Chapter 9

IMPROVING EDUCATION, TRAINING AND INNOVATION

"We are Africans.

We are an African country.

We are part of our multinational region.

We are an essential part of our continent.

We feel loved, respected and cared for at home, in community and in public institutions.

We learn together…..We love reading.

Each community has:

a school,

teachers who love teaching and learning,

a local library filled with the wealth of books,

a librarian.

All our citizens read, write, converse, and value idea and thought.

We are fascinated by scientific invention and its use in the enhancement of our lives.

We live the joy of speaking many languages."

Introduction

Education, training and innovation are central to South Africa's long-term development. They are core elements in eliminating poverty and reducing inequality, and the foundations of an equal society. Education empowers people to define their identity, take control of their lives, raise healthy families, take part confidently in developing a just society, and play an effective role in the politics and governance of their communities.

Foundational skills in areas such as mathematics, science, language, the arts and ethics are essential components of a good education system. Lifelong learning and work experience improves productivity, enabling a virtuous cycle that grows the economy.

Quality education encourages technology shifts and innovation that are necessary to solve present-day challenges.

Education, training and innovation are not a solution to all problems, but society's ability to solve problems, develop competitively, eliminate poverty and reduce inequality is severely hampered without them. Schools are the building blocks for learning and socialisation. The values learnt at school permeate society. The quality of the schooling system impacts significantly on further education, college, higher education and society's ability to innovate.

Higher education is the major driver of the information/knowledge system, linking it with economic development. However, higher education is much more than a simple instrument of economic development. Education is important for good citizenship and enriching and diversifying life. Quality higher education needs excellence in science and technology, just as quality science and technology needs excellent higher education. Good science and technology education is crucial for South Africa's future innovation. The humanities are important for understanding some of the difficult challenges the country faces such as transformation, violence, corruption, education, service delivery, innovation, the gap between the rich and the poor, and the issue of race.[1]

Universities are key to developing a nation. They play three main functions in society. Firstly, they educate and train people with high-level skills for the employment needs of the public and private sectors. Secondly, universities are the dominant producers of new knowledge, and they critique information and find new local and global applications for existing knowledge. Universities also set norms and standards, determine the curriculum, languages, and knowledge, ethics and philosophy underpinning a nation's knowledge-capital. South Africa needs knowledge that equips people for a society in constant social change. Thirdly, given the country's apartheid history, higher education provides opportunities for social mobility and simultaneously strengthens equity, social justice and democracy. In today's knowledge society, higher education underpinned by a strong science and technology innovation system is increasingly important in opening up people's opportunities.

However, universities no longer have a monopoly on knowledge production globally. Other organisations, such as science councils, non-governmental and privately funded research institutes, state-owned enterprises (SOEs), the private sector, and even some government departments, have become sites of new knowledge production and application. The framework in which the knowledge production system operates and its relationship to innovation and industry need to be reconfigured. A greater understanding within government is required to acknowledge the importance of science and technology and higher education in leading and shaping the future of modern nations. Government departments need to work together to develop a broad enabling framework and policy that encourages world-class research and innovation.

---

[1] ASSAF (2011). *The state of the Humanities in South Africa: Status, prospects and strategies*. Pretoria: Academy of Science of South Africa.

A strong educational system spanning early childhood development, primary, secondary, tertiary and further education is crucial for addressing poverty and inequality. The psychosocial wellbeing of learners from early childhood to higher education is also central to the success of a good quality education system. Other government policies, such as the provision of housing, basic services and social security, are therefore critical for building an education system that benefits all learners.

This chapter builds on the vision for education, training and innovation. The proposed actions are based on five cross-cutting, interdependent and implementable themes:

- *Lay a solid foundation for a long and healthy life and higher educational and scientific achievement*. This relates especially to early childhood development, basic education, further education and training, and higher education.

- *Build a properly qualified, professional, competent and committed teaching, academic, research and public service core*. This relates to quality early childhood learning, schooling, further education and training, higher education, and the national system of innovation. It requires a coordinated plan to produce high-level professionals to lead the public and private sectors, and the cutting-edge knowledge capacity needed for increased innovation and socioeconomic development.

- Build a strong and coherent set of institutions for delivering quality education, science and technology innovation, training and skills development. Develop world-class centres and programmes in the national system of innovation and the higher education sector over the next 20 years. The Department of Higher Education and Training and the Department of Science and Technology should lead and consolidate this process.

- *Expand the production of highly skilled professionals and enhance the innovative capacity of the nation*. This relates to higher education, the national system of innovation, SOEs and industry. Create a new national framework of common objectives and operations – recognising that new knowledge and innovation arise from many sites in modern society. Develop a common understanding within government in particular the Department of Higher Education and Training, Department of Science and Technology, Department of Trade and Industry, Public Enterprises, Treasury, Economic Development on how to promote the role of science and technology and higher education in shaping society, the future of the nation and the growth path.

- *Create an educational and national science system that serves the needs of society.* Increase participation rate in higher education to more than 30 percent, double the number of scientists and increase the numbers of African and woman postgraduates, especially PhDs, to improve research and innovation capacity. This will help to accelerate the transformation of South Africa's scientific and academic communities to better reflect the population. Develop African languages and incorporate indigenous knowledge systems in education and research.

The foundations for achieving the above actions should be fully established within the first five years of the plan to allow for expansion in the subsequent period.

Education and training vision

We need to ensure all children can access and benefit from a high quality education. This requires a range of early childhood development services and programmes that support the holistic development of young children. These services need to be flexible, so that they can be responsive to the needs of children, families and communities. Some services will need to be targeted directly at children, others will provide support to their primary caregivers. To overcome our apartheid legacy it is essential that everybody has access to services of a consistently high standard regardless of who they are and where they live. This will require that specific consideration be given to the most vulnerable children – those who are living in poverty or with disabilities.

We envisage schools that provide all learners with an excellent education, especially in literacy, mathematics and science. The education system needs to improve constantly.

The post-school sector needs to meet the wide range of education and training needs of people over 18. Together with the higher education system it will play a significant role in producing the skills and knowledge the country needs to drive its economic and social development. It will also be an inclusive system that provides opportunities for social mobility, while strengthening equity, social justice and democracy.

Key features of the education training and innovation system in 2030

To achieve this vision by 2030, we will need to focus on the following issues:

Early childhood development

Early childhood development is critical for ensuring that children are able to reach their full potential. Measures will need to be put in place to ensure that women are able to plan their pregnancies and that teenage pregnancy is no longer an issue. Pregnant mothers will need access to emotional and material support to ensure a healthy pregnancy. Children will need to be nurtured so that they grow up healthy, well nourished, physically fit, cared for in a stable home environment so that they can learn to interact and communicate with those around them. Measures will need to be in place to eradicate deficiencies in micronutrients among babies younger than 18 months and to ensure all children have sufficient food and nutrition. If these objectives are achieved it will be possible for children to grow up in stimulating environments that support learning and where they are not held back by their gender or the socioeconomic status of their family.[2]

---

[2] Biersteker L & Motala S (2011). Enhancing outcomes for Children 0-5 years through Early Childhood Development as a Core Component of the National Development Plan. Input paper prepared for the National Planning Commission.

Schooling

Teachers are central to education and teaching should be a highly valued profession. Teachers must have a good knowledge of the subjects they teach. It is particularly important that there are high quality teachers of maths and science. We should aspire to a future where teachers are recognised for their efforts and professionalism. Bodies such as the South African Council for Educators and specialist maths, science and other subject-specific associations need to play a leading role in the continuing development of teachers and the promotion of professional standards.

