

Technology Teacher Education in South Africa

ANDREW STEVENS

Faculty of Education, Rhodes University, Grahamstown 6140, South Africa.

E-mail: A.Stevens@ru.ac.za

ABSTRACT:As a teacher educator in the field of Technology Education, the author is concerned to understand the factors constraining the uptake and development of Technology Education in South Africa. In this paper, an analysis of the background to the introduction of the learning area into South Africa is looked at. A few of the specific constraints to the development of the learning area are discussed. A brief survey of tertiary institutions offering teacher education programmes are reported as well as some details about these programmes. Emerging from this data is the need to ask whether such programmes fulfill the needs of teachers of technology and of technology education more generally. Some key issues are put forward as a basis and starting point for this process.

Keywords: Technology Teacher Education, South Africa, apartheid, vocational and specialised education, curriculum change.

INTRODUCTION

Although twenty years is a long time in the relatively short global history of technology education, it is an even longer time in the educational history of a democratic South Africa. Twenty years ago, South Africa was in the midst of a state of political emergency and it would be five more long years before Nelson Mandela would be released and the process of nation-building could begin. Only last year, South Africa celebrated the tenth anniversary of its first democratic election. In the past ten years, South Africa has undergone fundamental transformation in many spheres, not least in the educational sphere. In order to present a coherent picture of the development and progress made in technology education, it is necessary to provide a brief account of its history.

APARTHEID EDUCATION

Prior to 1994, education in South Africa was organised on racial lines with separate schools, universities, teacher colleges and administration systems for each of the four main groups as defined by the apartheid state: namely black, white, coloured and Indian. (Note: Although it is offensive to use these racial labels, it is difficult to describe or understand South African education system without almost continual reference to them). To complicate matters further, there were four so-called 'independent homelands' within the borders of the country for four of the main black population groups, each having their own educational ministry and administration. Although the curricula in each of these systems was theoretically equal, the huge differential in state funding made a mockery of the apartheid state's claim of 'separate but equal' treatment for all races. In the resource heavy areas of the curriculum such as science laboratory work, home economics, woodwork and the other 'practical' subjects (which many see as the forerunners of technology education) very little provisioning was made in the black schools. This was particularly true in the rural schools where large proportions of black children were (and still are) educated. The result was that few schools in South Africa offered subjects with a

‘practical’ orientation: those that did were largely to be found in urban areas and were, to a large extent, reserved for white children only.

THE BEGINNINGS OF CHANGE

It is perhaps not surprising that it was an education issue which sparked the famous ‘Soweto Uprising’ in June 1976 which signalled the beginning of the end of apartheid. The fifteen years following 1976 were marked by almost continual unrest in many of South Africa’s black schools which was met with considerable force by the state. Military vehicles were a common sight on school property in this period. One of the more considered responses of the state was a comprehensive investigation into education published as ‘Provision of Education in the RSA’ by the Human Sciences Research Council (HSRC, 1981). Although the main findings of the report were rejected by the government as being too radical, many of the recommendations were to find resonance in the legislation of the late apartheid state and even in the reform legislation of the post 1994 democratic government. As Kraak (2002) points out, the HSRC report attempted to shift the focus on formal education based on the traditional ‘academic’ arts and sciences curriculum towards a more ‘appropriate’ skills-based vocational curriculum, particularly for the majority of black school goers. Although it is doubtful that the radical proposals of the HSRC regarding the vocationalising of the curriculum would have been accepted by the black community, there is little doubt that a key shortcoming of the curriculum, namely its over- emphasis on academic forms of knowing and knowledge production had been identified.

