The challenge of providing appropriate technology education in the new South Africa

Kaye Ter Morshuizen

Technology 2005 Project, Natal, South Africa

Abstract

As South Africa moves forward with its educational reforms, the Technology 2005 Project, based in Natal province, is focusing on developing technology education for all pupils. Teacher training is one of the prime objectives of the project and the project developers are working hard to create training programmes. This article outlines the background to the implementation of technology in the South African National Curriculum and shows a case study which is one example of the project's work to date.

Background

The term "the New South Africa" has become rather hackneyed, but new brooms seem to be sweeping through many aspects of our lives, certainly in the field of education. Educational restructuring was proposed in a 1995 White Paper and a number of significant activities are currently taking place towards the shaping of a new curriculum in general education. These changes are framed by the development of the National Qualifications Framework which aims to integrate education and training and is supported by both the Department of Education and the Department of Labour.

The implementation of technology as part of the South African National Curriculum

Since the adoption of the National Curriculum in South Africa in June 1996, technology has been recognised as a compulsory part of the future curriculum for all learners in Grades 1 to 9. In July 1996 the Department of Education (National) established a Learning Area Committee: Technology to develop a rationale and specific outcomes for technology as a Learning Area in the new National Curriculum.

In January 1997 a Ministerial Task Team and a Reference Committee were set up to refine and extend the work of the Learning Area Committees by reviewing their Specific Outcomes and developing associated Assessment Criteria and Range Statements. These materials are currently being developed into policy documents for each of the phases (Foundation: Reception to Grade 3; Intermediate: Grades 4 to 6; and Senior: Grades 7 to 9) in the General Education Band. These policy documents will form the basis for the training of provincial trainers, teacher in-service preparation and the subsequent implementation of Technology in Grade 1 at the beginning of 1998.

The implementation of technology in South African schools

The new National Curriculum makes a complete break with the past in that it:

- no longer conceptualises learning in terms of narrow academic disciplines but rather organises learning on models that are consistent with education and training in the world beyond formal education
- seeks to develop a holistic and integrated approach to learning and teaching
- seeks to reorganise assessment so that learning outcomes and accreditation can be articulated between sectors (i.e.: schools, Adult Basic Education, Further Education, Industry training, Higher Education and others).

Technology lends itself well to this reconceptualisation of education and training and will play a significant role in:

- changing perceptions of education and training
- transforming the quality of teaching and learning in schools by developing teaching methodologies appropriate to learning activities which integrate thinking and practical activities through engagement with technological tasks
- facilitating the integration of learning across learning areas (particularly in primary schools)
- supporting outcomes based approaches to assessment
- linking school learning with learning and work in the broader community.

However, unlike other Learning Areas in the National Curriculum, technology has no earlier form or history of development in schools. Its implementation will therefore need to include strategies which aim to accelerate the development of specific capacities and resources that Technology lacks in comparison with other Learning Areas. These would include developing:

- acceptable levels of pre- and in-service expertise among teacher educators and quality teacher education materials
- acceptable levels of expertise amongst provincial learning support staff
- adequate resources of equipment and teacher support materials in schools
- well planned medium and long term strategies to retrain teachers and enhance their confidence and commitment to teaching technology.

The Technology 2005 project

The Technology 2005 Project is a research and development project initiated by the Heads of Education Departments Committee (HEDCOM) in October 1994 to:

- test the feasibility of introducing technology as part of the compulsory school curriculum
- develop sufficient initial capacity to support the broader implementation of technology, if required.

Since the inclusion of technology in the National Curriculum the project has shifted its emphasis and now concentrates on supporting the implementation of technology in the National Curriculum through the strategic training interventions and the evaluation of piloted materials in all phases ahead of National Curriculum implementation time frames. To this end the project is currently working with provincial departments to:

- develop, trial and refine Provincial Learning Programmes, project work and

NUMBER OF SCHOOLS IN 1996

	Without Water	Without Power	Without Phones	With Platoon Classes	With Buildings not suited for education	Without Libraries (Sec)
Empangen	139	430	508	23	5	128
Ladysmith	222	384	400	14	34	124
North Durban	184	269	280	42	22	76
Pieter-maritzburg	286	448	500	34	29	80
Port Shepstone	282	477	514	25	25	118
South Durban	121	193	215	50	21	95
	Without Water	Without Power	Without Phones	With Platoon Classes	With Buildings not suited for education	Without Libraries (Sec)
Ulundi	394	652	687	32	25	155
Vryheid	285	461	455	21	20	42
Total	1913	3314	3559	241	181	818

support materials for teachers involved in the implementation of technology education as part of the National Curriculum