There needs to be an institutional structure, including bursary programmes for existing teachers, that promotes good teaching by attracting, investing in and retaining the best teachers. Teacher remuneration should be linked to their performance while taking into account mitigating factors such as the school environment and the socio-economic status of learners.[3] To develop and sustain this professional culture, schools need to be well run by skilled and dedicated principals who foster a vibrant but disciplined environment that is conducive to learning.

The curriculum will need to be tailored to the needs of South African society. This will require principals and management teams to fulfil their roles as leaders in implementing the curriculum.[4]

The importance of African languages or "mother tongue" is emphasised and integral to education, to science and technology, to the development and preservation of these languages.

Education institutions must have the capacity to implement policy and, where capacity is lacking, immediate measures need to be taken to address it. The interests of all stakeholders need to be aligned to support the common goal of achieving good educational outcomes that are responsive to community needs and economic development.

Districts should provide targeted support to improve practices within schools, and ensure communication and information sharing between authorities and schools. Schools need to share best practice.

Parents need to be given meaningful information on their children's performance. This requires teachers to carry out assessment practices that enable learners to compare their performance with their counterparts in other schools in the district. It needs to be

---

[3] Van der Berg S, Taylor S, Gustafsson M, Spaull N & Armstrong P (2011). Improving quality education in South Africa. A report prepared for the National Planning Commission.
[4] Taylor N (2011). A five year plan for South African schooling. A report commissioned by the National Planning Commission.

easy to identify areas where improvements in teaching and learning are required. This means policy-makers and districts need to be able to access information that helps them determine the rate and extent of progress in different sectors of the education system, including the reasons for underperformance and schools requiring intervention. Most importantly, it requires that adequate and appropriate capacity exists to support schools that are performing poorly.

By 2030, the schooling system is characterised by learners and teachers who are highly motivated; principals are effective managers who provide administrative and curriculum leadership; parents are involved in the schools their children attend; schools are accountable to parents; committed and professional teachers have good knowledge of the subjects they teach; schools and teachers are supported by knowledgeable district officials; the administration of education (including appointment and disciplining of teachers) is the preserve of the government, with unions ensuring that proper procedures are followed; learning materials are readily available; basic infrastructure requirements are met across the board; and high speed broadband is available to support learning.

Languages not only carry knowledge, but also create new and better knowledge. Language policy needs to be informed by a greater appreciation of labour market imperatives. Learners need to receive high-quality instruction in both their mother tongue and English from early in the foundation phase.

Infrastructure backlogs need to be addressed so that all schools meet the basic infrastructure and equipment standards set by the national Department of Basic Education. This requires targeted action to address the lack of basic infrastructure, such as libraries, books, science laboratories, sports fields, electricity and running water.

Further education and training and skills development

An expanded system of further education and training and skills development needs to offer clear and meaningful educational and training opportunities for young people who have obtained a low pass in the National Senior Certificate, as well as older people who wish to develop their skills, adults who left school early or had no access to education and young people between the ages of 16 and 20 who have completed grade 9 and left school. Curricula need to be designed to respond to the specific learning needs of these different groups in order to help them develop their life opportunities.

College should provide people between the ages of 18 and 45 with ongoing access to learning opportunities and qualifications, including general vocational certificates, technical or occupational qualifications and awards, higher certificates and other programmes. These courses should correspond with higher education, the National Senior Certificate for adults, and high school for those who have started high school and wish to complete the National Senior Certificate.

Technical high schools have a key role to play in addressing the needs of young people who leave school at grade 9 and wish to pursue a vocation: the National Certificate Vocation is for those who choose not to undertake a technical Senior Certificate.

A diverse set of private, workplace and community-based providers should be supported to offer targeted work-based training, as well as community and youth development programmes. This will require strong regulatory bodies that analyse demand, ensure a suitable range of courses is available, and monitor quality.[5] Sector Education and Training Authorities (SETAs) should play a more effective role in the production of skills that are required to meet the immediate needs of employers.

Higher education

Each university should have a clear mission that sets out its unique contribution towards knowledge production and national development.

Universities are an integral part of the post-school system, but are also the apex of the education, training and innovation system. School and college teachers are often products of the university system. The schooling, colleges and higher education systems should be better articulated and allow for mobility of learners and staff between these different parts of the education system.

Institutions need to be efficient, characterised by higher knowledge productivity units, throughput, graduation and participation rates. In 2030, 75 percent of university academic staff should hold PhDs. PhD graduates, either as staff or post-doctoral fellows, will be the dominant drivers of new knowledge production within the higher education and science innovation system.

Universities need to identify their areas of strength and develop centres of excellence in response to the needs of their immediate environment, the African region and global competitiveness.

There needs to be a coherent national plan for higher education that includes the promotion of innovation and the development of knowledge. This needs to be developed in collaboration with higher education institutions, science councils, SOEs, private industry and research institutes. The plan should be appropriately funded, including funding for poorly resourced institutions. It should also be closely linked to the nation's long-term needs in terms of human resources development and knowledge production.

The higher education system should be diverse so that each institution can build on its strengths and expand areas of specialisation. This differentiation should be enabling and developmental based on a recognition that higher education has to fulfil many functions

---

[5] Allais S, Lolwana P & Marock C (2011). Further Education and Training and Skills Development. A report prepared for the National Planning Commission.

and no one institution can serve all of societies needs. However, differentiation needs to take place in a context that takes account of social justice and equity imperatives, this means that historically disadvantaged institutions must be given adequate support and incentives to develop their own areas of excellence in both research and teaching.

Universities should be welcoming and supportive environments for black and female students and researchers. They need to make significant progress in gender and racial transformation in order to reduce gender and racial disparities so that women and Africans each make up more than 50 percent of research and teaching staff.

Private higher education institutions can play a greater and better-defined role in the higher education landscape, if the state provides effective and enabling regulation. The regulatory system must ensure these institutions are well run, provide stimulating learning environments for students and adhere to high standards of corporate governance.

We envisage a diverse national innovation system that consists of a range of world-class centres and programmes specialising in areas that address national priorities, including African languages and indigenous knowledge systems. These should draw on the many sites of knowledge and innovation within society. Their staff must be well qualified. Their participation and throughput rates will need to improve. They should provide a welcoming environment for young, black and female staff.

Progress since 1994

Great strides have been made in education. Access to education at various levels has improved and race and gender disparities have been largely eliminated.

- In 1996, 22.5 percent of five-year-olds were enrolled in an early childhood development institution. In 2007, 80.9 percent were enrolled.
- Universal access and gender parity were almost achieved in schooling by 2010. About 99 percent of children complete grades 1 to 9.
- Since 1996, the number of schools without water has decreased from 9 000 to 1 700 and the number of schools without electricity has dropped from 15 000 to 2 800. The percentage of classrooms with more than 45 learners has decreased from 55 percent to 25 percent.
- The infrastructure of colleges received a significant improvement following the infrastructure recapitalisation grant announced in the 2005 budget.
- School funding policies have been pro-poor, resulting in 60 percent of all schools being designated as "no fee" schools.
- The national school nutrition programme feeds about 6 million children in 18 000 schools across the country.
- In historically white schools, about 56 percent of learners are black.
- The race profile of higher education institutions has changed: 32 percent of all students in 1990 were African; by 2009 this had increased to two-thirds.

This is the foundation on which South Africa must build an education system for 2030.

The challenge

Although progress has been made in all subsectors of the education and training system, there are severe problems that must be solved to achieve the vision for education, training and innovation.

Early childhood development

Many South African children grow up lacking food and nutrition, which does not provide a good platform for cognitive development and full participation in society. Nowhere is this more evident than in South Africa's poor schooling outcomes and low skills base.