THE INFLUENCE OF MARKET FORCES

In the eighties, a period characterised by widespread unrest in black education, the vocationally oriented ideas of the HSRC report began to take root in much of the official discourse of the time. In accordance with global trends, the language of the market became an increasingly dominant voice in SA education and market-driven analyses and policies began to gain ascendancy over the traditional race-based ideology of apartheid. The influential Walters Report of 1990 recommended significant changes to the curriculum, specifically recommending that subjects such as Hand- and Needlework, Basic Techniques, Technical Orientation and the Handwork subjects ‘be re-curriculated in their entirety with reference to the English ‘Craft, Design and Technology’ approach, but taking the South African context and South African needs into account.” (DEC, 1990, p.123). The Education Renewal Strategy (ERS, 1991) made similar proposals to the Walters Report, recommending the introduction of a number of new compulsory subjects into the general formative curriculum (Gr 1-9). Amongst these were the new (to SA at least) subjects: Economics, Technology and Arts Education, the rationale being that these three subjects would provide education relevant to the needs of learners and society as well as contributing to the personpower requirements of the country. In the discussion document ‘A curriculum model for education in South Africa’ the following definition of technology appeared which indicates this economic/productivity rationale for the new subject:

Technology involves humankind's purposeful mastering and creative use of knowledge and skills with regard to products, processes and approaches so as better to control his environment. Technology comprises, inter alia, the utilisation of artefacts and processes by means of which labour productivity is increased. (DNE 1991).

It is clear that the proposals of the ERS were substantially influenced by the demands of the rapidly globalising knowledge economy in which flexibility, adaptability and the ability to respond to changing market circumstances are key skills. In this economy, as Castells points out:

It is the ability to retool and respond to rapidly changing market conditions that is highly valued. Only a formative general education can provide these capabilities through high levels of generalised yet unspecified skills which are in excess of those currently needed in the work place, but which in the future will be in great demand. (cited by Kraak, 2002, p83).

Since general formative education has been identified as providing such skills, and the ERS seems to have been aware of research pointing towards the dangers of vocationalising/specialising too early, it was careful not to propose too clear a differentiation between academic and vocational pathways in the compulsory phase of secondary education (i.e. Grades 1 to 9), but in the proposed post-compulsory phase, vocational education was to assume far greater significance. Although never implemented, these proposals by the apartheid government were to find strong echoes in the policies and legislation of the new democratic order.

THE NEW ORDER: CURRICULUM 2005

When the ANC convincingly swept to power in the first democratic elections in 1994, much was expected, particularly in the long neglected area of educational transformation. At the level of policy, Kraak (2002) identifies the following three pillars underpinning the new dispensation

- An integrated education and training system: The new government committed itself to eradicating the difference in status and privilege which a differentiated 'academic' vs. 'technical/vocational' system promoted. This has done much to boost the status of technology as a subject in schools, but it is still too early to judge how this will play out in further and higher education.
- A single qualifications structure. A new statutory body, the South African Qualifications Authority (SAQA) was established in 1995 to co-ordinate and manage the new National Qualifications Framework (NQF). This framework acts as a mechanism for linking the previously separate education and training fields together.
- A new curriculum framework. The new curriculum, named Curriculum 2005 (C2005) for the year in which implementation was to be accomplished, is the first single curriculum for all South Africans. Education, for the first time, was to be compulsory for all learners for nine years, the newly named General Education and Training Band (GET). Thereafter would follow three years of Further Education and Training (FET) which would provide for more differentiated general, vocational and work-based education and training.

A feature of the new C2005 was the introduction of eight new compulsory 'learning areas' (replacing the label 'subjects' was an attempt at encouraging the integration of disparate 'disciplines'). These were Language, Literacy and Communication; Mathematics Literacy; Human and Social Sciences; Natural Sciences; Technology; Arts and Culture; Economics and Management Sciences; and Life Orientation. For the first time, Technology, in a form corresponding largely to the British Design and Technology model, was to be part of every learner's education to Grade 9. The guiding philosophy of C2005 was to be 'outcomes-based education', a somewhat controversial philosophy with strong links to the 'competency based' approaches which were current in the vocational and work-based training arenas. Underlying the whole educational system are twelve 'critical outcomes' which all learning programmes are presumed to encompass. These include problem solving, working co-operatively, time management, communication in various modes, using science and technology effectively, etc. The fact that the new technology learning area, itself a product of recent educational thinking, clearly incorporated most of these critical outcomes, was certainly one of the factors which prevented it from being removed from the curriculum when the curriculum was reviewed in the year 2000 (See Chisholm Report, later in this paper).