- facilitate the development of teacher education programmes in selected institutions
- collaborate with Adult Basic Education and Training and Early Childhood Development initiatives in the General Education Band
- conduct a detailed evaluation of its development and implementation so that strategies for the wider implementation of technology in the General Education Band can be properly developed.

The challenge of change

The Department of Education is very serious about rapid change and the rapidity of the change has left many breathless. South Africa is attempting revolution. Revolution implies sweeping changes – political, economic, social and educational. Revolution overruns existing structures and policies and forces major change. However, control implies stability – is this not paradoxical?

Since February 1990, South Africa has been in the process of liberalising an authoritarian political regime and disbanding separate education departments, separated on racial lines. The deliberately differentiated education, designed by H F Verwoed, succeeded in keeping Blacks in poorly paid jobs with limited prospects due to inferior education. One of the problems to be addressed is the fact that the products of this system now constitute the bulk of teachers. These teachers

- lack effective teaching methods
- face economic and financial constraints
- lack basic necessities.

A quick glance at the table below will indicate that even basic necessities like water and electricity are lacking in many classrooms in KwaZulu-Natal alone.

In addition to the above factors, teachers need a massive paradigm shift to respond to major changes happening almost simultaneously:

- a new outcomes based curriculum is being designed and implemented throughout South Africa by the year 2005, starting with the phasing in of Grades 1 and 7 in 1998
- the development of a national curriculum framework for Technology Education in the compulsory phases of Grades 1-9, as well as Unit Standards, Range Statements and Performance Indicators
- development of appropriate pre- and in-service Teacher Education programmes
- development of Project 2005 in Natal. Part of this project involves training all primary teachers for design and technology
- development of systems for the implementation and evaluation of the Technology 2005 project. There will be close co-operation with Adult Basic Education courses
- the whole style of assessment in a new type of open-ended situation, with focus on process as well as product, is daunting for the qualified and experienced teachers. This is overwhelming for under-trained staff in an under-resourced school.

The basic notion of struggle for liberation before education was that improvement could not come without a change to the system. Several dangers are apparent. Firstly that change can occur simply for change's sake. Secondly that society is seen as an agent of change – not individuals. In the new system that allows participation at all levels, individuals are accountable for applying themselves to their studies in order to succeed. Further dangers

include the perception that Technology Education is just another practical subject and therefore devalued and the demand for collective entitlement which will lead to the lowering of standards. We do not want collective entitlement and non-accountability. This will contribute to a continuing downward spiral. The response of the lost generation to challenge and change is often increased lawlessness and violence.

Successful transition to a transformed and relevant education system should be possible if the curriculum is appropriate and effective and leads to employment and rising incomes which are reasonably distributed. Technology education calls on both action based qualities and the resources of knowledge, skills and experience.

Criteria for appropriate technology education

- use locally available materials before extending learners with new materials
- use local contexts before venturing into unfamiliar contexts
- capitalise on local skills and ingenuity, affirming self-respect, self-reliance and capability
- remember that Third World does not necessarily mean third rate
- be sensitive to the local social and cultural environment
- focus on simplicity and effectiveness
- appropriate technology should be compatible with and relevant to local practice
- it should be part of real development, owned and controlled by the community – the appropriators of the technology.

With these criteria in mind, the following Case Study was designed for Grade 1 children starting school.

Case study: Grade 1
Focus: Structures
Methodology

Case study story: Rainbow Rooster

Case Studies should provide a vehicle for examining the ethical, social and environmental issues related to the development of technology and its application within a meaningful context. For this reason, a story with a local rural setting was chosen as an appropriate way to introduce the project.

By using a story set in an indigenous rural setting, children

- are provided with a meaningful framework in which to develop concepts, skills and attitudes
- extend the fictional context to real-life first hand design challenges
- practice problems solving techniques in real life situations
- communicate their ideas in a variety of appropriate ways
- develop empathy with characters by identifying their needs and finding ways to meet these needs.