Children in the 0-4 age group have the highest mortality rates in the South African population and unacceptably high levels of stunting and exposure to violence and neglect. This impacts adversely on their development. South Africa is also one of the 20 countries with the highest burden of under-nutrition. There are 2.8 million households and 11.5 million individuals who are vulnerable to hunger, over 72 percent of whom live in rural areas.

An average South African eats less than four out of nine food groups against the dietary diversity norm of seven out of nine. Children, pregnant and breastfeeding women and those living with tuberculosis and HIV/AIDS are most at risk. Nationally, stunting affects almost one in five children (18 percent), with higher levels of stunting in rural areas (24.5 percent), and urban informal areas (18.5 percent). About one in 10 children (9.3 percent) are underweight, reflecting the severity of child under-nutrition. Micronutrient deficiency is also a problem. One in four women lacks vitamin A and about a third of women and children are iron deficient. A third of preschool children are vitamin A deficient, 21.4 percent are anaemic and 5 percent suffer from iron-deficiency anaemia.

Access to early childhood development centres remains low. In 2009 about a quarter of children aged two attended early childhood development centres compared to nearly 60 percent of those aged four.[6]

Schooling

Despite many positive changes since 1994, the legacy of low-quality education in historically disadvantaged parts of the school system persists. This seriously hampers the education system's ability to provide a way out of poverty for poor children. The grade promotion of learners who are not ready in the primary and early secondary phases leads to substantial dropout before the standardised matric examination.

---

[6] Biersteker & Motala, 2011.

In the Southern and East African Consortium for Monitoring Educational Quality III (2007) survey of grade 6 mathematics and reading, South Africa performed below most African countries. An alarmingly high proportion of grade 6 learners had not mastered even the most basic reading and numeracy skills. Of the 15 countries in the study, South Africa had the third highest proportion of functionally illiterate learners (27 percent), and the fifth highest proportion of functionally innumerate learners (40 percent).[7]

Most children are in the historically disadvantaged part of the education system, which still serves mainly black and coloured children. Learners in these schools typically exhibit low proficiency in reading, writing and numeracy. The schools that historically served white children produce educational achievement closer to the standards of developed countries. Literacy and numeracy testing within the National School Effectiveness Study demonstrates that grade 5 learners in historically black schools are performing considerably worse on average than grade 3 learners in historically white schools.[8]

Two factors are largely responsible for the failings of the school system. The primary cause is weak capacity throughout the civil service – teachers, principals and system-level officials, which results not only in poor schooling outcomes, but also breeds a lack of respect for government. The mirror image of this weakness in the technical core is a culture of patronage that permeates almost all areas of the civil service. Nepotism and the appointment of unsuitable personnel further weaken government capacity.[9]

Further education, training and skills development

Many parts of this sector are severely underperforming. There are not enough public institutions providing learning opportunities in this sector, despite the millions of young people who are eager to learn. Although there are some strong institutions, the college sector is small and weak. Public colleges enrol an equivalent of one-third (roughly 300 000) of the learners enrolled in higher education when ideally the situation should be the other way round. Private institutions, including non-governmental organisations, struggle to operate in the post-1994 policy environment due to lack of funding and existence of a regulatory system that does not support the development of institutions.

The success rate in FET colleges is extremely low. This is demonstrated by the 4 percent throughput rate in 2009 of the cohort that started the new National Certificate Vocation in 2007. The drop-out rate in colleges is estimated to range between 13 percent and 25 percent per annum, the highest dropout levels are in Level 2 of the National Certificate Vocation.[10]

---

[7] Van der Berg, Taylor, Gustafsson, Spaull & Armstrong, 2011.
[8] Taylor S (2011). Uncovering indicators of effective school management in South Africa using the National School Effectiveness Study. Stellenbosch Economic Working Papers No. 10/11.
[9] Taylor, 2011.
[10] Department of Higher Education and Training (2011). Green Paper on post-schooling.

Training providers, further education and training colleges have very weak relationships with workplaces, leading to inappropriate or incomplete training. It is estimated that approximately 65 percent of college students are unable to find workplace experience, which is valuable for all students and a requirement for completing N diplomas.

Despite spending large amounts of money, levy-funded institutions – the Sector Education and Training Authorities – have not made a major contribution to resolving the problems in skills development. Further problems include fragmented data systems, which lead to poor planning, and the lack of reliable information on the number of private providers and their output. There are also governance problems in further education and training colleges, and some of the sector education bodies.

The qualifications framework has proved inappropriate for the sector's learning and training needs. This has resulted in formal education and training institutions using their old qualifications, which have officially been rewritten into an outcomes-based format.

Higher education

The Shanghai JiaoTong Academic Ranking of World Universities 2008 placed South African higher education between 27 and 33, along with the Czech Republic, Hong Kong, New Zealand and Ireland. For a developing country, this is an exceptional rating, but it can do better and is underperforming in a number of key areas. There are some institutions within the system that continue to show signs of instability and dysfunction.[11]

Studies have shown that while the South African higher education system functions relatively well, higher education faces major challenges: low participation rates, high attrition rates, a curriculum that does not speak to society and its needs, the absence of an enabling environment that allows every individual to express and reach full potential, and poor knowledge production that often does not translate into innovation. While knowledge production is the rationale of higher education, high-quality knowledge production cannot be fully realised with a low student participation rate, a curriculum or environment that is alienating and does not articulate the vision of the nation, and an academic staff that is insufficiently qualified (only 34 percent of academic staff hold PhDs).

---

[11] Badsha N & Cloete N (2011). Higher Education: Contribution for the National Planning Commission's National Development Plan.

Institution	Enrolment	Institute for Scientific Information publications	PhD output	% Academics with PhDs
University of Sao Paulo	90 000	9 000	2 400	98
South Africa	899 000	8 200	1 420	34

Source: Badsha and Cloete, 2011

The World Bank characterises the South African higher education system as mid-level performer in terms of knowledge production, with low participation and high attrition rates and insufficient capacity for the level of skills production that is required.

Globally, Africa's proportion of publication output is declining, although South Africa is still the dominant producer on the continent. However, as is the case with ICT connectivity, South Africa's lead is being eroded, particularly by North Africa. [12]

Percentage share of publications in Africa		Global competitiveness ranking	
South Africa	37	South Africa	54
Egypt	27	Russia	63
Nigeria	12	Brazil	58
		India	51
		China	27

Source: Web of Science, Thompson Reuters, 2010; World Economic Forum, 2010

National system of innovation

In comparison to its population, South Africa's science and innovation system is small by international standards. The natural sciences produce the most accredited research outputs (36 percent of the country's total output), followed by the humanities (21 percent) and medical and health sciences (20 percent). From 1995 to 2007, the proportion of all scientific output produced by universities increased from 80 percent to 86 percent, which means that universities are increasing their dominance as knowledge institutions in South Africa.

Local research and development spend against GDP in 2007 was 0.92 percent; by comparison, Norway spends 1.62 percent.

---

[12] Gillwald A (2010). The poverty of ICT policy, research and practice in Africa.

Field/ discipline/ category	Norway	South Africa
Full-time researchers	25 000	19 000
Scientific publications	6 815	5 045
PhDs per million people	151	28

While South Africa has excelled in some areas such as registering plant cultivars, there has been little increase in public sector research personnel, PhD graduates and research outputs. The following statistics from Higher Education Management Information Systems, however, show that South Africa has been making progress in some key areas but needs to accelerate the development of key skills.

Degree type	2001	2009
Natural science	7 215	11 909
Engineering	1 912	4 068

African students made up 48 percent of the 2009 engineering graduates. These statistics are encouraging – over time and with adequate investment in the respective programmes, there will be an increase of students from master's to doctoral studies.