INTRODUCTION OF SPECIALISED AND VOCATIONAL EDUCATION

Another important feature of the new system with a bearing on technology education is the introduction, after the formative general education of the GET Band, of specialised education at the FET levels. It is here that the work of the previous government (the ERS and CUMSA) can be detected in that vastly expanded vocational education is envisaged. This phase of education transformation has been long delayed and there is still uncertainty about whether the proposed introductory date of January 2006 will be achieved. As far as technology is concerned, there is considerable confusion about *what* will be offered (the curricula for many of the new subjects in the technology field have yet to be finalised), *where* the subjects will be offered (there is confusion about the resource requirements for many of the new subjects) and *who* will offer the various subjects (there are very few, if any, teachers who have received training in the new subjects). At present, it is apparent that a general technology subject along the lines of the GET Technology will *not* be offered, in spite of strenuous protest by members of the Technology Association to Minister Asmal during the course of 2002/03. The rebuttal by the Minister (personal communication, 28 January 2003) and his department indicated their commitment to a narrow view of specialisation: they believed that aspects of GET Technology could be found in various of the new subjects which would be introduced in the new FET, namely Design, Computer Applications Technology, Mechanical Technology, Electrical Technology, Civil Technology, Engineering Graphics and Design, and Consumer Studies. All of these 'new' subjects are reformulations or aggregations of previous art, computer or technical subjects which appear to have retained a rather narrow focus. The argument that it is the holistic nature of a general technology subject with its emphasis on creative, flexible thinking, its combination of conceptual and procedural knowledge and its unique practical focus seems to have fallen on deaf ears. However, an informal group of teacher educators based at a number of universities is

working on a curriculum for a general technology subject which it is hoped will convince the authorities. As we have long been accustomed to saying in South Africa: Aluta Continua!

THE INTRODUCTION OF TECHNOLOGY EDUCATION

Returning to the introduction of technology as a learning area in the GET Band, this was a process not without its problems as can be expected in a resource-poor country with no experience of technology in the curriculum. At this point, it is instructive to recall the rapidity of the changes that took place following the unbanning of the African National Congress (ANC) and the first democratic elections in 1994. Although there had been discussion around the introduction of technology into the South African curriculum prior to 1994 (see the ERS and CUMSA proposals) and there was some trialing of programmes in schools at this time, it was only after the elections and the establishment of a new non-racial education system that such innovations could gain legitimacy. A National Task Team was appointed early in 1994 to spearhead the introduction of technology into the curriculum. This project, titled 'Technology 2005' (T2005), had the task of developing a national curriculum and trialing it in schools in all nine provinces from March 1994 to March 1997, a very tight time frame for such a novel innovation. Unfortunately, the difficult work of T2005 was overshadowed by the launch in March 1997 of Curriculum 2005: an event which was to transform, if not quite revolutionise, the policy and practise of education in South Africa. The massive task of rebuilding a national schools curriculum from the grassroots was one which stretched the educational resources of the country to the limit. The introduction of the new curriculum within the unrealistic time frames set by National Department of Education placed such strains on the system that Technology lost its novelty opportunity: all learning areas were in a very real sense 'new' and demanded the attention of all involved in education. The burden fell particularly heavily on the shoulders of the teachers (now called 'educators') who not only had to master a plethora of new terms and jargon, but also were expected to translate the new curriculum into implementable classroom activities.

