

## **CHAPTER 7**

### **OVERVIEW, MAIN FINDINGS AND RECOMMENDATIONS**

#### **7.1 INTRODUCTION**

Technology was introduced as a new learning area in 1998 as part of Curriculum 2005. This learning area is faced with unique challenges and these were alluded to in the first three chapters of the study. The inclusion of Technology as a learning area in the revised curriculum was approved at cabinet level after rejecting the recommendations of the review committee to drop Technology in the curriculum. This chapter provides an overview, main findings, recommendations and items for further study.

#### **7.2 OVERVIEW OF THE STUDY**

In **chapter 1** an orientation and explanation of the problem statement in the implementation of Technology education in schools was given.

In **chapter 2** critical issues regarding the implementation of Technology education worldwide were scrutinised. The constructivist framework to support educators in implementing Technology was highlighted as a panacea for solving implementation problems. In the GET band the review of Technology in C2005, from which emanated the RNCS and now the NCS, helped in overcoming some of the problems including implementation time frames.

In **chapter 3** various implementation approaches were explored. These included the United States of America, Finland, The Netherlands, the United Kingdom, Germany, Taiwan, Australia, Canada, France, Japan, New Zealand, Chile, Nigeria, Ghana, Botswana and South Africa. These countries are at different levels in the implementation of Technology Education in schools. Socio-economic factors are cited as one of the reasons for lack of implementing Technology in some African countries.

In **chapter 4**, the research design, population, sampling and data analysis were discussed. Two approaches, namely the qualitative and quantitative were selected to collect data regarding the implementation of Technology. Educator questionnaires were used to solicit the views of educators on implementation issues. Learner questionnaires were used to enquire about concepts and attitudes towards Technology. The interviews were used with Technology heads of departments, experts and subject advisors to establish the context within which Technology education is implemented.

In **chapter 5** results of both of both quantitative and qualitative data were analysed. These were presented in the form of tables, frequencies, percentages, graphs and Chi-Square. The results were presented according to issues amongst other things: the profile of Technology educators, the attitude and construct of learners regarding Technology and resources as well as the level of support educators receive from the department.

In **chapter 6** an implementation approach for Technology Education for schools in the North West province was presented. It provides a proposed solution to the problems and challenges of implementing Technology education as an emerging field of study. The approach was derived from the literature study in chapters two and three supported by the qualitative and quantitative research in chapter five.

The following are the major findings pertaining to the study:

**Major findings pertaining to research aim No. 1 (What are the critical issues in the implementation of Technology education in schools worldwide?)**

The following were identified as some of the major issues in the implementation of Technology Education in schools:

- The educators' concepts and construct of Technology was seen to be crucial for the implementation of Technology. Educators need to be well trained building on their confidence in teaching (paragraph 5.7.1, page 210).
- Materials and equipment need to be made available for educator and learner support should be provided (paragraph 5.6.1). Most educators indicated that they do not have sufficient resources to implement Technology. This was the case related to tools required for systems and control. However, tools required for working with paper and food processing were said to be sufficient (Table 5.19, page 149).
- Awareness campaigns about the benefits and importance of learning Technology especially the parents should be conducted (paragraph 5.7.1, page 211). The parents are the major stakeholders in the education of their children because they pay the school fees. They have a greater say on what their children should study. If Technology is popularized among parents, they will encourage their children to be serious about Technology.
- Assessment of Technology education in order to improve learners' learning and the quality of learning programmes should be properly implemented. This will assist facilitate accountability and monitoring of educational standards (paragraph 5.7.1, page 210).