Knowledge production capacity is not evenly distributed in South Africa. The higher education sector can be differentiated into three groups: high knowledge-producing, medium knowledge-producing and low knowledge-producing institutions.[13] New knowledge is also produced in many other sites, for example, the science councils, SOEs and private industry. It is critical for these components to work together in the national interest.

Massive investments in the higher education system have not produced better outcomes in the level of academic performance or graduation rates. While enrolment and attainment gaps have narrowed across different race groups, the quality of education for the vast majority has remained poor at all levels. The higher education therefore tends to be a low-participation, high-attrition system.

South Africa's participation rate[14] of 17 percent is significantly lower than that for comparable middle-income countries, although much higher than the average of six percent for sub-Saharan African countries. African student numbers grew by an average of 6.2 percent per year between 2000 and 2009, against 1.1 percent for white students. Two-thirds of all students in higher education in 2009 were African, compared to only 32 percent in 1990.

---

[13] Knowledge production is measured by a combination of input and output variables, consisting of indicators such as master's and doctoral enrolments and graduates, proportion of staff with doctorates, proportion of PhD graduates to permanent staff and Institute for Scientific Information-accredited publication output.
[14] Enrolment as a proportion of the 20-24-year-old cohort.

Notwithstanding this significant progress, the participation rate for African and Coloured students is still only at 13 percent. The National Plan for Higher Education[15] set a goal of 20 percent participation by 2016. Graduation rates remain unacceptably low and below the benchmarks set in the National Plan for Higher Education. At postgraduate level, graduation rates are declining.

Achieving the 2030 vision for education, training and innovation

The challenges outlined above and in the National Planning Commission's *Diagnostic Report* are not new. In the education sector, the respective departments are aware of these problems and have plans in place to address many of them. The aim of our proposals is to acknowledge and build on departmental plans and, where necessary, to recommend a different way of approaching the problems. We propose a set of quantifiable targets for 2030, followed by an outline of critical reforms necessary to achieve the set targets.

Quantifiable targets for 2030

Early childhood development

Early childhood development is defined in the Children's Act (2005)[16] as the process of children developing their emotional, cognitive, sensory, spiritual, moral, physical, social and communication capabilities from birth to school-going age.

Delays in cognitive and overall development before schooling can often have long-lasting and costly consequences for children, families and society. The most effective and cost-efficient time to intervene is before birth and in the early years of life. The 1 000-day window from conception to two years is a particularly sensitive period in child development. Investment in early childhood development should be a key priority. Research shows well planned and targeted early childhood development initiatives to be a cost-effective way of ensuring that all children have a childhood that is free of factors that impede their physical and cognitive development. The focus should be on children under the age of five. By 2030, all children should start their learning and development at early childhood development centres. These centres should be set up and properly monitored.

Eradicate child under-nutrition

The benefits of investing in early intervention programmes include improvements in school enrolment rates, retention and academic performance, decline in antisocial behaviour and higher rates of high school completion. Eliminating anaemia has been shown to increase adult productivity by between 5 percent and 17 percent. Attention should focus on establishing the most effective intervention and appropriate delivery

---

[15] Department of Education (2001). National Plan for Higher Education. Pretoria: Department of Education.
[16] Republic of South Africa (2006). Children's Act, 2005. Government Gazette, No. 28944. Vol. 492.

mechanisms. The feeding schemes at schools have contributed greatly to reducing under-nutrition. In 2030, feeding schemes in schools should cover all children in need and provide food that is high in nutritional content and rich in vitamins, particularly vitamin A.

Eradicate vitamin A deficiency among children

Reliable research is needed to understand the extent of the vitamin A problem. The 2007 Lancet Series highlighted the 1 000-day window of opportunity from pregnancy to 23 months as a critical period in the development of the child. There is a need for a pilot initiative to identify an effective delivery mechanism for a programme targeted at this age group.

Universal access to two years of early childhood development

Different kinds of interventions are required for different age groups. Capacity needs to be developed to provide relevant development activities to the total projected 4 million children in the 0-3 age cohort and nearly 2 million in the 4-5 age group by 2030. Capacity needs to be developed to effectively monitor and regulate the sector as well.

Schooling targets

About 80 percent of schools and learners achieve 50 percent and above in literacy, mathematics and science in grades 3, 6, 9

The Department of Basic Education understands the need to improve the quality of outcomes at different grades for mathematics, literacy and science. It has set ambitious targets for 2024. For language and numeracy in grade 3 and grade 6, the target is that 90 percent of learners should perform at the required level.

However, the performance standard is ambiguous, referring only to minimum competencies in different subjects. We propose that the acceptable level of performance be defined as 50 percent and above, and the target of learners and schools performing at this level by 2030 be set at 80 percent. If 80 percent of schools and learners achieve results above 50 percent on average, it will demonstrate considerable improvement.

Secondary school completion rate is 77 percent in the United States, 87 percent in the United Kingdom and 93 percent in Japan.

Increase the number of students eligible to study maths and science at university to 450 000 per year

The department has set a target to increase the number of learners eligible for bachelors programme to 300 000 by 2024, 350 000 learners who pass mathematics, and 320 000 learners who pass physical science. These targets are very ambitious, more than doubling the results achieved in 2010. We propose a target of 450 000 learners eligible for bachelors programme with maths and science by 2030.

South Africa improves its position in international education rankings

The department aims to improve its average Southern and East African Consortium for Monitoring Education Quality results for grade 6 languages and maths from 495 to 600 by 2022 and to improve average grade 8 scores in the Trends in Mathematics and Science Study from 264 to 420 in 2023. The commission supports these targets and proposes that by 2030, grade 8 scores in the Trends in Mathematics and Science Study should reach 500. Ideally, South Africa should improve its position by 10 places or more by 2030.

About 80 percent of every cohort of learners successfully completes the full 12 years of schooling

South Africa loses half of every cohort that enters the school system by the end of the 12-year schooling period, wasting significant human potential and harming the life-chances of those concerned. We believe it is important to increase learner retention rates to 90 percent, of whom 80 percent successfully pass the exit exam.

Further education and training and skills development

The Department of Higher Education and Training has identified the need to massively increase learning opportunities after school. The Green Paper on post-schooling proposes creating different types of institutions to meet the high demand for education and training. The department proposes to establish Community Education and Training Centres which will incorporate the current public adult learning centres. The commission supports the vision for an expanded post-school sector. We also believe that improving the performance of the post-school system will result in far greater gains than merely increasing the number of learners.

Increase graduation rate of further education and training colleges to 75 percent

Throughput in the National Certificate Vocation programme was as low as 4 percent in 2009 and the graduation rate was about 40 percent in 2010. This is unproductive and frustrating for learners. We propose improving the graduation rate to 75 percent by 2030. This would have a major impact on the nation's skills profile. Lifelong learning also needs to be promoted to complement further education. All sectors of society need to

set up lifelong learning initiatives to ensure that citizens have ample opportunities to develop their skills and gain a deeper understanding of the ever-changing environment in which they live.

Produce 30 000 artisans per year

One of the targets set for 2014 in the delivery agreement signed by the Minister of Higher Education and Training is to produce 10 000 artisans per year. This target can be met with concerted effort and adequate funding. We propose a target of 30 000 by 2030, subject to demand. The Department of Higher Education and Training has recently signed a Skills Accord with unions and the private sector. One of the elements of the accord is a commitment by businesses to provide more internship opportunities. This is one of the areas that have constrained the production of artisans. The commission welcomes this development.