Although the work of the T2005 project committee was extended for a further period, the teacher training aspect of the project was only completed in three of the nine provinces, namely Gauteng, KwaZulu Natal and the Western Cape. Even in these provinces according to Mouton et al (1999), the 'cascade' model, which had been envisaged as a means of extending training into a wider and wider network of schools, was a failure. It was not particularly surprising therefore that the Chisholm Commission, appointed by Minister Asmal in February 2000 to review the new C2005, recommended that the two newest learning areas of the GET, namely Technology Education and Economic and Management Sciences, be scrapped. That this recommendation was not accepted by the Heads of Education Committee (HEDCOM) was due, at least in part, to the enthusiastic following that Technology had built up in the short period following its introduction. The following quote from the extensive evaluation study (see Mouton et al 1999) done of the T2005 project indicates the extent of the enthusiasm with which Technology was being received:

*Teachers' enthusiasm for and dedication to technology is one of the most consistent and impressive findings from this evaluation. **The positive attitude of teachers was fed, in part, by the enthusiasm of their learners.** Most teachers indicated that they would like to continue technology. More than that, many seemed pleased to be able to break out of the old modes of teaching and reconceptualise their notions of what it means to be a teacher/facilitator.*

Technology was an introduction to OBE-style teaching for most teachers, who found this approach to be a positive experience, and one that often gained the attention and recognition of their peers. Most teachers thus commented that they had benefited both professionally and personally from their participation in the project. (Mouton et al 1999, p.157-8)

FACTORS CONSTRAINING THE DEVELOPMENT OF TECHNOLOGY

It would make an interesting study to understand what other factors lay behind the decision to retain Technology: clearly it was not the success of the teacher preparation programme which was, at an official level at least, only operational in two thirds of the provinces of the country. Apart from the work done in some provinces by the T2005 team, much of the early teacher education was done by non governmental organisations (NGOs) such as the ORT-STEP Institute who were active in some of the provinces. In addition, some of the former technical subject educators at universities and teacher training institutions, realising the limited future of their existing programmes, had begun to offer training programmes in the new Technology learning area. On the other hand, many teachers and teacher educators in the former technical and practical subjects did not make the necessary changes and opted for the various severance 'packages' that were being offered at that time. In this way much potentially valuable expertise was lost.

In summary, I would list the following factors as having a constraining influence on the development of technology in schools and in teacher education in particular:

- The transformation of the South African curriculum in the form of C2005 has made it difficult for the new learning area to attract the necessary attention and resources to establish itself in the curriculum and in schools.
- The loss of NGOs who performed a vital role in championing Technology and in providing teacher education programmes (although the latter role has to some extent been taken over by tertiary institutions).
- The ending of the T2005 project meant that Technology lost its most visible champion and its most direct channel of communication with the education authorities. This role is slowly being taken up by the emergence of teacher – led organisations such as the Technology Association (TA) and the South African Association for Science and Technology Education (SAASTE).
- The major upheavals and changes in the tertiary education landscape have dangerously destabilised teacher education programmes, the effects of which on the supply of MST teachers are predicted to be far-reaching.

- The focus on MST subjects towards the late 1990s has, ironically, not necessarily favoured Technology: although it is seldom that you hear the phrase ‘science and technology’ without the word technology, it is clear that for many it means at best the use of high technology devices and at worst only the use of computers. Indeed the perception that technology is synonymous with computers is a persistent one even in curriculum circles in South Africa and abroad as confirmed by a recent Gallup poll commissioned by the ITEA (ITEA, 2004). The wider conception of technology as an engagement with the technological processes of designing and making has yet to develop deep roots in our curriculum and in our society at large.
- Perhaps the largest constraint to the development of Technology as a learning area in schools is the fact that there is no general technology subject at tertiary level in South African institutions. The subjects which are closest are to be found in the Art, Design and Engineering fields, very few of whose graduates traditionally enter the teaching profession. The lack of a general technology subject in the FET Band exacerbates the situation and is an issue which the TA has attempted to address. I believe that the development of an FET curriculum for a general technology subject is essential if the visionary goals of technology education are to be fully realised. The motivating ‘pull’ which the presence of such a subject will have on the learning and teaching in the GET Band will be significant. The creation of such a curriculum may even inspire the development of similar tertiary interdisciplinary courses which will assist in alleviating the shortage of suitably qualified teacher trainees.