**Major findings pertaining to research aim No. 2 (Which international models exist in the implementation of Technology Education?)**

The following curricular approaches were identified from literature review as models for implementing Technology internationally:

- A technical skills approach, seeking emphasis on craft skills in treating resistant materials, food and textiles, or in electronics and automatic control. The disadvantage with this approach is that creativity and critical thinking are not prevalent (paragraph 3.2, page 60).
- A craft approach, in which the cultural and personal value of the combination of manual skills, aesthetic sensibility, and traditional design is to be preserved. The design process is not evident in this type of approach (paragraph 3.2, page 60).
- A technical production approach, seeking emphasis on skills appropriate to modern mass production and its control and organization (Eastern Europe former socialist traditions). This approach is based on one type of skill and does not promote critical thinking skills (paragraph 3.2, page 60).
- An engineering apprentice approach, seeing the school subject as a preparation ground for specialist technicians and engineers in tertiary education. The FET colleges in South Africa are practising this type of approach through the Sector Education and Training Authorities (SETA), (paragraph 3.2, page 61). The disadvantage with this type of approach is that the technological process is not prevalent.
- A “modern technology” approach, which looks to the nature of “work” in the next century and focuses strongly on information technology to mean computers – (a strong tendency in the French and Canadian approaches). The disadvantage of this approach is that Technology is reduced to computers (paragraph 3.2, page 61).



- A “science and technology” approach in which it is assumed that these two subjects are, or ought to be, studied in close association with each other where concentration on design, is seen by some as a central concept in the study and practice of technology. In this approach Technology is seen as the application of science. However in chapter 2 the differences between Science and Technology were discussed. It was seen that Technology is not merely the application of Science (paragraph 2.3, page 61).
- A problem-solving emphasis, focusing on an understanding of the nature of social needs in the definition of “problems” and of the need for a cross-disciplinary approach to tackling issues (Scotland, United States). This is the ideal approach but the disadvantage is that it emphasises the design process and the content of Technology is not prevalent (paragraph 3.2, page 62).
- A “practical capability” approach, emphasizing personal and active involvement of learners in tackling realistic problems to offset the passive and receptive ethos of most of school education. In this model the design process is not active as learners concentrate on the product rather than the process (paragraph 3.2, page 62).
- Emphasis on the technology-society nexus, which calls for study of technological innovation as a driving force for social change and of its interaction with other forces that also drive change (the Science Technology Society movement in the USA). This approach has limitations in terms of Technology content as it focuses on Technology, Science and the Society (paragraph 3.2, page 62).
- A comprehensive approach (The Pedagogical Technological College model)  
Most curricula show a combination of the approaches to eliminate the weak points seen in other models (De Vries, 1999:8).

**Major findings pertaining to research aim No. 3 (How is the profile of educators (qualifications, experience, relevant training?) and what they think about in-service education and training (INSET) and other forms of support received?)**

The following profiles of Technology educators and their INSET needs were identified from the educators' questionnaires:

- Most respondents (55.2 %) had a teachers' diploma as the highest general education qualification and they did not have a formal qualification in Technology (paragraph 5.2.1, page 127).
- Eighty-nine percent, which is more than 2/3 majority, indicated that they needed support in order to teach Technology effectively, and believed that training workshops did not equip them sufficiently to handle the learning area (paragraph 5.3.1, page 142).

**Major findings pertaining to research aim No. 4 (How do educators perceive Technology implementation in schools?)**

The following findings related to the perception of educators towards Technology implementation were identified from the interviews:

- There is lack of professional development programmes and insufficient Technology subject advisors. At certain instances when educators were called to the workshops, they were sent home as there was no Technology subject advisor to facilitate training. This is frustrating the educators and is a disservice to the South African Nation (paragraph 5.7.3, page 213).

### **Major findings pertaining to research aim No. 5 (What is the attitude of learners towards Technology?)**

The under-mentioned findings pertaining to the attitude of learners towards Technology were identified from the learner questionnaires and interviews:

- The attitude of learners towards Technology is positive depending on how well it is taught in schools. The positive attitude gain occurs in grade 7 or age group 11-12 (paragraph 5.7.7, page 221).
- Learners are thrilled about career opportunities, which the learning area exposes them to. They see Technology as the means of survival in South Africa in the 21<sup>st</sup> century. There is however no link between GET and FET in terms of continuation and career pathing. A general Technology learning area does not exist at FET level (paragraph 5.7.7, page 222).