Increase participation rates in further education and training colleges to 25 percent

About 3 percent of 20 to 24 year olds participate in further education and training. This is very low given the large number of young people who are neither employed, nor in education or training institutions. There is high unmet demand for learning opportunities. A participation rate of 25 percent would accommodate about 1.25 million enrolments compared to the current 300 000.

An additional 1 million learning opportunities per year

Private providers already play a significant role in post-school education and training. The Department of Higher Education and Training proposes establishing Community Education and Training Centres which will incorporate the current public adult learning centres. These institutions, combined with enrolment in workplace-based programmes, should meet the target of 1 million learners. This will increase the participation rate in post-school education and training (excluding higher education) above 40 percent.

Higher education, science and technology

The following targets are proposed for the higher education, science and technology sector.

Increase university science and mathematics entrants to 450 000

By 2030, science and mathematics should be revitalised through the increased number of school leavers who are eligible to study science and mathematics-based subjects at university. The number of people embarking on careers in science and technology should be at least three times the current levels.

Increase graduation rates to more than 25 percent by 2030

Achieving a 25 percent graduation rate will require an increase in the number of graduates from the combined total of 167 469 for private and public higher education institutions to a combined total of 425 000 by 2030. As part of this target, the number of science, technology, engineering and mathematics graduates should increase significantly.

Increase participation rates to more than 30 percent

Enrolments in the higher education sector including private higher education will need to increase to 1 620 000, from 950 000 in 2010. This is a 70 percent increase. The planned new universities in Mpumalanga and the Northern Cape and the new medical school in Limpopo will contribute to the expansion of capacity in the higher education sector.

Produce more than 100 doctoral graduates per million per year by 2030

South Africa produces 28 PhD graduates per million per year. This is very low by international standards. In comparison the University of Sao Paulo has 90 000 students and produces 2 400 PhD graduates per year. To achieve the target of 100 PhD graduates per million per year, South Africa needs more than 5 000 PhD graduates per year against the figure of 1 420 in 2010. If South Africa is to be a leading innovator, most of these doctorates should be in science, engineering, technology and mathematics.

Portugal produces 569 PhDs per million, the United Kingdom 288 per million, the United States 201 per million, Australia 264 per million, Korea 187 per million and Brazil 48 per million. South Africa produces just 28 per million.

South Africa needs to increase the percentage of PhD qualified staff within the higher education sector from the current 34 percent level to over 75 percent over 20 years; double the number of graduate, postgraduate and first-rate scientists and increase the number of African and women postgraduates, especially PhDs to improve research and innovation capacity and normalise staff demographics. A learning and research environment needs to be created that is welcoming to all, eliminating all forms of discrimination and other intolerances within the system.

A few world-class centres and programmes should be developed within both the national system of innovation and the higher education sector over the next 20 years. These should be in areas of comparative and competitive advantage, including indigenous knowledge systems.

Efforts should be made to establish South Africa as a hub for higher education and training in the region capable of attracting a significant share of the international student population.

Policy proposals

These targets are indicators of what South Africa should achieve by 2030. Many incremental, yet bold, steps will need to be taken between now and 2030 to achieve these targets.

This section outlines actions necessary to overcome the challenges discussed earlier. Commitment from government, teachers, unions, the private sector and the rest of society will be vital for success.

The proposals are organised according to the five themes, and detailed actions are outlined for each.

Lay a solid foundation for a long and healthy life and higher educational and science achievement

Early childhood development is one of the most underdeveloped sectors of education. There are many areas that need attention, including infrastructure, planning, advocacy, human resources and funding. We propose that the following be given priority attention:

- Design and implement a nutrition intervention for pregnant women to prevent low birth weight and put in place targeting mechanisms for women at risk. The health sector is a possible delivery mechanism for this initiative. This should be first piloted over two years before national rollout.
- Implement an 18 month postnatal support programme for vulnerable caregivers to ensure positive nutrition, micronutrient provision, immunisation and care. A similar initiative to the nutrition intervention discussed above should be initiated and piloted. This initiative could be implemented through the health system or early childhood development structures. The most appropriate delivery system should be identified through a pilot.
- Introduce a school readiness programme for children between three and five to encourage their early development by promoting school readiness, health and nutrition. The centres should be urgently created and their activities increased incrementally so that by 2030, all children have access to two years of quality pre-school learning exposure.
- Pilot home and community-based early childhood development interventions in selected districts. Progressively expand if these prove to be successful over a period of five years.
- Develop and implement norms and standards for the funding and management of early childhood development sites.

- Implement a strategy to improve the qualifications of early childhood development workers and develop training for new types of extension workers. And address career-pathing and conditions of service for all early childhood development workers.

Build a properly qualified, professional, competent and committed teaching, academic, research and public service cadre

Three broad categories of action are needed to improve our education system. They all require unprecedented mobilisation and collaboration across society.

Build a political consensus

In the first instance, to build technical capacity in education requires a political consensus. There should be a national education pact, ideally mobilised by the President. Participants should include political parties, government, unions, the private sector, professional bodies including the South African Council for Educators and subject-specific associations, student organisations, associations of governing bodies and community groups.

The pact needs to be built on the idea that all parties stand to gain, but only if all parties are willing to make concessions, all parties need to be able to mobilise those they represent behind this principle.

Parties to the pact should commit themselves to work together to advance the goals of improving the quality of education in South Africa.

- The goal of the pact should be to build a professional civil service for the school sphere in which:
  - There are clear career paths for educators – two paths beyond the level of deputy principal: 1) Management, which starts with a principalship and proceeds to district institutional management and governance advisor, senior management in the district, provincial institutional management and governance advisor, senior manager in a provincial or national office. 2) Academic, which starts from school head of department, to deputy principal, to district curriculum advisor, senior curriculum management in the district, provincial curriculum advisor, and to senior curriculum manager in a provincial or national office.
  - Expertise is recognised as the only criterion for appointing and promoting teachers and principals.
  - The appointment and promotion of teachers and district officials are accepted as the responsibility of government. Unions' role should be in ensuring that proper processes are followed, not who gets appointed.

- The following are achieved within five years:
  - Competency standards for all educator jobs
  - Competency assessments for entry into all educator jobs
  - Training programmes for all educator jobs
  - Organisational development and staff training in nine provincial offices, district offices, and poorly performing schools.
- This pact has benefits for everyone. Teachers would benefit from:
  - A clear system of career pathways, marked by competence standards.
  - Leadership in provinces and districts able to help school principals manage schools more effectively, and to support classroom teachers in improving their teaching skills.
  - All officials and teachers will receive continuous training.
  - Principals and teachers in underperforming schools will receive training, mentoring and support.

The concessions that teachers will have to make for this scheme include:

- Entry into the profession and promotion will depend on passing competency tests.
- Principals and teachers in underperforming schools will receive training during the June vacation, and on-site mentoring and support for a full year.
- Training courses will be followed by competency tests.
- The results of these tests will lead to one of three outcomes: certified competent, identified as being in need of further development, or removed through formal procedures.
- All strikes must occur within the law. Criminal behaviour will be prosecuted, and teacher indiscipline will be punished. There will be no "political solutions" to incidents of lawlessness and indiscipline.

Government will have to commit to improving the management of the education sector, ensure policy stability, a better working environment (including security in schools) and ongoing support. Government will have to agree to respect teachers' professional expertise and seek their opinion on educational matters, invests more in the support services teachers need such as libraries/classroom assistants in return for teachers attending training during vacation and the training being linked to assessments.

The pact restates elements of good education administration and includes proposals already under consideration by the Department of Basic Education. Once signed by all stakeholders, no aspect should be subject to further negotiation in the Education Labour Relations Council. Government should play a leading role in implementing the pact.

