THE IMPLEMENTATION OF TECHNOLOGY EDUCATION IN SECONDARY SCHOOLS IN THE FREE STATE PROVINCE (URBAN AREAS)

by

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Faculty of Management Sciences

at the

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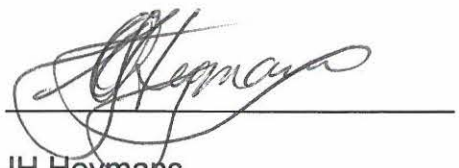
Supervisor: Prof AJ Pienaar, Ph.D

September 2004

DECLARATION WITH REGARD TO

INDEPENDENT WORK

I, Jacobus Hendrikus Heymans, hereby declare that the research project submitted by me in fulfilment of the degree MAGISTER TECHNOLOGIAE: EDUCATION at the Central University of Technology, Free State is my own independent work and has not been previously submitted by myself or any other person in fulfilment of any qualification.



JH Heymans

17/09/2004

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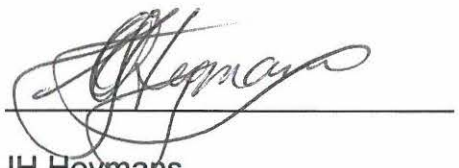

JH Heymans

17/09/2004

Date

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SUMMARY

THE IMPLEMENTATION OF TECHNOLOGY EDUCATION IN SECONDARY SCHOOLS IN THE FREE STATE PROVINCE (URBAN AREAS)

The purpose of this study was to investigate the implimentation of Technology as a subject in schools and to determine the attitudes of educators towards Technology as a subject and Outcomes-Based Education in general.

The main aim of this study was to determine how successful the introduction of Technology Education (in Secondary Schools in the Free State Province urban areas) was, how the subject is being taught and what problems are experienced. The study also aimed to give a general overview and an international perspective of Technology Education. Furthermore, the study aimed to investigate the perceptions of educators of Technology Education, their training to present the subject and whether schools are equipped and resourced to present the subject effectively.

Concerning the research methodology, a literature study was undertaken and experiences from other countries were studied. The approach was mainly qualitative and a non-experimental research was conducted. The population (schools) were selected by means of cluster sampling and the sample (Technology educators) by means of simple random sampling. Data were collected by means of questionnaires and structured interviews. The analysis was done by using a Likert-scale to obtain the opinions of the teachers, and to determine whether there were differences in the proportion of persons' opinions regarding the questions , the Chi-square (χ^2) value for homogeneity (Howell, 1997) was used.

Technology is fast becoming a key learning area in the curriculum of tertiary institutions as well as secondary and primary schools. Technology learner-educators should endeavour to prepare young people for life in a technological society.

From an international perspective the investigation revealed that the way in which Technology Education has been organised differs from country to country, but that they had similar experiences and problems when they introduced the subject for the first time. Specialized subject teachers (Former Industrial Arts, Vocational Education, Industrial Technology specialists etc) usually teach Technology Education in the junior and senior secondary schools in the countries that were studied. One of the biggest problems was the shortage of Technology trained teachers.

The investigation revealed that a very low percentage of educators feel that the implementation of Technology Education was successful and that schools were ready for the implementation. It further revealed that the level / standard of Technology Education in different schools are not the same. There also exists a need for specialised trained teachers to present Technology Education. The need for appropriate equipment and physical facilities also came across. There are still problems / shortcomings regarding the subject Technology Education at schools. The study further revealed that a high percentage of educators feel that the subject Technology Education does have a place in the Further Education and Training sector.

OPSOMMING

DIE IMPLEMENTERING VAN TEGNOLOGIE ONDERRIG IN SEKONDêRE SKOLE IN DIE VRYSTAAT PROVINSIE (STEDELIKE AREAS)

Die doel van hierdie studie was om die implimentering van Tegnologie as 'n vak in skole, asook die houding van onderwysers teenoor Tegnologie as 'n vak en Uitkoms-Gerigte Onderwys in geheel te ondersoek.