### **Major findings pertaining to research aim No. 6 (What is the attitude of educators towards Technology?)**

The finding pertaining to the attitude of educators towards Technology was identified from the educator questionnaires and interviews:

- There are mixed feelings on the attitudes of educators towards Technology depending on their background. Those who are in the Science field tend to say that Technology is not necessary since they are already teaching it. They perceive Technology as applied Science. Technical vocational and Home economics educators see the change as they were used to emphasise the product rather than the process. Educators of other learning areas are not interested as some Technology tasks are too difficult for them especially because they are not supported in the classrooms (paragraph 5.7.6, page 220).

### **Major findings pertaining to research aim No. 7 (Which specific tools, equipment and other resources exist in the school?)**

The following finding pertaining to the availability of resources in schools was identified from the educator questionnaires:

Most schools have basic tools (scissors, paper punch, ruler, mathematics set, measuring tape, stove and First aid Kit) required to teach the technological process as well as food processing. However, they lack tools and equipment (protective worktop, hacksaw, pliers, vices, soldering iron, multimeter, scale, sewing machine, glue gun and drilling machine) required to teach structures and systems and control (paragraph 5.3.4, pages 147-149). It must be remembered that learning outcome one for Technology deals with the design process and cannot be decontextualised from other learning outcomes.

## **7.4 RECOMMENDATIONS**

Based on the findings of the literature review and the empirical research on the implementation of Technology education the following recommendations are made:

### **Recommendation No.1 (Major finding No. 1 bullet 1)**

Implement train the trainers programme.

#### **Motivation**

The Provincial Department of Education should employ trained officers in Technology to pass on their training to other educators in their schools and regions. This would most effectively be implemented in the context of the National educator in-service programme currently being implemented.



### **Recommendation No. 2 (Major finding No. 1 bullet 2)**

Procure Technology materials and equipment for learners and educators.

#### **Motivation**

The Department of Education should procure the required materials and equipment so that the curriculum could be taught to defined standards. These equipment and models will help highlight connections in real world systems and processes. They will also provide an environment for interactive learner engagement in the classrooms.

### **Recommendation No. 3 (Major finding No. 1 bullet 3)**

Hold advocacy campaigns.

#### **Motivation**

The different Education regions of the North West Province should hold advocacy campaigns for all school stakeholders. The schools should also hold parent evenings where Technology as a learning area will be popularized. This is because parents are the key stakeholders in the children's education.

### **Recommendation No. 4 (Major finding No. 1 bullet 4)**

Diversify assessment strategies.

#### **Motivation**

The North West Provincial Department of Education should put mechanisms in place to ensure that assessment matches the nature of technological activities. It should incorporate performance assessment, project assessment as well as summative and

formative assessment. This will ensure that learners are challenged in a variety of ways to meet the different learning styles.

#### **Recommendation No. 5 (Major finding No. 2)**

Adopt the integrated approach in implementing Technology.

#### **Motivation**

The relevant approach for the North West province is a combination of the five approaches. These are: design, practical capability, problem solving, engineering apprentice and technology-society nexus. Learning outcome one of the National Curriculum Statements addresses the design approach. Since Technology takes place within a particular context, the problem solving approach should be incorporated as well. Learning outcome two deals with the skills in Technology focusing on structures, processing and systems and control as content areas. These skills need to be addressed through the practical capability and engineering apprentice approaches. Learning outcome three that deals with the impact, bias and indigenous Technology should be addressed through the technology-society nexus approach.

#### **Recommendation No. 6 (Major finding No. 3 bullet No. 1)**

Accredit in-service training courses.

