resources they need to train additional teachers; that graduation rates remain at 65 per cent or higher; and that teacher attrition rates remain at 4 per cent or less.¹⁶

The danger inherent in such projections is that they could prompt universities to lower their intake standards as well as the standards of their courses.

A quarter or even more of all newly trained teachers do not take up teaching posts in South Africa’s schools. They are deterred largely by low salaries and the poor image of the profession.¹⁷ Incentives could be introduced to attract and retain better teachers as well as teachers in scarce subjects, but this has been opposed by the teachers’ unions.¹⁸

Besides the public university system, more teachers could be sourced from the private higher education sector (i.e. private colleges and universities which could be accredited to do so), the pool of unemployed teachers (estimated by the Department at some 10 000 in 2007), or abroad. On the last point CDE has argued the case for greater flexibility in respect of skilled migration to South Africa,¹⁹ but despite verbal support from prominent policy-makers and other politicians, including the Minister of Home Affairs and members of the Parliamentary Portfolio Committee, the Department of Home Affairs appears not to have opened the country’s borders to skilled teachers or other skilled migrants on any scale that would be more realistic in relation to need.

Management systems

Quality management systems intended to support and develop teachers and also hold them accountable are inadequate, not least because some district-level government officials and subject advisors are incompetent, but also because teachers' unions defy these sorts of measures.²⁰ Moreover, teacher performance is severely compromised by teachers' apparent lack of self-confidence, lack of discipline, and lack of commitment. According to Deacon, these factors are not unique to South Africa, but are more acute here than in many other countries.²¹

At the same time, there is significant global (and especially sub-Saharan African) demand for teachers – particularly in mathematics, science, language, technology, and special education – due to growing school populations, increasing numbers of retirements from the profession, and Education for All targets. South Africa will need to become more aware of and responsive to this global competition, because part of the reason South Africa is not attracting new, or retaining existing, mathematics and science teachers of quality is that they are migrating elsewhere. According to one estimate, about 10 000 teachers migrated to the United Kingdom alone between July 1997 and July 2006.²² While this figure was not broken down by subject, it is common cause that maths and science teachers are in highest demand worldwide. Teachers who emigrate also tend to be among the most talented, thus depleting the country's already inadequate pool of good teachers.

Research shows overwhelmingly that good teaching is vital for better results. This in turn, means that any system seeking to improve itself should attract better candidates, train them better, and support them more effectively when they start teaching. South African and international research shows that efforts to recruit and retain good teachers should begin with the careful selection of capable and motivated people; providing them with rigorous and relevant training; paying them well; providing them with opportunities for advancement; and supporting them via induction, mentoring, and practice teaching programmes.²³

This is true for all teachers, but especially for science and mathematics teachers. As will be evident from the projections to follow, simply having more teachers and paying them better is not the solution. The solution lies in having particular types of teachers who are better supported and better paid.

In summary, key points made in the Deacon review are that:

- There is a shortfall in the production of new teachers of about 15 000 a year. However, the quality of teachers is more important than the extent of the shortage; and
- While more teachers are needed, this will not necessarily improve the performance of learners, especially in scarce subjects such as maths and science.

Having said this, most would agree that we need to produce more good maths and science teachers, and retain them in South Africa. Therefore, we now turn to a second study dealing with the supply and demand of teachers, especially in scarce subjects.

Teachers should not become the scapegoats for a large and struggling system

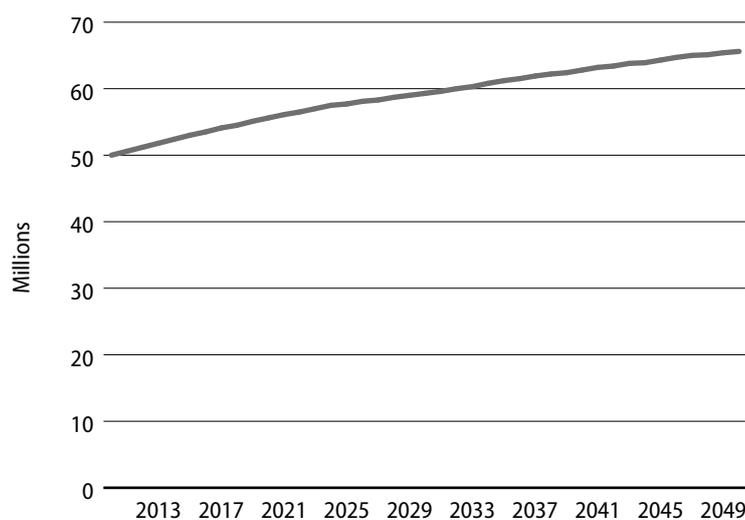
THE DEMAND FOR TEACHERS IN CERTAIN SUBJECTS

THIS SECTION is based on a statistical study of the demand for and supply of teachers up to 2050 by Prof Charles Simkins. Simkins first projected the population to 2050 and then projected learners to 2050, using assumptions about repetition rates and drop-out rates. Next, he delineated four groups of teachers, namely grade R teachers in public and independent ordinary (ie non-specialist) schools; grades 1–9 teachers in public and independent ordinary schools; grades 10–12 teachers in public and independent ordinary schools; and teachers in Further Education Colleges. Finally, he projected learner-teacher ratios, and applied attrition rates to the teacher stock.

Population projection

Figure 2 projects the South African population to 2050. The projection includes the effects of AIDS.

Figure 2: South African population, 2010–2050



Source: C Simkins, Demand for and Supply of Teachers 2010 to 2050, CDE, 2010.

CDE 2011

Although the population will continue to grow, South Africans are having fewer children. Thus, in terms of this model, the percentage of the population younger than 15 falls from 31.1 per cent in 2010 to 23.5 per cent in 2050, implying that the absolute size of this age group will be close to static over the 40-year period. This drop in the percentage of young people occurs despite substantial projected immigration.²⁴

This trend does not relieve the pressure to produce more teachers. Simkins models relationships between projected age groups, enrolments, promotions, drop-out rates, and cohort survival rates and arrives at projected pupil intake estimates, promotion

SA's expenditure on education is not being matched by results

rates, repetition rates, and period survival rates. After comparing these statistics to teacher production levels, he concludes that there will be a significant undersupply of teachers.