Die hoofdoel van hierdie studie was om vas te stel hoe suksesvol die bekendstelling van Tegnologie Onderrig (in Sekondêre Skole in die stedelike gebiede van die Vrystaat) was, hoe die vak aangebied word en watter probleme ondervind word.
Die studie het ook gepoog om 'n algemene oorsig en internasionale perspektief van Tegnologie Onderrig te verskaf. Verdermeer was die doel van hierdie studie om die persepsies van onderwysers van Tegnologie as 'n vak, hulle opleiding aangaande die vak tot dusver asook of die skole toegerus en oor die nodige hulpbronne beskik om hierdie vak aan te bied, te ondersoek.

Die ondersoekmetodes het ondermeer 'n literatuurstudie asook 'n studie van die ervaringe van ander lande ingesluit. Die benadering was hoofsaaklik kwalitatief van aard en nie-eksperimentele navorsing is gedoen. Die populasie (skole) is gekies deur middle van groepering en die monster (Tegnologie onderwysers) deur middle van eenvoudige willekeurige steekproef. Data is ingesamel deur middel van vraelyste en gestruktureerde onderhoude. Die analise is gedoen deur 'n Likert-skaal om die mening van onderwysers te verkry, en om te bepaal of daar verskille in die

verhouding van persone se menings is ten opsigte van die vrae, is die Chi-kwadraat (χ^2) waarde vir homogeniteit (Howell, 1997) gebruik.

Tegnologie is vinnig besig om 'n onmisbare leer-area in die kurrikulum van tersiêre instansies so wel as sekondêre en primêre skole te word. Tegnologie leerder-opvoeders behoort daarop uit te gaan om jong mense vir 'n lewe in 'n tegnologiese samelewing voor te berei.

Vanuit 'n internasionale perspektief het die ondersoek getoon dat die manier waarop Tegnologie Onderrig georganiseer word van land tot land wissel, maar dat hulle soortgelyke ondervindinge en probleme ervaar het toe hulle die vak vir die eerste keer ingestel het. Gespesialiseerde onderwysers (voorheen van Bedryfskennis, Beroepsonderwys, Industriële Tegnologie ens.) bied gewoonlik Tegnologie in die junior en senior sekondêre skole aan. Een van die grootste probleme is egter die tekort aan bekwame Tegnologie onderwysers.

Die ondersoek het getoon dat 'n baie lae persentasie opvoeders voel dat die implementering van Tegnologie Onderrig suksesvol was en dat skole gereed was vir die implementering daarvan. Dit het verder getoon dat die vlak/standaard van Tegnologie as vak nie in alle skole dieselfde is nie en dat daar 'n behoefte bestaan vir gespesialiseerde opvoeders om Tegnologie as 'n vak aan te bied. Die behoefte vir geskikte toerusting en fisiese fasiliteite het ook na vore gekom. Daar bestaan dus steeds probleme/tekortkominge aangaande die vak, Tegnologie Onderrig, by skole. Die studie het verder getoon dat 'n hoë persentasie opvoeders voel dat die vak wel 'n plek in die verdere onderrig-en opleidingsektor het.

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CHAPTER ONE

THE PROBLEM

1.1 INTRODUCTION

This chapter focuses on the orientation and background of the major problem. It is also concerned with the purpose, aim, objectives and theoretical rationale of the study. Further more are the research plan, hypothesis and definition of terms provided.

The exposition of chapters is also explained.

1.2 BACKGROUND TO THE STUDY

The changes in the National Education Policy Act and the implementation of Curriculum 2005 saw the introduction of Technology as school subject in schools (National Department of Education Policy Act no 27 of 1996). Technology, and certainly Technology Education, may be characterised as more of an activity than a discrete body of content (McCormick, 1996:64). Technological knowledge may be divided into conceptual knowledge, which relates to the body of content and procedural knowledge, which relates to the activity (Hennessey & Mc Cormick, 1994:1). Technology should be perceived as a thoroughly integrated activity, not one, which may be separated into content and process, or theory and practice (Williams 2000:1).

In the traditional schools in the Free State the focus in vocational subjects has been on activity (practical), i.e. on doing and making things, and this has represented a narrow interpretation of procedural knowledge. This focus has not been accompanied by an emphasis on all aspects of procedural knowledge, but has typically been concerned with those procedures most closely aligned with the development of manipulative skills and how to use tools effectively and safely, for example:

A relatively recent realisation has been that there are many significant cognitive skills which are important for learners to develop, and which are suitable to be developed in the unique context of Technology education. The term unique is appropriate because there is no other Curriculum area in which students have as significant an opportunity to think, reflect, develop ideas and then to test these ideas in a practical context. The development of these cognitive skills occurs through the procedural knowledge of Technology education. (Williams, 2000:2).