#### **Motivation**

The researcher recommends that the training of educators be recognized in a model of accreditation and certification. The researcher recognizes that this might be at a range of levels. There will be some educators without an undergraduate degree and who may wish to count their Technology training towards a diploma or undergraduate qualification. Equally there will be some with degrees who will wish to count their work towards a

post-graduate diploma or a senior degree. Naturally the process of accreditation involves a validating body and this matter should be pursued with Higher Education Institutions.

**Recommendation No. 7 (Major finding No.3 bullet No. 2)**

Establish Pilot schools.

**Motivation**

The researcher recommends that the Provincial Department of Education should identify pilot schools to act as area project office resource centres for the implementation of Technology education. Strategically, some variant on the buddy system should be developed, whereby experienced schools take one or more schools under their wing to help disseminate the practice.

**Recommendation No.8 (Major finding No. 4)**

Appoint Technology subject advisors.

**Motivation**

The Department of Education should employ at least two subject advisors per area project office. This will ensure continued support and that professional development needs are addressed.

**Recommendation No. 9 (Major finding No.5 bullet No.1)**

Teach the technological process well.

### **Motivation**

The learning area heads should ensure that the design process is taught in such a way that it is conceived by learners, as well as having them construct solutions to problems. There should be room for learners to be innovative in the use of inexpensive and locally available materials and equipment. However, much emphasis should be placed on cognitive skills as on technological literacy and capability.

### **Recommendation No. 10 (Major finding No.5 bullet No.2)**

Advocate links between GET and FET Technology.

### **Motivation**

The School Management Team should ensure that learners are informed about Technology programs in the FET band. These should include curricular offered in both FET schools and FET colleges. The reinforcement of these links in the school curriculum would enhance the Technology education offerings.

### **Recommendation No. 11 (Major finding No.5 bullet No.3)**

Forge links between schools and industry.

### **Motivation**

Links with industry are very important, not just for learner visits but with the potential for exchange programmes. Educators could spend short term secondments in industries to enhance their levels of technological literacy, in exchange with industry personnel to provide role models for learners. This may lead to increased levels of industry support for schools and should be initiated at the school level. This will afford educators from

various educational backgrounds the opportunity to grow professionally and understand the type of Technology that is advocated by the policy.

## **7.5 RECOMMENDATION FOR FURTHER STUDY**

In South Africa, Technology is still a new learning area, particularly in the FET band. There are many areas that cry out for attention. In this study an attempt has been made to develop an approach for implementing Technology in the senior phase schools. The approach has not been tried. In this regard the researcher suggests:

- A longitudinal study of schools that will implement the suggested approach; and
- A quantitative research on the implementation of Technology in the FET band.

## **7.6 LIMITATIONS OF THE STUDY**

The main limitations of this study arise from its qualitative and quantitative nature. The study was limited in the following way:

- Some schools were not accessible due to the condition of the roads especially during the floods that happened around the Taung area at the time of the study. The sample for rural schools was therefore limited.

## **7.7 SUMMARY**

In summary, the implementation of Technology education in the North West Province is faced with a number of challenges. For an effective implementation of Technology Education in schools a number of factors need to be taken into consideration. These include adequately trained educators and availability of resources to teach Technology. There are significant quantitative positive advantages to learners in studying Technology.

According to Ter-morshuizen (2006:27) there is usually sufficient material available from overseas and existing books. However, we need to evaluate the material in terms of clarification and understanding and what is applicable in the South African classroom to address the content areas of knowledge and related skills for learning outcome two in the curriculum.

The recommendations made in this research serve as a foundation for schools which want to implement technology Education properly. It is the wish of the researcher that the study will be replicated in other provinces in South Africa.

The most urgent need in the context of the implementation of Technology education is training for senior phase educators. There should be room for learners to be innovative in the use of inexpensive and locally available materials and equipment. More emphasis should be placed on the development of cognitive skills as on technological literacy and capability. The approach should be used in the development of Technology education resources for the General education and Training Band.