Technical mobilisation

It is estimated that approximately 80 percent of our schools are underperforming. This translates to about 20 000 schools. International experience shows that system wide improvements in education systems can be implemented in a number of ways, including putting together multi-disciplinary teams that assess the functionality of a school, develop a turnaround plan and oversee its implementation.

As a nation we need to mobilise our technical capacity to support the improvements in education along the following lines:

- Assemble a 5 000 - 6 000 member group of professionals with different areas of expertise and task them with assessing the levels of functionality in each school, develop a plan for addressing the weaknesses, and oversee the implementation of the turnaround plan for each school.
- Professionals from different government departments with appropriate expertise, national and provincial departments of education, education researchers / specialists, retired principals and teachers from better performing schools where this can be done without disrupting learning, will be part of the team.
- Each underperforming school will be assigned a team of three to five highly skilled professionals for a period of six months, and one mentor thereafter to work with the school management team to implement the turnaround plan over a three year period.
- The team of three to five per school will be made up of a mixture of skills sets ranging from financial managers, accountants, education specialists, management consultants, engineers, and academics. Members of the team will be drawn from public and private education institutions, management consulting firms, businesses, training providers, unions and professional bodies, non-profit organisations and faith-based groups. The mentors will either be retired principals, local business persons or specially recruited organisational development specialists.
- After the initial six months follow-up work overseen by the mentors will include infrastructure development, in-service training for teachers and principals, and implementation of new management systems.
- The group of professionals assembled needs to be large enough to cover all targeted schools within a period of five to six years. Each team will work with two schools in one year, meaning that, in total, up to 3 000 schools could be covered each year.
- For this initiative to work and be affordable, the different professional services firms across the disciplines, non-government organisations, training providers, professional bodies and other companies would need to agree to deploy their staff to work with government on this initiative free or at reduced rates of between 40 and 50 percent of their normal charge out rates in exchange for a commitment from government to provide work on this initiative for a period of six years.

- This initiative should be led by the national Department of Basic Education working with provincial departments of education. As far as possible officials of the national and provincial departments of education should be part of the schools teams.

Given the amount of work and the numbers of people involved, and to prevent corruption, this scheme cannot be managed by government negotiating with individual firms and professionals. Broad terms of the scheme will be negotiated with representative bodies of the different professions to make sure that design is broadly acceptable and firms would have to sign up to participate and be allocated to schools.

Consolidation of improvements

The third category of actions is intended to consolidate and ensure sustainability of the improvements. These actions are long term in nature. They recognise that teachers and principals are central to the functioning of a school. These actions focus on improving the quality of teaching and school management.

Expand Funza Lushaka Bursary Scheme

Funza Lushaka is an important new strategy to attract learners into the teaching profession, especially those with good passes in maths, science and languages. It should be strengthened and expanded. In addition, measures are needed to ensure that Funza Lushaka graduates are immediately absorbed into schools.

Provide more support to professional bodies

To enhance teachers' subject knowledge and their pride in the profession, greater support should be given to teacher associations that specialise in specific subjects, such as the Association for Mathematics Education of South Africa. The Eastern Cape has recently established an association of English teachers. Other countries have associations of computer science, science and English teachers.

These organisations could provide professional development opportunities, disseminate information about best practices and provide updates on cutting-edge research. South Africa would benefit immensely from having such organisations in key subject areas.

Change the pay structure to attract and retain good teachers

Bursaries alone will not attract enough top-achieving candidates into teaching. The flat wage gradient in teaching deters highly skilled people from entering or staying in teaching.

The performance of teachers is only one of the things that impacts on the performance of learners. As a result, performance-based incentives often prove highly controversial.

However, it is possible to identify some indicators of improvements in teachers' performance that can be used to reward teachers for enhancing their skills. Remuneration and promotion systems should take such indicators of a teacher's level of expertise and commitment into account. Each year, there should be an opportunity for teachers to take an examination focused on the curriculum that they teach. Within each education band, there should be a test for every subject. Teachers taking part should write the test corresponding to the subject and highest band in which they teach. For foundation-phase teachers, a more generic test will be appropriate. For accurate budgeting, a fixed number of teachers should receive a financial bonus, paid out over about three years, so that teachers are tested regularly, but not too often. It should also be recognised that there are non-economic ways of rewarding good performance, ranging from public awards to exchange programmes and sabbaticals.

School management for instructional leadership

A targeted approach will need to be taken to the application of the recommendations, as not every proposal will be appropriate for every school. Schools that are already performing well should not be expected to fulfil additional tasks that are designed to deliver improvements in poorly performing schools. Very low-performing schools should receive the closest attention. This principle is accepted by the Department of Basic Education. Visible indicators of the quality of school leadership should be monitored. For example, in schools where curriculum coverage is a problem, principals should report regularly on this issue.

Ensure that appropriately qualified and competent people become principals

High-quality principals need to be attracted, trained and supported. Changes should be introduced to appointment processes for principals including administering a competency test for all candidates. Minimum qualifications for becoming principals should be introduced and recruitment processes should ensure that candidates meet these criteria. Serving principals should be given a period of 10 years to acquire the qualifications, failing which they should face retrenchment or demotion.

Principals should gradually be given more powers to administer schools, including financial management, procurement of textbooks and other educational material, as well as hiring and firing educators. These delegations are necessary so that principals can be accountable for the performance of their schools. The commission supports the Department of Basic Education initiative to introduce performance contracts for principals. These contracts should be used as a means to help principals who strive for excellence to find ways to improve their performance year on year, including being used as a way of identifying training needs. However, if principals repeatedly fail to meet performance targets, monitoring information indicates poor performance, and investigations based on interviews with school stakeholders confirm that the principal is ineffective, then the principal should be replaced.

Clarify the role of districts and improve their capacity to support schools

A clearer understanding of the functions of districts is required. Lack of capacity may limit what can reasonably be delegated to district offices. Since it takes time for professional capacity to be built up in districts, the focus should be on improving the availability of intervention tools that can be used by district officials and other bodies that support schools.

Promote constructive partnerships

Teacher unions are crucial to improving the education system. Government should look at effective ways of working with unions to reach their members. Experience in other countries shows that without a critical level of professional expertise among union leaders, it is difficult to get unions to move beyond the issue of salary increments to the core professional concern of improving the quality of education. Sponsoring advanced studies for union leaders could form part of the constructive partnership.

Generate and draw support from civil society

School governing bodies have a strong legislative mandate to fulfil the governance function of schools, including extensive responsibility in finances and setting internal school policies. Many governing bodies are significantly hampered by parents' lack of expertise and social status relative to school staff. Additional support should be given to governing bodies to enable them to fulfil their mandate in promoting the effective management of schools. School governing bodies should attend compulsory courses once elected.

Externally administer and mark the annual national assessment in one primary school grade

In a minimum of one primary school grade (perhaps grade 6), the annual national assessment should be externally administered and marked to ensure that there is at least one reliable system-wide measure of quality for all primary schools.

Present the annual national assessment results in an accessible format

The assessment results should be made accessible to parents and the community in a way that makes the data easy to interpret.

Ensure high-quality language instruction in the foundation phase

High-quality teaching of students' first language and English is vital during the foundation phase. Effective support materials need to be available for teachers and learners during the transition to English as the language of learning and teaching. The

Department of Basic Education should actively participate in the international market for skills, including recruiting teachers from other English-speaking countries.

Build a strong and coherent system for delivering quality education, science and technology innovation, training and skills development

Putting strong systems in place for developing skills will help to improve the quality of life, human capital development and competitiveness. It will be necessary to develop world-class institutions and programmes within the national system of innovation and the higher education sector over the next 20 years.