The central problem to this story involves Zipho trying to get his beloved Rainbow Rooster down from a high point after it escaped whilst being transported in a plastic packet in an overcrowded taxi.

*Through discussion, children identified a variety of problems and needs. From this story, two **Capability Tasks** were developed for the project, each one being supported by three preceding **Resource tasks**, as can be seen in the outline.*

Case study story : Rainbow Rooster

Resource Task	1 Developing a Knowledge of different materials 2 Investigating containers and space 3 Investigating simple mechanisms e.g. hinges and fasteners
Capability Task	Design and make a Rooster Transporter
Resource Task	1 Cook eggs using a variety of Processes and Energy 2 Make an Egg-Timer 3 Evaluate Egg-cups
Capability Task	Design and make an Egg-cup

In designing the above eight tasks, four of the seven specific outcomes identified in the Discussion Document Curriculum 2005 were included:

1) understand and apply the Technological process to solve problems and to satisfy needs and wants

2) apply a range of Technological Knowledge and skills ethically and responsibly

3) access, process and use data

4) select and evaluate products.

Assessment

In this Case Study we set out to establish

- whether second language learners in Grade 1 with only one term of English medium instruction, could cope with a Technology Education lesson conducted in English

- whether Grade 1 learners were capable of designing in 2D prior to making a 3D product

- whether there were any noticeable differences in creativity in learners from "disadvantaged" backgrounds.

N.B. This is not a scientific study but is based on detailed observation in the classrooms of the two schools. A video recording* of the story and Capability Task 2 was later used for evaluation. The finished products were also evaluated using a simple form.

Findings

Two schools were used. School A was a boys preparatory school of predominantly white children, including a minority of Indian and Black children. School B was all Black children of whom only 25% had attended pre-school. Many could not speak English on enrolment and were from low to middle class backgrounds. There were 25 children in each class.

- The children from school B had an excellent teacher trained in High-scope methodology. From her clear speech, excellent logical questioning, demonstrating and organisation, the children produced very good products. This emphasised the need for skilled teachers as a priority resource. The support she provided was:

– environmental: she laid out materials clearly. Children who did not have the expressive language and verbal skills could point to the materials they wanted to use when discussing their designs with her. Everything was within easy reach. Children simply got on with their designs and products, freeing the teacher to discuss each design prior to making and during the making process. This also took place during evaluation.

– verbal: this continued throughout, including probing, prompting and praising. Children were put in touch with each other to share successful making skills.

– non-verbal, which provided positive reinforcement.

- Learners from School A drew designs on paper while those from School B used small blackboards. Both showed the ability to design. However, what was interesting was that several changed their designs when they found their products were unstable or unsatisfactory. Thando changed her

elegant champagne-glass-style eggcup to a square design with a hole cut in it, when she found out that her original design could not support an egg. Only a few learners disregarded their designs and simply made a product.

- Learners from School B showed more variety in their designs and in their use of a range of materials, Zamani stuck to the materials he knew and made a very effective egg cup from an old coke can and wire. Both these materials were available at School A but no child used them. By entertaining options, learners are often forced to be more creative by improvising and imagining and visualising possibilities.

Conclusion

It is premature to draw any conclusions because pilot schools are still being set up for trialling of materials and input from teachers. This case study was an interim observation. One can easily become discouraged at the enormity of the task in attempting technological literacy for all by 2005. We need to remind ourselves of the words of E. Everett Hale.

> I am only one,
> But still I am one,
> I cannot do everything,
> But still I can do something;
> And because I cannot do everything
> I will not refuse to do something that I can do.

If each of us works for the transformation of learning, something significant will happen in the lives of our children, the leaders of tomorrow.

* *Clare Benson holds a copy of the video recording. This was filmed in a short space of time and is not professionally produced. If anyone would like to see it, please contact DATA.*

References

Black, P, Harrison, G (1985) *In Place of Confusion Technology & Science in the School Curriculum*, The Nuffield-Chelsea Curriculum Trust

Toft, P (1989) *Managing Change in the CDT Department*, Trentham Books

Tucker, B, Scott, B (Ed.) (1992) *South Africa Prospects for Successful Transition*, Juta and Co Ltd.