Teacher need projection

Simkins calculates how many teachers will be needed to teach the projected number of learners at different levels (grades), in different types of schools, and in different subjects. Plans for Further Education and Training (FET) have a major bearing on these projections. As Simkins notes:

‘The most recent statement of policy on Further Education Colleges is contained in Government Notice No 1361 in the Government Gazette of 12 December 2008. Relevant to this exercise are the following provisions:

- The distinction between initial vocational education and training (IVET) and continuing vocational education and training (CVET). IVET will take the form of national certificates (vocational) at NQF levels 2, 3 and 4 and higher education training at the certificate and diploma levels. CVET consists of training closely related to the workplace. 70–80 per cent of enrolments should be for IVET, and 20–30 per cent for CVET. The National Certificate (Vocational) qualifications will gradually replace the old NATED Report 191 (N) programmes.
- The majority of students in the Colleges should be in the 17-24 age range, The Colleges are to focus on the following groups:
 - Unemployed matriculants
 - Unemployed youth with grades 9, 10 and 11
 - Grade 9 learners with the capacity to succeed in NC(V) programmes
 - Employed adults wishing to enrol in IVET or CVET programmes.
- In 2006, the enrolment at public colleges was about 400 000. This should be doubled to 800 000 by 2014. There were about 100 000 in private colleges in 2006 and this should be doubled to 200 000, giving a total enrolment in the sector of a million.

Simkins then asks: Are these goals coherent? Are they realistic? What will they lead to? He concludes: ‘FET colleges will compete with universities for the biggest single group by highest level of education achieved, and the basis of the competition is not clear.²⁵ One determinant is whether universities expand their certificate and diploma programmes. Another will be institutional loyalty to further education colleges – the extent to which people, having entered technical colleges, elect to complete all their education there. It will be assumed that further education colleges capture 25 per cent of all National Senior Certificate passes allowing entry into higher education certificates and diplomas.’

More than two-thirds of South Africa's teachers are older than 40

'The government's assumptions about FET are roseate to the point of self-delusion'

THE GOVERNMENT'S ASSUMPTIONS REGARDING FET

The Department's assumptions about the FET College constituency and its needs are contained in key passages from its planning report on this sector:

'... students will enrol in FET colleges, not because they are failures of other parts of the education system, but because they have made an informed decision to make FET colleges preferred institutions and institutions of first choice.²⁶

'... it is clear from international experience that employers are not looking for individuals who have narrow occupational skills, but people who are able to communicate, solve problems, calculate and effectively participate in team work. It is increasingly understood that the key role of vocational education institutions is to support long term employability and skills development rather than short-term training for a specific occupation or trade. This speaks to the need for initial vocational education to focus on general vocational programmes which support the development of vocational skills with a breadth of knowledge and a strong general education foundation...

'It is important to make a distinction between initial vocational education and training (IVET) and continuing vocational education training (CVET). The curricula for IVET are broadly specified in order to lay down the foundations for further learning or for several related occupations. On the other hand, CVET refers to vocational programmes that are offered to the youth or adults to enhance their knowledge and skills closely related to the work place and the job functions of CVET participants... Between 70 per cent and 80 per cent of each college's enrolment capacity should be devoted to IVET, and between 20 per cent and 30 per cent to CVET.²⁷

CDE 2011

FET policy assumes that this is an alternative channel for students who are more practical than academic in orientation, but who might continue into post NSC level education. Simkins, however, concludes that the underlying government assumptions about FET (see box on this page) are 'roseate to the point of self-delusion.' There are several reasons he says this, including that a large number of students currently enrolling have already failed at some point in the school system, and that many learners first repeat and then drop out of grades 10 and 11 because they have not acquired the literacy and numeracy to prepare for the National Senior Certificate. Expecting these learners to absorb more general education at further education colleges when they have not mastered the requirements of grades 1–9 is unrealistic. This has important implications for projecting the numbers of specialist teachers projected to be required at FET institutions.

They are special types of teachers, unlike those produced in most faculties of education. Simkins notes:

'There are perhaps a half to three quarters of million students in grades 10–12 who would be better occupied on simple industrial unit standards [i.e. practical semi-skilled

occupational tasks like bricklaying or erecting scaffolding in construction] in further education colleges, schools or other sites of instruction.' And beyond this, the education of teachers at FET colleges is also a considerable challenge, given the projected doubling of enrolments in a short space of time, and the fact that good work experience outside of education would be a necessary ingredient for success in this field.

Teacher demand projections by level and subject

Simkins points out that learner: teacher ratios provide the link between projections of enrolments and projections of teacher demand. His projections to 2050 are based on actual ratios in 2008.

Table 3: Learner: teacher ratios, 2008-2050

	Grade	Grades	Grades	FET	
	R	1-9	10-12	Public	Private ²⁸
2008	32	32	28	73	30
2010	32	32	28	60	30
2015	32	32	28	50	30
2025	31	31	27	40	30
2050	30	30	26	26	30

Source: C Simkins, Demand for and Supply of Teachers 2010 to 2050, CDE, 2010.

CDE 2011

The assumption that such ratios should be used for projecting future teacher needs might be regarded as arguable by some, who could argue that one of the problems with South African education is that current ratios are too high. Be that as it may, the effect of such an argument would be simply to underline the extent and urgency of the teacher training challenge. Table 4 reflects the demand for teachers based on the ratios in table 1.

Table 4: Demand for teachers, 2010-2050

	Grade	Grades	Grades	FET		Total
	R	1-9	10-12	Public	Private	
2010	19 259	280 914	85 787	7 878	3 333	397 171
2015	23 152	280 301	89 837	15 695	5 000	413 985
2025	28 149	299 134	96 132	23 649	6 667	453 731
2050	32 482	305 192	99 723	47 513	6 667	491 577

Source: C Simkins, Demand for and Supply of Teachers 2010 to 2050, CDE, 2010.