Improve systems for skills planning and shaping the production of skills

In the Delivery Agreement with the President, the Department of Higher Education and Training has committed to improving skills planning. This should both inform funding allocations and improve the supply of relevant skills to the labour market. The commission supports this initiative. The education and training system should be able to respond to the skills needs that are identified. This requires improved capacity, drawing on both public and private providers of training. It should include a focus on building relationships with workplaces, and the development of both training curricula and skilled trainers.

The following are central to improving skills planning:
- Establish a national skills planning system to conduct labour market research and produce different skills scenarios, which should inform training providers. It is important to understand the country's long-term human resource needs. The focus should be on improving general education with an increased percentage of learners attaining grade 12 with good passes in mathematics, science, and English. A greater number of individuals should be able to access post-school education, and attain qualifications at an intermediate or higher level. There should be an increase in science and technology graduates, as outlined in the National Human Resource Development Strategy.
- Develop the capacity of the levy-grant institutions. The scope of the Sector Education and Training Authorities must be refined to remove overlaps in government institutions. The authorities should focus on skills development for existing businesses, including skills development for people working in the sector and unemployed people who wish to obtain employment in the sector. Training should cover levels of the National Qualifications Framework required by the sector.
- Training for start-ups and emerging businesses, rural development, adult basic education and training, and community development should be supported by money from the National Skills Fund and managed by relevant departments or agencies, such as the Small Enterprise Development Agency, Kha Ri Gude and the National Youth Development Agency. This would enable the National Skills Fund to focus on large skills development programmes that form part of a broader

programme. This would simplify the grant funding mechanism by supporting fewer but larger programmes.

- Increase linkages between post-school education and workplaces building on the commitments in the Skills Accord. Linkages between institutions of learning and the workplace need to increase. This should help with lecturer development, curriculum development, external assessment, and placement of learners. However, as placement opportunities will be limited, careful consideration should be given to which qualifications require work experience. Sector authorities should play a more active role in enabling these linkages by briefing further and higher education and training providers, fostering relations between institutions of learning and of work, and funding internships and other work experience programmes.

- Improve funding modalities and systems. The recommendations above have implications for what should be funded by the fiscus and the levy-grant. A single system, with a single funding formula, should incorporate both sources of money.

- Increase access to career guidance and placement services. A key area that requires further development is how individuals can access the information and support they need to make appropriate subject choices. Initiatives such as life orientation and career fairs should be expanded and linked to student support services in the college sector. Further effort is needed to demonstrate to employers the benefit of participating in these activities, particularly in recruitment opportunities and raising the profile of their sector.

Develop a diverse range of providers of further education and training

The state needs to develop and support a coordinated system for providing a diverse range of further education and training opportunities, through a range of state providers complemented by private providers. The starting point must be strengthening existing institutions, with a focus on the college sector, public adult learning centres and technical high schools.

A one-size-fits-all model is inappropriate at this point. Not all institutions can or should offer all types of training. We propose a highly differentiated system. A careful analysis is needed of all further education and training colleges, as well as the stronger public adult learning centres and colleges that fall under departments other than the Department of Higher Education and Training. Placing unrealistic expectations on these institutions will only make it harder for them to perform. However, some do have the capacity to expand and diversify.

Critical actions to achieving the objective of an expanded, strengthened and diversified institutional landscape include:

- Develop a set of strong national qualifications and a variety of non-formal programmes.
- Strengthen and expand further education and training colleges by addressing their infrastructure and other institutional challenges chief among which is the training of college lecturers.
- Gradually expand adult education offered in colleges.
- Build new public colleges.

Build a strong and streamlined quality assurance and qualification system

A strong and simple quality assurance and qualification system is essential to support public provision and to enable and regulate private provision. Improvements need to be made to the configuration and roles of regulatory institutions, including the three quality councils and the South African Qualifications Authority. The quality councils are the primary bodies with a direct role in governing curricula, assessment and certification. The Council for Higher Education, Umalusi, and the Quality Council for Trades and Occupations are responsible for defining three sub-frameworks of the National Qualifications Framework, and checking the quality of the provision, assessment and certification of qualifications, as well as maintaining a database of learners' achievements.

The levels on the National Qualifications Framework cause ongoing confusion. They could be simplified by replacing the framework's levels with clearly designated qualifications, such as national certificates, diplomas and degrees. The relationships between key qualifications could be clarified by mapping the qualification types against each other. This could be done without substantial changes to the three current sub-frameworks.

A simpler organisation of qualifications would make it easier to clarify the configuration of quality councils, which is problematic and needs to be re-examined. If levels on the National Qualifications Framework are removed, there should be no problem with Umalusi quality assuring post-school qualifications that are not part of the university system. If levels on the National Qualifications Framework remain, the demarcation of quality assurance bodies does not need to be confined to these levels.

Regardless of the configuration of quality councils, the approach to quality assurance needs to change. There should be external assessment for all national qualifications. The state should continue to assess the National Certificate Vocation and Nated courses, as well as the courses that replace Nated. The state must also take responsibility for assessing the National Senior Certificate for adults, and the Further Certificate Vocation. Quality councils should provide quality assurance for this assessment, and accredit assessment bodies where appropriate. Quality councils should not accredit or register

individual assessors, nor should they use individual moderators and verifiers to provide quality assurance for assessment decisions.

Expand the production of highly skilled professionals and enhance innovation capacity

A common policy framework should be developed on the critical role of science and technology and higher education in shaping society, the future of the nation and the growth path. This should be done with the involvement of the Departments of Higher Education, Science and Technology, Trade and Industry, Public Enterprises, Treasury and Economic Development.

Enhance the innovative capacity of the nation

The science and innovation system is small but becoming more racially inclusive. The key challenge lies in building the base of science, technology, innovation and skilled human resources. South Africa should invest in people and acquire the best equipment available.

Higher education is one of the main contributors to developing science, technology and innovation, which in turn improves national development. School teachers, as well as staff and programmes in Dinaledi schools, should be evaluated to ensure they have adequate knowledge of science, technology, engineering and mathematics. All science and mathematics teachers should have access to in-service support to ensure continuous professional development. Higher education institutions should extend the length of their science, technology, engineering and mathematics degrees to four years, and redesign the first-year of the course to make it more accessible. Where necessary the extension of length of degrees should be widened to other disciplines.

Immigration requirements should be relaxed for highly skilled science and mathematics teachers, technicians and researchers. One way of doing this is to grant 7 year working permits to all graduates from foreign countries. The movement of people, ideas and goods should be encouraged across the East and Southern African Community region.

The National System of Innovation needs to function in a coherent and coordinated manner with broad common objectives aligned to national priorities. The National System of Innovation, the higher and further education system, SOEs and private industries should create a common overarching framework to address pressing challenges. Special consideration should also be given to dedicated programmes in water, power, marine, space and software engineering, in which South Africa has both comparative and competitive advantage. Companies that focus on such programmes should provide internship programmes for experiential learning specifically in manufacturing and services.

Addressing the decline of the humanities

One of our country's greatest comparative advantages is in the humanities. Our emerging identity, languages, ethics, morality, indigenous systems, struggle for liberation, Codesa, constitution, the creation of a non-sexist and non-racial society and the discovery of humankind are major humanist projects which link our heritage and our future as a society. Our education from basic to tertiary and through the science and innovation system should invest and build capacity and high level expertise in these.

Enhance the entrepreneurial capability of the nation

Courses should be designed, introduced and taught to promote and instil a culture of entrepreneurship in society. In this way, entrepreneurship complements the innovation system.