The UNESCO Project 2000+ concerns Technology as part of general education. The International Survey on Technology Education (Ort-Step, 1994:5-6) that was conducted in 37 countries drew the conclusion that Technology Education is a learning area (subject) in its own right. According to UNESCO (Project 2000+:1983), by the year 2001, there should be in place appropriate structures and activities to foster science and technology literacy for all, in all countries.

In view of the UNESCO Project 2000+ declaration and recommendations, Technology Education is an outcome-based learning area in its own right and consists of three main attributes viz:

- **Knowledge items** such as: literacy, technology, scientific principles and concepts, mathematical terms and models, environmental studies, agriculture, materials, economics, etc.

- **Skills items** such as: observation, design and construction, data collection, analysis, interpretation, research skills, technical and cognitive skills, making and manipulative skills, teamwork, communication, graphic communication and safe work habits.

- **Ways of thinking** such as: critical thinking, reasoning, decision-making, evaluation, analytical skills, problem solving, positive attitudes and values, creative and innovative thinking skills (Ort-Step, 1994:6).

1.3 STATEMENT OF THE PROBLEM

South Africa has had no formal subject known as Technology in its schools until the introduction of Curriculum 2005. The introduction of Curriculum 2005 meant that educators at schools were caught unprepared, as they had to teach a subject that most were not conversant with. Hot on the heels of the introduction of Curriculum 2005

came the introduction of Outcomes-Based Education (OBE) as a method of instruction. The problem that this study investigated was the implications of the implementation of Technology as a subject in schools and the attitudes of educators towards Technology and OBE in general.

1.3.1 Delimitation of the problem

There are two factors that delimit the external validity of this study:

Firstly, the results of this study may not be generalised beyond secondary schools in the Free State Province because Technical Colleges, Community Colleges, Universities and former Technikons are not represented. They pursue different teaching and learning programmes: mostly employ differently qualified staff, and they have different administrative structures.

Secondly, the results may not be generalised to secondary schools in rural areas, also due to differences in environmental factors that have an impact on them in terms of perception, attitudinal norms and time. This aspect is referred to as the history effect.

1.3.2 Significance of the study

This study will contribute to the promotion of the standard of teaching and learning of Technology and will also contribute to literature regarding the implementation of Technology as a subject in Secondary Schools.

1.3.3 Purpose of the study

The purpose of this research was to highlight problems that might be encountered with the introduction of Technology as a subject without proper planning and preparation by secondary school personnel. The primary purpose of this study was to examine the implementation of Technology Education as a new learning area in schools in the urban areas of the Free State Province.

1.3.4 The objectives of the study

The objectives of this study were to:

- To investigate the current stance of Technology Education in Free State secondary schools (Urban areas)
- To determine educators' perceptions of the old curriculum versus the curriculum 2005
- To get the opinion of educators towards the meaning/role of Technology Education
- To determine the level of training of educators for the new curriculum
- To determine the perception of educators regarding the teaching of Technology Education
- To investigate the opinion of educators regarding the role of Technology Education in Further Education and Training (FET)
- To determine the functioning of Technology Education in schools

Further goals of this study were to:

- To give a general overview of Technology Education as a new learning area.
- To get an international perspective on Technology Education.
- To investigate the perceptions of educators of Technology Education.
- To provide guidelines to educational authorities with regard to Technology Education.
- To give conclusions, discussions and recommendations about Technology Education as a possible new learning area in Further Education and Training (FET).

1.4 DEFINITION OF TERMS

1.4.1 Technology

The Department of Education Draft revised National Curriculum Statement (DOE, 2002:28) gives the following definition of Technology:

> ***"Technology is a human activity of developing solutions to people's needs by combining skills, values, knowledge and resources with sensitivity to social and environmental factors".***

The National Education Policy Act no 27 of 1996, gives the following definition of technology:

> ***"Technology is the use of knowledge, skills and resources to meet human needs and wants and recognise and solve problems by investigating, designing, developing and evaluating products, processes and systems".***

There are many definitions of Technology and many misrepresentations of what Technology is meant to be. Below will be found the terms and definitions that are used in this dissertation in order to discuss this widely misunderstood term (ITEA, 2001:1)

Technology - 1. Human innovation in action that involves the generation of knowledge and processes to develop systems that solve problems and extend human capabilities. 2. The innovation, change, or modification of the natural environment to satisfy perceived human needs and wants (ITEA, 2001:1).