CDE 2011

Many teachers often come late, leave early, spend only 46 per cent of their time teaching each week and hardly teach at all on Fridays

Value in the classroom

The demand for grade 12 teachers can be broken down by area of specialisation. For example, it can be argued that learners in grades 10–12 receive 27,5 hours of instruction per week, divided up as follows:

- nine hours in official languages;
- four and a half hours in mathematics or mathematics literacy;
- two hours in life orientation; and
- four hours in each of three other subjects.²⁹

The distribution of learners across subjects can be found by analysing the 2009 National Senior Certificate results.³⁰ The demand for teachers overall in grades 10–12 by area of specialisation can then be calculated as in table 5.

Table 5: Teacher subject needs projected over time (grades 10–12)

Field	2010	2015	2025	2050
Official languages	28 076	29 401	31 462	32 637
Mathematics	7 334	7 680	8 218	8 525
Mathematics literacy	6 704	7 020	7 512	7 793
Life orientation	6 239	6 534	6 991	7 253
Commerce	11 792	12 349	13 214	13 707
Life sciences	6 588	6 899	7 383	7 659
Physical sciences	4 904	5 135	5 495	5 701
Social studies	6 776	7 096	7 593	5 701
Services	2 620	2 744	2 936	3 046
Agriculture	2 021	2 117	2 265	2 350
Computers	1 273	1 333	1 426	1 480
Technology	1 086	1 137	1 217	1 262
Arts and culture	374	392	419	435
Total	85 787	89 837	96 132	99 723

Source: C Simkins, Demand for and Supply of Teachers 2010 to 2050, CDE, 2010.

CDE 2011

Teacher supply – The South African Council for Educators

Teachers in general and those in further education have to be registered with the South African Council for Educators (SACE). According to SACE, there were about 560 000 registered teachers in 2009/10.³¹ The new registrations components in that period are reflected in table 6:

According to one official evaluation, only about a third of institutions currently training teachers should qualify for accreditation

Table 6: New teacher registrations, 2009/10

Full (Requirement at least an M+3 year teacher qualification) ³²	6 690
Provisional (Offered to teachers with less than M+3)	12 957
Early childhood development	1 115
Recognition of foreign teaching qualifications	7 961
TOTAL	28 723

Source: C Simkins, Demand for and Supply of Teachers 2010 to 2050, CDE, 2010.

CDE 2011

The table shows that only 23 per cent of registrations were for South African trained teachers with at least M+3 (that is, a matric qualification plus three years or tertiary education). Nearly double that number were provisional registrations of teachers with less than an M+3 qualification.³³ And 28 per cent – more than local M+3 qualifications – were for teachers who had qualified in other countries. This demonstrates that the South African supply of ‘qualified’ teachers falls well short of demand. This means that 77 per cent of new teachers registered in 2009/10 were either underqualified or trained abroad. Once again, this indicates that South Africa is not producing enough teachers.

Government report on the supply and development of teachers

In July 2010, the Chief Directorate: Teacher Education in the Department of Higher Education and Training produced a report on the supply and development of teachers,³⁴ based on information gathered from higher education institutions.

The study found that a total of 5 716 teachers had graduated from Bachelor of Education and Postgraduate Certificate of Education programmes in 2007, and 5 942 in 2008.

In 2009, 1 275 teachers were expected to graduate from foundation phase (grade 3 and below) programmes; 2 524 from intermediate phase (grades 4–6) programmes, with 17 per cent specialised in physical science, 16 per cent in languages, and 13 per cent in mathematics; 2 650 from senior phase (grades 7–9) programmes, with 19 per cent specialised in languages, 13 per cent in mathematics, and 12 per cent in physical science; and 2 949 teachers from FET phase (grades 10–12) programmes, with 15 per cent specialised in languages, 12 per cent in mathematics, and 7 per cent in physical science. In all, this is fewer than 10 000, well short of the projected requirements, but a major improvement over the figures for 2007, which were below 6 000.

Full-time equivalent enrolments for the B Ed (Bachelor of Education) and PGCE (Post Graduate Certificate in Education) rose from 27 747 in 2008 to 34 675 in 2009, a 25 per cent increase. First-time enrolments rose from 11 855 to 16 257, a 37 per cent increase, so output could be expected to grow significantly over the next few years.³⁵

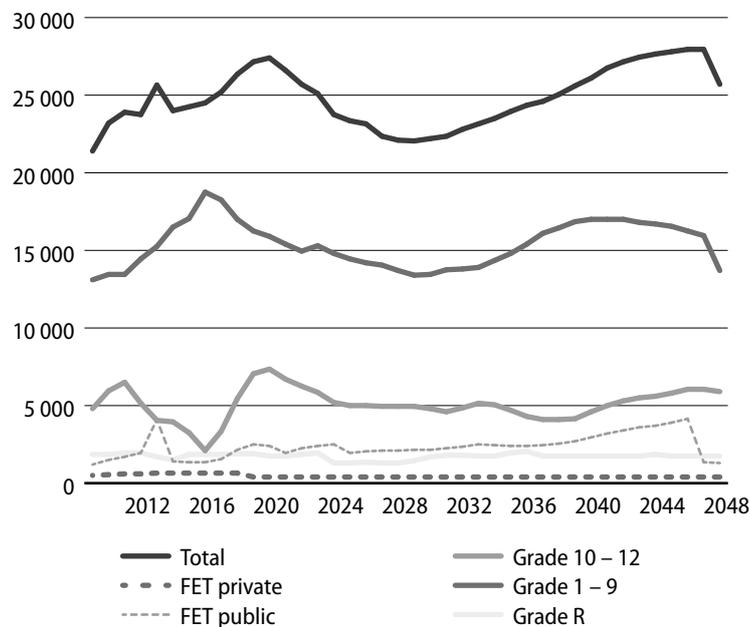
Some 77 per cent of new teachers registered in 2009/10 were either underqualified or trained abroad

While no accurate figures were available, the report estimated the attrition rate among existing teachers at between 3.8 and 6 per cent a year. These figures provide a foundation for the projection of subject and levels requirements of new teachers in the sub-section to follow.