TEACHER EDUCATION IN SOUTH AFRICA

As has been mentioned above, teacher education in South Africa is in considerable flux at present owing to the closure of the majority (over a hundred) of teacher training colleges and the incorporation of the remaining twenty-seven under the authority of tertiary institutions. This radical process has been further complicated by the process of restructuring and merging of higher education institutions which is due to continue for the next few years until South Africa will have eleven universities, six technikons/universities of technology, four ‘comprehensive’ institutions (the result of mergers of universities with technikons) and two higher education institutes (based in the Northern Cape and Mpumalanga provinces which are the only provinces without tertiary institutions). Although the closure of many of the former colleges of education was widely seen as necessary (some of these were little more than glorified ‘finishing schools’, producing ‘teachers’ with minimal skills and little chance of employment), the restructuring process has continued the disruption of teacher training in ways which are difficult to quantify. At present, predictions about teacher shortages as a result of these transformations and the effects of HIV/AIDS fluctuate widely: some analysts such as Crouch and Perry forecast that we will need around 25 000 new teachers per year from 2005 (Crouch and Perry, 2003). The Western Cape Education Department has estimated that total current enrolment in teacher education has declined from 70 000 in 1994 to only 13 000 in 2003. (Vinjevold, 2002). This suggests that there will be fewer than 5 000 new entrants to the profession for the next few years. Nevertheless, in spite of these

predictions, some provinces (e.g. the Eastern Cape) still operate ‘closed bulletins’ as a result of an apparent excess of unemployed teachers in the system. In this climate of confusion, many of our newly qualified young teachers are seeking employment overseas. What is clear however, is that there is a very great shortage of qualified teachers in the scarce subjects of mathematics, science and technology.

TECHNOLOGY TEACHER EDUCATION: A PRELIMINARY SURVEY

In an attempt to gain insight into the supply of qualified teachers of technology in South Africa, I undertook a survey of all the tertiary institutions in the country in 2002-2003. At that stage, the work was complicated by the rationalising and merging of institutions mentioned above and the survey will need to be repeated when the new landscape has finally emerged. Nevertheless, the following features of the landscape can be detected from the data:

- A majority of the tertiary institutions are offering teacher education in technology, but there are significant exceptions, such as some of the prestige universities which appear to be scaling down their teacher education programmes in favour of research.
- The teaching staff on technology education courses represents a mix of technical/vocational and academically trained personnel. This represents an opportunity for a rich tradition to emerge, provided opportunities are created for collaboration and cross-fertilisation between institutions. A significant number of institutions employ part-time lecturers to deliver the courses. Some employ NGO ‘partners’ in a range of creative arrangements to provide education to teachers nearer their places of work.
- Some institutions offer only inservice programmes and some only preservice programmes, but many offer both, attempting to respond to the critical shortages.
- Many of the programmes suffer from a severe shortage of staff, with a number of institutions operating ‘one person bands’. There are very few institutions with more than three technology education staff members, thus limiting the opportunities for research and development of the field.
- There is a wide range of interpretation of what counts as relevant ‘content’ for teacher education in technology. Although the school curriculum clearly underpins much of the content of the various courses, there is a lot of variation both within the technology components of the courses and in the number and variety of ancillary courses (education theory, methodology etc) offered. This is an area for future research.
- There is a wide range in length and duration of course, even where equivalent qualifications are offered. Many institutions report that they are ‘under orders’ from educational managers to cut contact time to the bare minimum. This clearly has severe implications for course quality.
- Very few institutions have access to ‘resource-rich’ environments for technology education. Although computer facilities are fairly common, there are few institutions which have access to purposely designed workshop or studio environments. Many staff are ambivalent about such facilities, feeling that teachers should be prepared for the realities of a poorly resourced school

environment. The result is that few programmes deepen the practical capability of teachers (this is particularly true of inservice courses).