Coordinate and steer a differentiated system

In the past, differential treatment of universities was used as a policy of racial discrimination. Today different universities have different strengths in terms of teaching, research, and the students and communities they serve. Within the next five years, ways need to be found of building on these different strengths to develop a differentiated system that allows all universities to build on their own areas of strength and respond to the needs they identify. Government and higher education institutions will need to reach formal and binding agreements on the principles that guide and underpin the coordination and funding of this differentiated system. Differentiation should be enabling and developmental for all institutions. This will form the basis of agreements and compacts at a system-wide and institutional level. Agreement should also be reached on the sanctions to be applied to institutions that do not adhere to agreements. Based on these agreements, a ministerial statement should be issued on the agreed scope of activities of each of the 23 universities for a five-year period.

South Africa should set participation rate targets at five-year intervals to promote increased university enrolment. We propose aiming for participation rate of over 30 percent by 2030. This target will need to be translated into institution-level targets and broken down into five-year intervals, taking into account the lead time required to build infrastructure, funding and staff capacity.

Agreements should be reached on a planning model that builds and strengthens the current enrolment planning approach. Targets for enrolments and graduates will cover a range of skills, from high-level research training at doctorate level, to shorter term, career-focused diplomas and certificates. Decisions will need to be taken about which type of institution contributes most effectively to which skill level. Specific plans for priority professional sectors such as health, engineering and built environment, and teaching need to be included, along with major infrastructure needs, including provision for new facilities to train medical and other health professionals.

The model should also address South Africa's need to increase training in a number of scarce skills. There need to be closer links between economic and education planning, stronger incentives for developing scarce skills and an expansion of the public sector with private post-secondary sectors focusing on education and training in niche areas. Plans and resources are needed to increase career-focused higher education certificates and diplomas.

There needs to be better coordination between the Departments of Higher Education and Science and Technology to support knowledge production.

The low output rate from doctoral programmes will make it difficult for higher education institutions to replace the aging cohort of researchers. A new future scholars programme aimed at attracting younger researchers needs to be developed. This is necessary for research and development, but also to increase the proportion of academic staff with doctorates and meet the increasing demand for "professional" PhDs in the financial and services sectors.

Government will need to provide an overarching policy framework to coordinate the effective and efficient production of knowledge across universities, science councils, SOEs and the private sector. This will ensure that knowledge production is in line with national priorities.

Build an enabling and high quality differentiated system

South Africa needs to strengthen research excellence through performance-based grants. More weight should be given to building departments, and centres or networks of excellence. Given that performance-based grants, can entrench historical privilege and disadvantage, capacity-building grants should be provided with clear targets for improvement in five-year intervals.

The role of science councils should be reviewed in light of the worldwide tendency to align research councils with universities.

Progressive differentiation requires that all higher education institutions provide high quality education and skills training, underpinned by common standards for student facilities, libraries, laboratories, computer access and staff qualifications. Adequate resourcing will be needed to enable historically disadvantaged institutions to achieve these standards and overcome historical backlogs.

The current high student dropout rates highlight the need to focus on improving the quality of teaching and learning support throughout the higher education system. The response needs to focus on improving the quality of higher education, through flexible curricula, encouraging excellence in teaching, providing technology to support teaching and learning, continued support for academic development and the professionalisation of teaching in higher education. Specific attention should be given to making the higher

education environment more welcoming for black students, students from poor backgrounds and women.

A differentiated system can only fulfil its promise if it provides students with a range of flexible pathways for developing their skills and opportunities. This requires national guidelines to facilitate student mobility.

The quality assurance framework will need to be reviewed in light of an expanded and diversified system. The Higher Education Quality Committee should develop and manage a core set of quality indicators for the higher education system. A national graduate tracking system should also be considered as a proxy for quality.

A differentiated system guided by evidence-based planning and performance monitoring will require maintaining and strengthening the current Higher Education Management Information System, and the additional capacity to analyse national trends and changes between and among institutions and institutional groups.

Fund an enabling, high quality differentiated system

The *Ministerial Committee for the Review of the Funding of Universities* is considering revisions to universities' funding framework. Such revisions should be based on the needs of a differentiated system, with adequate provision for both teaching and research. As the quality assurance and monitoring system matures, greater emphasis should be placed on incentivising graduate output. Such a shift would be in line with the international trend towards greater emphasis on output-based funding. The higher education department would have to put measures in place to ensure that the risk of this approach discouraging universities from taking students from deprived backgrounds is reduced.

All students who qualify for the National Student Financial Aid Scheme should have access to full funding through loans and bursaries to cover the costs of tuition, books, accommodation and other living expenses. Students who do not qualify should have access to bank loans, backed by state sureties. Both the National Student Financial Aid Scheme and bank loans should be recovered through arrangements with the South African Revenue Service. Service-linked scholarships should be available in areas such as teaching and social work.

Consideration should be given to extending the National Student Financial Aid Scheme to qualifying students in not-for-profit registered private colleges as an incentive for private sector expansion. When resources allow, access to financial aid and bank loans could be extended to students qualifying for other registered private colleges.

Funding for higher education as proportion of GDP has declined marginally over the last few years from 0.76 percent in 2000 to 0.69 percent in 2009. To preserve the quality of

higher education, additional funding will be needed to support an increase in participation and knowledge production.

Support institutions in chronic distress

The higher education department should identify institutions that are facing ongoing crises despite earlier recovery interventions. Dedicated support should be provided to these institutions to develop and implement comprehensive renewal plans over five years. The plans should identify a viable and sustainable academic path for the institution, with an appropriate programme and qualification mix. If measurable progress towards achieving the objectives is not evident after five years, consideration should be given to reviewing the status of the institution.

The sequencing of proposals

First five-year period

The overarching goal in the first five years is to increase the system's effectiveness. Increasing the schooling success rate, and improving throughput in further and higher education will deliver far more positive results than merely expanding access.

Within the first five years of the plan, the foundations on which to implement the above actions should be established. During this period, there will need to be research and experimentation on different delivery models within the early childhood development sector, together with training programmes for early childhood development practitioners.

In schooling, the focus will need to be on negotiating a pact and mobilising popular support behind it. There will need to be professional support available to help underperforming schools develop and implement turnaround plans. There will need to be a broader approach to building capacity by training district officials, principals and teachers to address gaps in both subject knowledge and administrative skills. There will also need to be a focus on institutionalising the annual national assessments, and investigating and then introducing new incentive structures for teachers.

In further education and training, institutions will be strengthened by improving training for college lecturers, establishing satellite colleges and building new colleges where necessary. The mandates of SETAs should be clarified and given more focus, with their physical, financial and human resource capacity being developed to enable expansion. In higher education, attention will need to be focused on building the capacity and quality of the national system of innovation, as well as increasing the numbers of higher education staff qualified with PhDs. Extension of degrees to four years and support measures for undergraduate students, including a structured bridging programme, will need to be introduced.

Second five-year period

At the beginning of the second five-year period, an evaluation process must take place to inform decisions for the next phase. Activities from the first phase will continue, with focus on increasing enrolments in early childhood development, and further education and training, intensifying support for undergraduate students, and addressing funding issues in the national system of innovation and higher education.

Third and fourth five-year periods

All activities from the previous phases continue. The remaining proposals should be implemented during this phase, but attention should now focus on massively expanding enrolments in all parts of the education and training system including FET and higher education at both undergraduate and postgraduate levels.

Conclusion

Helping people to develop their skills and enhance their capabilities is an essential part of a sustainable strategy for tackling poverty. Education, training and innovation are central to this. Highly educated and trained individuals have much better chances in the labour market and a nation with highly educated citizens, particularly in science, engineering and technology, and the humanities is more competitive and will be able to participate in the knowledge-driven economy of the future. The national economy benefits when there is a critical mass of highly skilled people as the current skills shortages have raised the cost of many vital skills.