The required supply of new teachers to 2050

The Simkins model (supported by Deacon, who worked independently but in parallel to Simkins) assumes a median attrition rate of 5 per cent a year, which enables the calculation of the number of new teachers required for grade R, grades 1-9, grades 10-12, public further education colleges, and private further education colleges. The results are depicted in figure 3.

Figure 3: Required new teacher production, 2010-2050



Current production is less than 40 per cent of projected requirements

Source: C Simkins, Demand for and Supply of Teachers 2010 to 2050, CDE, 2010.

CDE 2011

Total required production varies between 22 000 and 28 000 a year. This cannot simply be translated into a production requirement for universities, because past experience suggests that about one quarter of graduates will not take up teaching in South Africa. Current production is less than 40 per cent of projected requirements. If we build in the projected attrition of a quarter of this number to other professions or countries, actual production is closer to 30 per cent of requirements.

Simkins argues that it is undesirable to expand the role of under qualified teachers in the system, and perhaps unwise to rely heavily on continued inflows of foreign-trained teachers for too long. The Department’s own recent reports conclude that initial teacher

education programmes should be given a 'higher priority than they appear to be receiving at present'.

CDE would concur with this assessment, but it would also re-emphasise what Deacon was inferring from research on existing teachers, namely the need to incubate and retain *good* teachers, especially in scarce subjects such as mathematics and science. Moreover, the new emphasis on IVET/CVET/ FET means that the demand for good technical teachers is also rising rapidly. They will need more than only academic training, frequently by trainers with little practical knowledge.

Indeed, international experience suggests that if IVET/CVET/FET-type education is to be respected by both parents and potential employers, they will need to be convinced that teachers/instructors themselves have proven track records in the workplace.³⁶ Unfortunately, outside a few centres of excellence in the country, often supported by specific companies, there is little evidence of such educators being produced and retained (see CDE, Vocational Education in South Africa – Strategies for improvement, forthcoming).

In summary:

- South Africa needs to produce about three times more teachers a year. It currently produces fewer than 10 000 teachers a year. It needs an additional 15 000 teachers a year to go into schools, and allow for some graduates who will not take up teaching.
- The country needs to do so without sacrificing quality in teacher training; rather, teacher training needs to be enhanced, so that accredited mathematics and science teachers, for example, impart knowledge much more effectively than they are at present.
- We need to provide many more bursaries for teacher training, especially in mathematics and science. While precise numbers cannot be given without specific research, evidence available now shows that bursaries need to be increased many times over, especially for maths and science.
- Teaching needs to be made a more attractive profession. This is especially the case when it comes to ensuring that we retain and attract competent teachers in mathematics and science as well as other scarce subjects. The competition for such teachers is coming from opportunities in the rest of the domestic economy as well as globally.

We need many more bursaries for teacher training, especially in mathematics and science

IMPROVING THE PERFORMANCE OF EXISTING MATHS AND SCIENCE TEACHERS

BESIDES IMPROVING the supply of new teachers, a key challenge is to improve the performance of existing teachers, especially those in specialised subjects such as maths and science. To this end, CDE asked Professors Marissa Rollnick and Karin Brodie of the University of the Witwatersrand to identify international best practice with respect to improving maths and science education in public schools.

They report: 'There can be little doubt that the South African public school system is in crisis. South Africa spends more money on education than similar income-level countries, and produces poorer results than many countries with lower Human Development Indices. CDE has consistently addressed the problem of what it might take to improve mathematics and science education in public schools, where improvement means an increase in the number and quality of passes in mathematics and science. This important goal is easy to state but much harder to achieve, as the increased pass rate can be artificial, and the goal of more and better passes at grade 12 level is susceptible to quick fixes and superficial change.'³⁷

Their last remark chimes with other allegations of grade inflation in the NSC. These are difficult to prove, and have sometimes led to polarising political statements.³⁸ Be that as it may, Rollnick and Brodie argue that improving mathematics and science education needs to go beyond a focus on grade 12 results to all levels of the schooling system.

They consider a number of possible strategies, including whole-school reform; the provision of materials and resources; a focus on initial teacher education; support for new teachers; using assessment to leverage the system; extra support for learners; teacher retention; and teacher professional development.

They say that all these are necessary, and no single strategy is sufficient on its own. However, they conclude that professional development lies at the centre of all the other interventions, primarily because it is not possible to improve maths and science education without better teachers. They acknowledge that not all forms of professional development are equally successful, and that it should build on initial teacher education; support new teachers; help teachers to engage with curriculum change; help them to evaluate and use materials; help them learn from assessing their learners; and contribute to, and be supported by, school leadership. Nevertheless, making a meaningful impact on teacher performance would require 'deep and targeted interventions.'

Key principles for teacher development

Drawing on the international literature, Rollnick and Brodie posit seven principles for effective professional development:

1. The piecemeal, workshop-type professional development currently prevalent in South Africa is not effective.

The piecemeal, workshop-type professional development currently prevalent in SA is not effective

2. A focus on a few important instructional priorities over a long period of time is most effective.
3. Actual school and classroom data is an important source for teacher learning.
4. Teachers learn best through interactions with other teachers and with experts acting as 'critical friends' in professional learning communities, in an environment of mutual trust.
5. High-quality professional development should immerse participants in enquiry, questioning, and experimentation, and act as a model for enquiry forms of teaching.
6. There should be a focus on both subject-matter knowledge and pedagogical content knowledge.
7. Reform strategies must be linked to other aspects of school change, such as whole-school development and curriculum change.