A survey such as the above is merely a starting point for an analysis of the state of teacher preparation in technology in the country. Many important dimensions have not been addressed and await future research. For example:

- What are the numbers of teachers being trained at present and how many need to be trained in the years ahead, bearing in mind the predicted impact of HIV/AIDS?
- What is the nature of the courses being offered and how can mechanisms be established so that these are continually developed and improved?
- What is the impact of the courses on schooling and on the lives of school learners? Is the experience of technology enriching the lives of all school children, particularly those in disadvantaged circumstances?

CONCLUSION

The above list is not complete nor is it intended that the above should be used in a normative context: rather I hope to stimulate a debate around the provision of education and training of technology teachers in South Africa in order to strengthen the credibility of the learning area and to establish it more firmly in the educational landscape of the country. I believe that, as a result of the immense pressure teachers and teacher educators have been operating under in South Africa for the last decade, there has been limited opportunity for the reflexion which is necessary if we are to develop technology education so that it occupies its rightful place as one of the most significant innovations in the curriculum of the past twenty years.

REFERENCES

- Crouch, L and Perry, H. (2003). In *Human Resources Development Review 2003: Chapter 21: Educators*. Pretoria: HSRC. Available online at <http://hrdwarehouse.hsrc.ac.za/hrd/chapter.jsp?chid=138>
- Hartshorne, K. (1992). *Crisis and challenge: Black education 1910 – 1990*. Cape Town: Oxford University Press.
- HSRC (1981). *Provision of education in the RSA*. Report of the main committee of the investigation into education. Pretoria:HSRC.
- International Technology Education Association (2004). *ITEA Gallup Poll on Technological Literacy*. Available online at <http://www.nae.edu/nae/techlithome.nsf>
- Kahn, M.J. and Volmink, J.D. (1997) *A position paper on technology education in South Africa*. Development Bank of South Africa: Johannesburg.
- Kimbell, R. and Perry, D. (2001) *Design and technology in a knowledge economy*. London: Engineering Council.

- Kraak, A. (2002). Discursive shifts and structural continuities in South African vocational education and training: 1981-1999. In P. Kallaway (Ed). *The history of education under apartheid, 1948 – 1994*. New York: Peter Lang.
- Kraak, A. and Young, M. (2001) *Education in retrospect. Policy and implementation since 1990*. Pretoria: HSRC
- Mouton, J., Tapp, J., Luthuli, D. and Rogan, J. (1999). *Technology 2005: A National Implementation Evaluation Study*. Stellenbosch: CENIS.
- National Education Policy Investigation. (1992) *Teacher Education. Report of the NEPI Teacher Education Research Group*. Cape Town: Oxford/NECC.
- South Africa. Department of Education (DoE). (2002). *Revised National curriculum statement Grades R-9 (Schools)*. Pretoria: Department of Education.
- South Africa. Department of Education and Culture (DEC) (1990). *The Evaluation and Promotion of Career Education in South Africa*. Main Report of the committee chaired by Dr S.W. Walters. Pretoria: Government Printer.
- South Africa. Department of National Education (DNE) (1991). *A curriculum model for education in South Africa*. Pretoria: Committee of Heads of Education Departments.
- Stevens, A.(2003). Getting Technology into the FET. Proceedings of the Technology Association Conference, Cape Town, September 2003: Technology Association.
- Technology 2005 (1996) *Draft National framework for curriculum development*.
- Technology 2005. (undated) *Curriculum model for a preset teacher education course in technology*. Unpublished circular compiled by H.Johnstone, National task team co-ordinator
- Vinjevoold, P., quoted by Business Day, 29 September 2002. Web edition viewed at <http://www.bday.co.za/bday/content/direct/1%2C3523%2C1095576-6096-0%2C00.html> on 20 October 2004.