Technological literacy - The ability to use, manage, understand, and assess technology (ITEA, 2001:1).

Technology content standard - A written statement that specifies the knowledge (what learners should know) and process (what learners

should be able to do) that learners should possess in order to be technologically literate (ITEA, 2001:1).

Technology Education - A study of Technology, which provides an opportunity for students to learn about the processes and knowledge related to technology that are needed to solve problems and extend human capabilities (ITEA, 2001:1).

Technological transfer - The process by which products, systems, knowledge, or skills, developed under federal research and development funding, are translated into commercial products to fulfil public and private needs (ITEA, 2001:1).

Technological design / Engineering design - The systematic and creative application of scientific and mathematical principles to practical ends such as the design, manufacture, and operation of efficient and economical structures, machines, processes, and systems (ITEA, 2001:1).

Vocational education - Training within an educational institution that is intended to prepare an individual for a particular career or job (ITEA, 2001:1).

Instructional Technology - The use of computers, multi-media, and other technological tools to enhance the teaching and learning process. Sometimes referred to as Educational Technology (ITEA, 2001:1).

1.4.2 Technology Education

HEDCOM (1996:12) defines Technology Education as concerning technological knowledge and skills; technological processes; understanding the impact of Technology on both individual and society; designed to promote the capability of the learner to perform effectively in the technological environment he/she lives in, and stimulate him/her to contribute towards its improvement.

For the purpose of this study Technology is the use of knowledge, skills and resources to meet human needs and wants, and recognise and solve problems by investigating, designing and evaluating products, processes and systems.

1.4.3 Technical school

The word "***technical***" is derived from the Greek "technikos" or "techne" meaning art, or pertaining to some particular art science or trade. It further means a particular field of knowledge pertaining to mechanical art (Mafrika, 1989:15).

According to Griesel et al (1996:49) the word ***"school"*** is derived from the Greek *schole* (free time) and Latin *schola* (learned investigation

According to Van der Stoep et al (1984:243) the school is that structure which stands in a clear relationship to the cultural, economic, religious and social activities of a community. This leads to the acceptance in certain circles that the school has its origin in one or more of these differentiated occupational structures of society. The implication is that if a school is not orientated to, or concerned with, a certain occupational field, it will not have the status of a school. The school is further defined within the context of its aim, namely to orientate the child for occupational life in the community.

A **Technical school** is therefore a school that specialises in specific trades of industry and prepares learners in a certain occupational field with the necessary knowledge and skills.

1.4.4 Teacher / Educator

Teacher

In the didactic situations at school the teachers are the persons who are professionally and didactically trained and who are qualified, as far as their respective subjects and their occupation are concerned, to carry out educative teaching. They are expected to be aware of their responsibility

to society for formal educative teaching. They must also have sufficient knowledge of and insight into the meaning and cultural value of the aspects of reality which are taught as the learning content of the curriculum (Fraser et al, 1993:14).

Educator

Educator means any person who teaches, educates or trains other persons at an education institution or assists in rendering education services or education auxiliary or support services provided by or in an education department (NDE, Act no 27, 1996:2).

1.4.5 Implementation

The Readers Digest Family Wordfinder (1975:408) explains the word **implement** as follows:

"-v. **2** *Donations are needed to implement our child-care programs:* put into effect, begin, activate, enact, start, set in motion, carry out, fulfil, achieve, accomplish, realize".

The Readers Digest Oxford Complete Word finder (1994:752) explains the word **implementation** as follows:

"*n.***1** utensil, tool, instrument, apparatus, device, appliance, contrivance, mechanism, (piece of) equipment, gadget, *deroc. or joc.* Contraption.

*v.***1, 2** carry out, execute, accomplish, perform, complete, achieve, (put into) effect, bring about, cause, fulfil, realize".

For the purpose of this study implementation is beginning or introduction of a new subject called Technology in the secondary school.