With this in mind, Rollnick and Brodie study four teacher enhancement programmes relevant to South Africa, namely the New Zealand Secondary Mathematics Project (NSZMP); the Local Systemic Change through Teacher Enhancement Initiative (LSC) of the National Science Foundation in the United States; the Ohio Statewide Systemic Initiative (SSI) in the United States; and the concept of professional learning communities.

According to them, the SSI is most relevant to South Africa. This comprised a large-scale, 10-year investigation into mathematics and science teaching in the state of Ohio, aimed at systemic change with an equity agenda. Professional development took the form of summer workshops, reinforced by further regular workshops on both content and pedagogy throughout the year.

Participating teachers received university credits for professional development courses. Work was also done with principals and school administrators in a school system comprising a 17 per cent African-American population as well as high levels of poverty, with 800 000 of 1 800 000 learners qualifying for school food subsidies. The initiative uses both qualitative and quantitative data to show major learning gains across the board (in richer and poorer areas) and a narrowing of the achievement gap between black and white learners. These outcomes were directly linked to professional development. According to Rollnick and Brodie, this project resonates with the South African context because of its emphasis on disadvantaged schools, and its success in improving the performance of black students.

Probably the most important consideration is whether such initiatives would be replicable under South African conditions where, compared to Ohio, we have a weaker state, stronger unions,³⁹ and no appropriate effort-reward relationships.

Limitations

According to Rollnick and Brodie, professional learning communities comprise a form of in-school teacher development that involves the networking of teachers either within or across schools, and the use of learner data to inform practice, mostly with the support of external facilitators. This approach cuts across many disciplinary areas, and is taking place throughout the world. Together with facilitators, teachers study data gathered

Which institutions should train the teachers of tomorrow?

from their own classrooms, such as learner responses to tests and video-recorded lessons which they study to better understand learners and their own practice. Good school leadership plays a key role in supporting and sustaining these communities. Research shows positive outcomes in learner achievement, teacher quality and improved teacher morale, producing higher intrinsic motivation. Some studies also show that these communities work better in primary schools. Rollnick and Brodie say there is evidence from rural schools in northern KwaZulu-Natal to show that such communities can work in South Africa, but that they require openness to critique and introspection.

In many educational circles in South Africa this type of perspective has become conventional wisdom. This wisdom is not necessarily being challenged but it is worth recollecting the point made earlier in this report about poor utilisation of existing capacity. As Deacon puts it in his study for CDE:

‘The Education Labour Relations Council Report of 2005 found that there was no “lack of educators trained in mathematics”, and that there were more trained mathematics

In Brazil teachers’
performance
bonuses consist
of 2,4 times
salaries at schools
that reach their
performance
targets

INCENTIVES FOR TEACHERS – LESSONS FROM INTERNATIONAL EXPERIENCE

In April 2011 CDE held a Round Table on international experience of schooling reform (see CDE, *Schooling Reform Is Possible: Lessons for South Africa from international experience*, September 2011). It was addressed by experts from four countries where significant schooling reforms have been implemented in recent years: Brazil, Ghana, the United States, and India. It was supplemented by a new McKinsey overview of schooling reform in 20 countries, as well as a World Bank review of African experience. Participants included the South African Minister of Basic Education, Angie Motshekga; the director-general of the Department of Basic Education, Bobby Soobrayan; education experts, business leaders, and civil society representatives.

Paulo Renato Souza, former Brazilian minister of education and former secretary of education of the state of São Paulo, reported that Brazil’s schooling reform concentrated on three areas: establishing an effective assessment system of schools and pupil performance, training and rewarding good teachers, and training and rewarding good principals.

Teachers’ performance bonuses consist of 2.4 times salaries at schools that reach their performance targets, and 2.9 times salaries at schools that exceed their performance targets. Poor attendance may result in bonuses being reduced or even eliminated. In 2010, 210 000 of 227 000 eligible teachers and staff received some kind of bonus.

New career paths for teachers have been created, involving promotion along five new levels, and larger salary increases for each level. Conditions for promotion include improved attendance, permanence, and further studies.

The new promotion system comprises five levels. Promotion to the next level involves a salary increase of 25 per cent. This means that the salaries of teachers could increase

The quantity and quality of SA's teachers

teachers than were teaching mathematics across South Africa. Similarly, in 2005, 16 581 teachers in the Eastern Cape were qualified to teach mathematics, but only 7 090 teachers were actually teaching mathematics in the province and only 5 032 of these had a mathematics qualification. ... [Moreover, DoE surveys in 2006 and 2007 found] that 38 per cent of schools reported a mathematics teacher shortfall, yet some 6 000 qualified mathematics teachers were not teaching mathematics (and one third of these teachers were from schools that also reported experiencing a shortfall of mathematics teachers), either because they were school managers, or were teaching another subject altogether. Of qualified mathematics teachers not teaching mathematics, three quarters were said to be willing to teach mathematics in the same school, and one quarter in another school, leading to an estimate that perhaps between 800 and 1 600 mathematics teachers could be relocated.⁴⁰

These observations do not amount to disputing the need for producing more mathematics teachers and upgrading existing ones, but do underline concerns reported

threefold in the course of their careers. Twenty per cent of all teachers may be promoted yearly, and each teacher may be promoted once every three years.

Teacher attendance in Brazil has been a major problem. Four years ago, teachers might have been absent every other day for purported family and other reasons while still continuing to draw their pay. The regulations have been tightened, but levels of absence are still very high. Teachers are allowed to be absent for a certain number of days. 'We now say, you don't necessarily have to take all those days, and will be promoted if you take fewer than the maximum number.'⁴²

Tom Boasberg, superintendent of Public Schools in Denver, Colorado, said it was very important for principals to have the ability to hire and dismiss teachers. 'This is the most fundamental right of leading any organisation – the right to make sure your people are on the bus, and going in the right direction.'

Schools in Denver have a lot of flexibility on how to spend their budgets. Unlike many other school districts, Denver does not prescribe staffing

The factor with the greatest impact on student achievement by far is the quality of teachers. According to Boasberg, a few years ago, a seminal study was conducted in Dallas which traced the development of two groups of students from grade 3 to grade 6. Their performance at grade 3 level was identical. Half subsequently had effective teachers, and half had ineffective teachers. After three years, 75 percent of students in the first group were at grade level, compared to 25 per cent in the second.

'This is bigger than the achievement gap in any city in our country, and goes to show that we can close our achievement gaps and dramatically change performance by focusing above all on the quality of teaching in our classrooms.'⁴³

CDE 2011

The projected expansion of FET colleges will require more good teachers in technical subjects

earlier that 44 per cent of teachers of scarce subjects are actually teaching them. It is also worth noting that many formally qualified maths and science teachers do not do so effectively. A major part of this problem is the poor training of teachers (including initial training and current on-the-job training).

A recent review of teacher education programmes by the Higher Education Quality Committee (HEQC) of the Council on Higher Education (CHE) concluded that: 'Teacher education programmes are not providing the subject and pedagogical knowledge required to improve the quality of teaching substantially – in 2007, only 40 per cent of 15 B Ed programmes and 32 per cent of 22 PGCE programmes were deemed worthy of full accreditation after being reviewed by the HEQC.'⁴¹

In other words, one of the main reasons South African schools are performing so badly may be the poor training of teachers, particularly in specialised subjects such as maths and science. Therefore, while remedial programmes such as those proposed by Rollnick and Brodie may have a positive effect, they are not necessarily a comprehensive response to our current challenges.

Teachers in scarce subjects who are performing well should be selectively rewarded

KEY FINDINGS AND INSIGHTS

Key findings

South Africa is producing too few teachers, especially in key subjects such as maths and science. Moreover, many of the current teachers in these subjects are teaching badly, and are also poorly managed.

South Africa has many teachers, but they are often poorly utilised. There is a national shortage of maths teachers, yet we have qualified maths teachers who are not teaching maths but have indicated that they are willing to do so.

The teacher age profile suggests a looming shortage, and a growing need for greater numbers of younger teachers. Also, while their formal qualifications have improved, existing teachers spend too little time in the classroom, and many teach badly when they do. Moreover:

- The teacher training system is currently producing about a third of the country's total needs – it needs to produce some 15 000 more teachers a year, with an emphasis on scarce subjects.
- Only about a third of the institutions training teachers deserve accreditation, which means that actual production levels in the past and present suffer quality problems.
- Far too few bursaries are being offered to talented potential teachers, and several thousand new bursaries a year are required for those prepared to study and teach scarce subjects.
- Too few candidate teachers are being trained in scarce subjects, which can only be remedied by more bursaries and better and more diversified teacher training.

The quantity and quality of SA's teachers

- Many talented graduate teachers either emigrate or take up other professions, with a resulting loss of thousands per annum.
- South Africa is already benefiting from immigrant teachers (reportedly about 1 000 a year), but some policy-makers and planners do not favour this approach, with the result that the importation of teachers is not properly planned.

Both CDE's research and government statements reflect a concern about the lack of teacher professionalism. Education specialist Dr Roger Deacon notes: 'Not least, teachers' productivity and work ethic leave much to be desired. In his 2009 State of the Nation address, President Zuma stated that teachers should be in school, in class, on time, teaching, with no neglect of duty and no abuse of pupils. That he felt it necessary to make such an emphatic statement affirming what ought to be ordinary educational practice is a further indictment of the quantity and quality of teaching taking place in the country, where, according to Dr Graeme Bloch up to "80 per cent of schools are dysfunctional, especially in terms of the poor outcomes produced'".⁴⁴

The National Planning Commission (NPC) recently identified poor education and youth unemployment as the country's two key challenges, and identified the application of teachers to task as a key cause of poor student performance. Rejecting national poverty or poor teacher salaries as relevant causes, the NPC stated that the test scores of poor learners in South Africa were 'far lower than those of poor learners in other African countries. Research evidence highlights the significance of factors or problems within the education system itself. These include the ongoing changes and amendments to curricula, the type of teacher training, inadequate support to teachers, teaching time compared to other activities... Our conclusion is that the main problems lie in teacher performance and the quality of school leadership'.⁴⁵

The NPC believes South Africa is receiving poor value for money from its teachers: 'Literacy and numeracy test scores are low by African and global standards, despite the fact that government spends about 6 percent of GDP on education and South Africa's teachers are among the highest paid in the world (in purchasing power parity terms).'⁴⁶

Key insights

Teachers play a key role in determining results

CDE's research confirms that the poor performance of teachers is a major reason for the poor performance of the South African schooling system. However, aggregates often hide important points about variations by subject, for example. South African teachers as a whole are adequately paid, but is this true of competent mathematics teachers? South Africa needs to produce more teachers, but should this be done in all subjects, and by all the current public institutions?

More good maths and science teachers are vital

The biggest future demand will be for teachers in languages, mathematics (and mathematical literacy), commerce, life sciences, and physical sciences. The projected expansion of FET colleges will also require more good teachers in technical subjects.

CDE's research confirms that the poor performance of teachers is a major reason for the dismal performance of the SA schooling system

South Africa is at or near the bottom of the world class in terms of student performances in maths and science. There is also much scope for improvement in other subjects relevant to the economy, such as technology and commerce. The availability and quality of teachers in these subjects is a key factor in poor student performances.

Given the scale of the challenge (hundreds of thousands of teachers and millions of learners), one needs to acknowledge the limitations of producing, say, 1 000 more science and mathematics teachers through existing B Ed programmes, or placing 1 000 existing teachers in professional learning communities. Such efforts might help, but would not significantly improve the average performance of South Africa's body of learners.

Carrots as well as sticks are required

This raises the issue of whether teacher training in maths, science and other specialised subjects, teacher improvement programmes, and teacher retention should be linked to market forces.