1.4.6 Outcomes-Based Education (OBE)

The starting point of OBE is a clear statement of ***intended learning outcomes and their associated performance indicators***. When these are clearly and publicly stated, and then used as the foundation for all other decisions about teaching and learning, we have an OBE system (DOE, Implementing OBE – 4, 1998:6).

According to the Revised National Curriculum Statement (DOE, 2002:10) Outcomes-Based Education considers the process of learning as important as the content. Both the process and the content of education are emphasised by spelling out the outcomes to be achieved at the end of the process. Learning outcomes and assessment standards were designed down from the critical and developmental outcomes.

The South African version of Outcomes-Based Education is aimed at stimulating the minds of young people so that they are able to participate fully in economic and social life. It is intended to ensure that all learners

are able to develop and achieve to their maximum ability and are equipped for lifelong learning.

1.4.7 Curriculum 2005 (C2005)

The education minister (City Press, 1997:17) announced a new far-reaching education plan that focuses on people-centred, lifelong learning and a culture of human rights: Curriculum 2005. A plan for the next century aims to encourage effective communication, critical thinking, responsible behaviour and the ability to manage oneself, and work with others "by a lifelong education system, which is people-centred".

South Africa's past education system was not designed to produce creative, critical and independent thinkers with the ability to solve problems. With the introduction of C2005 there was a total paradigm shift and curriculum change.

The newly formed curriculum is thus based on the principle of Outcomes-Based Education and is at the centre of change for schools. In short C2005 is designed to promote the development of well-rounded individuals who are to be responsible citizens of our democratic country.

1.4.8 Old regime

For the purposes of this study the term "old regime" refers to former white schools under the Apartheid system.

1.4.9 Previously disadvantaged

For the purposes of this study the term "previously disadvantage" refers to black and coloured schools under the Apartheid system.

1.5 THEORETICAL RATIONALE

1.5.1 Research abroad

The British School System has understandably influenced the educational system of New Zealand, a former British Colony. The historical concept of technical education in New Zealand is based on the British Model.

England and Wales designed and introduced a new technology curriculum of necessity, and New Zealand has developed a technology curriculum, which is more suited to New Zealand developing culture. (Reid, 2000:2).

In the Journal of Technology Education Reid (2000:2) takes a closer look at the new technology curriculum of New Zealand. The paper focuses on the process of curriculum development. It illustrates some of the good features and some of the difficulties resulting from the introduction of technology as a subject in New Zealand schools in 1999.

In early 1999, Gary Benenson, Professor of Mechanical Engineering, City College, NY and Fernando Cajas, Researcher, American Association for the Advancement Science/Project 2061, established an on-going dialogue about the importance of technology education research (Cajas, 2000:2).

In developing curriculum material, Beneson and his team felt the need for research in Technology Education to guide their word. There is a need for good research in Technology Education to shed light on how students' understanding and abilities grow over time.

In the international arena the United Nations Educational Scientific and Cultural Organisation (UNESCO) has also recognised the urgency of Technology literacy throughout its innovation in science and Technology Education series (Cajas, 2000:1).

At a conference held in December 1999 in America participants from science education, Technology Education and cognitive science focused on the following issues:

- Research Areas
- How children learn technological ideas
- Research Methods
- Assessment

Attention was also given to educator development by means of professional development programmes. In his reflections about the conference Kenneth Welty (Cajas, 2000:6) pointed out that a common proactive in Technology education is to engage students in activities that are grounded in time-honoured practices and that reach predetermined destinations (the attainment of standards).

From the above-mentioned it is clear that Technology Education is receiving special attention and stress out of the necessity of research on this terrain. This aspect will receive more attention in Chapter 2.

1.5.2 Research in South Africa

In South Africa there are currently several researchers engaged in research concerning Technology Education. The following are examples:

- Development of learning programme for the learning area Technology at colleges of education, Dixon E.
- Supporting Technology Education, Drost A.W.
- 'n Prinsipiële verantwoording van tegnologie – onderwys in die skoolkurrikulum, Baadjies BS.
- Technological Education in Germany and its relevance for the situation in South Africa, Du Plessis W.S.
- Tegnologie – onderwys in die huidige Suid Afrikaanse Konteks, Adam I.

- Curriculum Development and Curriculum 2005 Staff Development through Inset, Maculeka J. K.