In his State of the Nation Address in February 2011, President Jacob Zuma admonished teachers to work harder. There is little doubt that many teachers (though not all) deserve this admonition. However, in the case of mathematics, for instance, carrots may be more effective than sticks.

International experience suggests that performance incentives for teachers can work well. For example, at the CDE Round Table on international experiences of schooling reform held earlier this year, Paulo Renato Souza, former Brazilian minister of education and secretary of education in the state of São Paulo, reported that teacher upgrading and selective rewards were key to education reform in that country. Tom Boasberg, superintendent of the school system in Denver, Colorado, in the United States, also reported on the positive results of performance pay for teachers, and similar experiences have been documented in other cities and countries.⁴⁷

Selective rewards should be considered

CDE is not suggesting all teachers deserve greater rewards. Many – possibly most – teachers are evidently underperforming. However, teachers in scarce subjects who are performing well should be selectively rewarded. And prospective teachers in subjects most needed for economic growth and national development – selected languages, mathematics, science and commerce, as well as new vocational/technical subjects – should be better paid.

Teachers should not only be trained by public institutions

Another issue is which institutions should produce the teachers of tomorrow. Public tertiary institutions are currently producing about one third of the required numbers. The issue is not only whether they will be able to train far more teachers, but whether they will be able to train them well. For instance, if only a small proportion of formally

South African teachers generally are well paid, but is this true of competent maths teachers?

trained maths and science teachers teach competently, what does this say about quality control at the institutions that produced them?

The Department of Higher Education and Training is aware of the need to produce more teachers, and the pressure on universities in this regard is reportedly building. But can we rely solely on these institutions to increase the output of good science, mathematics and vocational teachers to the required levels? And can we rely solely on state-supported enhancement programmes to improve the quality of existing teachers?

The short answer is that we cannot. Moreover, many of the most talented teaching graduates will continue to emigrate, opt for jobs at private or 'Model C' schools, or opt for other careers altogether.

Therefore, the problem of providing enough good teachers to meet South Africa's current and future needs will not be resolved simply by bringing political will to bear on public institutions.

Market forces should be harnessed

Besides improving the output and performance of public training institutions, market forces need to be harnessed. Much more work is required to determine how this could or should be done, but three principles stand out even at this early stage:

- South Africa is spending enough money on education; the problem is that this expenditure is poorly utilised.
- If we are to get better value for our education spend, the economic laws of supply and demand, and associated pricing signals, should be brought to bear on this sector as well. We argue in favour of increased competition in other areas of state expenditure. Why not in this sector, where it is so urgently needed?
- Teacher training and upgrading programmes should be opened up to market forces. Private players and public institutions should compete for public funds to produce the best quality programmes.

CONCLUDING REMARKS

Teachers are at the centre of South Africa's struggling school system. This report has examined the supply of and demand for teachers from a number of angles. It is clear that South Africa cannot continue to rely solely on current systems to train more and better teachers. Government as a whole, and the Departments of Basic and Higher Education, have acknowledged that South Africa lacks sufficient good teachers, and have begun initiatives to fill this gap. However, given the nature and scale of the challenge, the public sector alone cannot address this national need with sufficient scale, quality and speed. A new response is required, drawing upon the best of global experience as well as all our national resources, both public and private.

Teacher training and upgrading programmes should be opened up to market forces

ENDNOTES

1. McKinsey & Co, *How The World's Best-Performing School Systems Come Out On Top, 2007*; also see CDE, *Schooling Reform Is Possible: Lessons for South Africa from international experience*, September 2011.
2. See M Selvaratnam, Competence of matric physical science teachers in some basic problem-solving strategies, *SA Journal of Science*, Vol 107 no 1, 2011. Prof Martin Carnoy et al make a similar point in their 2011 study of mathematics teachers in North West: 'Our main findings are that teacher quality and opportunity to learn contribute significantly to student achievement gains.' See *The Process of Learning in South Africa: The quality of mathematics teaching in North West*, HSRC, June 2011, p 131.
3. His brief was to review the South African evidence on teacher supply and demand, examine relevant international research, practice and experience, and identify lessons which could be used to amend or refine current government policies and strategies.
4. It is difficult to know how many teachers are in all private schools in South Africa, but some order of magnitude can be gauged from the commissioned research reflected in this publication.
5. Cited in R Deacon, Teacher Demand, Supply and Quality in South Africa and in International Perspective: A review of the literature, background research report for CDE, November 2010, p 16.
6. Department of Education, *National Education Human Resources Planning Framework*, Pretoria, Gauteng, 2009, p 40.
7. See Selvaratnam, Competence of matric physical science teachers.
8. Department of Education, *Systemic evaluation foundation phase mainstream report*, 2003, <http://www.education.gov.za/dynamic/imgshow.aspx?id=2203>. In 2007, grade 3 learners fared far worse in literacy (36 per cent) and only slightly better in numeracy (35 per cent). Department of Basic Education, Education for All (EFA): 2009 country report: South Africa 2010, p 35, <http://www.pmg.org.za/files/docs/100607report.pdf>, 8 October 2010.
9. Department of Education, *Grade 6 systemic evaluation report*, 2005, p 2, <http://www.info.gov.za/view/DownloadFileAction?id=122281>, 28 July 2009.
10. J Strauss and M Burger, *Monitoring Learning Achievement Project*, Pretoria: Department of Education, 2000; V Chinapah, *With Africa for Africa: Towards quality education for all*, HSRC, 2000.
11. HSRC Media Release, 2004, see http://www.hsrc.ac.za/Media_Release-232.phtml. For further details on learner achievement, see R Deacon and V Dieltiens, Country Background Report: South African Education, report prepared for the DoE and OECD, Johannesburg, p 31-3.
12. Ibid, p 25.
13. Ibid, p 26.
14. 'Increasing numbers of Funza Lushaka bursars have graduated over the past three years, with a total of 18 391 bursaries having been awarded from 2007 to 2009. [However] In 2010, there were 30 000 applicants for only 2 000 new bursaries available.' Ibid, p 24.

15. Ibid, p 21.
16. Ibid.
17. Deacon, Teacher demand, p 22; M Cosser, *Studying Ambitions: Pathways from grade 12 and the factors that shape them*, HSRC, 2009, p 96-97.
18. Kuben Naidoo, acting head of secretariat, National Planning Commission, discussion with CDE, April 2011.
19. Ibid.
20. Deacon, Teacher Demand, p 29, citing various government reports. Department of Education, Ministerial committee on a national education evaluation and development unit: Final report, January 2009, <http://www.pmg.org.za/files/docs/090417education-%20needu.pdf>, 15 October 2010, pp 41, 43, 52, 60.
21. Deacon, Teacher demand, pp 29-30.
22. According to calculations by the teacher migration specialist Dr R de Villiers of the University of Pretoria.
23. Deacon, Teacher Demand, p 48.
24. According to Simkins, the first round impact of immigration will be limited as far as this age group is concerned, but it will have a second round impact as immigrants have children in South Africa. This point is perhaps arguable, but the model can be adjusted to accommodate other assumptions.
25. It is often assumed that those attending FET colleges would be students who could not get into university by virtue of their NSC or other school grades. However, such grade restrictions are falling in certain categories of university entrance (including – in certain cases – for those taking up teacher training); and in other cases good school students who have a more practical bent may wish to opt for the FET route.
26. C. Simkins, Demand for and Supply of Teachers, 2010 to 2050, background research report for CDE, 2010, p 9.
27. Simkins, Demand for and Supply of Teachers, pp 14-15.
28. Private here refers to registered FET colleges.
29. We are not suggesting that 27,5 hours is an ideal figure, but Simkins uses it based on current norms. If better norms were adopted, more teachers would be needed.
30. Summarised in Simkins, Demand for and Supply of Teachers.
31. Of course, not all of these will be active teachers, or even those potentially available to teach, but simply those who registered at some time.
32. This would typically be someone with a Bachelor of Education (B Ed) degree or a three-year degree plus a university education diploma. The term M refers to the notion of Matric (or now NSC), and 3 refers to the number of years of subsequent study (in the case of a B Ed).
33. This is a complex category of teachers including those who are in the process of upgrading their qualifications; but it also contains some who apparently do not have such intentions and who are a subject of concern – see Deacon, Teacher Demand, p 26-30.
34. The report is summarised in Simkins, Demand for and Supply of Teachers.
35. However, this partly depends on the availability of bursaries which were curtailed to only 2 000 in 2010 despite 30 000 applications.

Endnotes

36. See CDE, Vocational Education In South Africa: Strategies for improvement (forthcoming), based on Rolf Stumpf and Gustav Niebuhr, International Best Practice on the Introduction of Vocationally Oriented Education in the Secondary School Sector, CDE background research report, 2010.
37. See CDE, *Doubling for Growth: Addressing the Maths and Science Challenge in South Africa's schools*, 2007; and CDE, *The Maths and Science Performance of South Africa's Public Schools: Some lessons from the past decade*, 2010.
38. For example, in February 2011, the Minister of Higher Education, Blade Nzimande, reportedly said in parliament that the questioning of NSC grade inflation by opposition MPs was based on racist presuppositions: 'Higher Education Minister Blade Nzimande angered officials in Parliament by saying the opposition and media assume that this government of darkies is incapable' when it comes to improving education in South Africa.
<http://news.iafrica.com/sa/706641.html>.
39. As just one illustration of such constraints, see the remarks by Prof Crain Soudien at the launch of the National Education Evaluation and Development Unit (NEEDU) on how teachers' unions were resisting evaluation initiatives.
40. Deacon, *Teacher Demand*, p 12.
41. *Ibid*, p 28, citing Education Labour Relations Council (ELRC), *Resource Documents*, pp 143-145.
42. CDE, *Schooling Reform Is Possible*, p 13.
43. *Ibid*, p 17.
44. Deacon, p 30, citing former DBSA education specialist Dr Graeme Bloch.
45. National Planning Commission, *Diagnostic Overview 2011*, p 15.
46. *Ibid*, p 14.
47. See remarks by Paulo Renato Souza in CDE, *Schooling Reform Is Possible*.

Previous publications in this series

Hidden Assets: South Africa's low-fee private schools (August 2010)

Immigrants in Johannesburg: Estimating numbers and assessing impacts
(August 2008)

**South Africa's 'Door Knockers': Young people and unemployment
in metropolitan South Africa** (July 2008)

**Under the Radar: Pentecostalism in South Africa and its potential social and
economic role** (March 2008)

The Skills Revolution: Are we making progress? (October 2007)

Skills, Growth and Migration Policy: Overcoming the 'fatal constraint'
(February 2007)

Can Black Economic Empowerment Drive New Growth? (January 2007)

**Private schooling for the poor? International research raises new questions
for South Africa** (November 2005)

**Growth and Development in South Africa's Hheartland: Silence, exit and
voice in the Free State** (July 2005)

**Labour-intensive Public Works: Towards providing employment for all
South Africans willing to work** (April 2003)



CENTRE FOR DEVELOPMENT AND ENTERPRISE
Informing South African Policy

5 Eton Road, Parktown, Johannesburg 2193, South Africa
P O Box 1936, Johannesburg 2000, South Africa
Tel 27 11 482 5140 • Fax 27 11 482 5089 • info@cde.org.za • www.cde.org.za

BOARD

L Dippenaar (chairman), A Bernstein (executive director), F Bam, E Bradley,
C Coovadia, M Cutifani, B Figaji, F Hoosain, M Le Roux, S Maseko,
I Mkhabela, W Nkuhlu, S Ridley, E van As

INTERNATIONAL ASSOCIATE

Peter L Berger

ZENEX
FOUNDATION



This study has been funded by the Zenex Foundation
and the Epoch and Optima Trusts. The opinions expressed in this report
do not necessarily reflect the views of the funders.