When we look at the above-mentioned research efforts, we may deduce that they do not address the problems of the implementation of Technology Education.

1.6 HYPOTHESES

In this study the following is hypothesised:

- The current situation / level / standard of Technology in different secondary schools will not be the same.
- The composition of Technology learning material will be different in schools.
- The teaching of Technology does not take place according to Outcomes-Based Education and Curriculum 2005 in all schools.

1.6.1 Research questions

The purpose and objectives of the study gave rise to the following questions:

Main question: How successful was the introduction of Technology Education in Secondary Schools in the Free State Province (Urban areas) and how is the subject being taught and what problems are experienced?

The following questions were also asked;

- Are all educators equipped to teach Technology Education?
- Is technology implemented according to Curriculum 2005 requirements and Outcomes-Based Education?
- Do problems and difficulties cause educators to fall back on earlier didactic methodology?
- Are educators willing to undergo retraining?

1.7 RESEARCH PLAN

The approach followed in this study was mainly qualitative and a non-experimental research was conducted. The following research instruments were utilised to collect data: a literature study, questionnaires and individual interviews.

1.7.1 Population and sample

The population of this study was determined by means of cluster sampling. Secondary schools in the Free State Province situated in the Bloemfontein, Welkom and Kroonstad area were selected. Thirty five schools were selected (See also section 3.2.1).

Gall and Borg (1996:217) state that sample size in qualitative studies typically is small. Sample size might be a single case. For example, if

researchers wish to understand how educators attempt to implement a new curriculum, they might design a qualitative study that allows them to observe intensely a few educators engaged in this activity for an entire school year (Gall and Borg, 1996:218).

A sufficient representative sample was obtained through cluster and simple random sampling techniques. A simple random sampling technique was applied to the representative "clusters" to select the desired number of Technology educators that will participate in the study.

The sample of this study was directed to all Technology educators in secondary schools in the Free State Province situated in the Bloemfontein, Welkom and Kroonstad areas, and some principals / vice principals of schools. Sixty educators were selected for the sample.

1.7.2 Data collection

In educational research questionnaires and interviews are used extensively to collect information that is not directly observable. These data-collection techniques typically inquire about feelings, motivations, accomplishments and experiences of individuals. A wide range of educational problems may be investigated with questionnaires and interviews (Gall and Borg, 1996:288).

Two groups of educators were used in the collecting of data (former white schools and previously disadvantaged schools). The total group consists of 60 educators, of which 30 were from former white schools and 30 from previously disadvantaged schools. Data were collected in the following ways in this study:

1.7.2.1 Questionnaire

According to Mahlangu (1987:79), the technique whereby the researcher believes that an impersonal approach will suffice, and according to which he puts his questions on paper and submits them to respondents, asking them in turn to write their answers on paper, is called the questionnaire.

Questionnaires are implemented without any outside influence and the information directly given by people may be converted into data. Gall and Borg (1996:289) define questionnaires as documents that ask the same questions of all individuals in the sample.

1.7.2.2 Interview

In this study interviews were held with educators to establish their perceptions and understanding of Technology Education as a new learning area in the general Curriculum 2005 in secondary schools.

According to Gall and Borg (1996:289) interviews consist of oral questions by the interviewer and oral responses by the research participants. Interview respondents typically speak in their own words, and their responses are recorded by the interviewer, either verbatim on audiotape or videotape, through handwritten or computer-generated notes, or in short-term memory for later note taking

1.7.3 Data Analysis

Creswell (1994:153) states that the process of data analysis is eclectic: there is no "right way". Data analysis requires that the researcher be comfortable with developing categories and making comparisons and contrasts.

The data analysis was conducted as an activity simultaneously with data collection, data interpretation and narrative report writing. By making use of a Likert-scale, tables were used to analyse and interpret the data derived from the questionnaire. In this study, the researcher used an interview schedule to prepare his interview questions. Interviews were recorded on audiotape and transcribed verbatim (See section 3.2.4.2).

1.8 DIVISION OF CHAPTERS.

Chapter One covers the background for the dissertation, the statement of the problem, aims and objectives that the investigator hopes to reach,

the methodology of the dissertation, explanation of key concepts, the division of the chapters as well as the concluding paragraph/s that introduce/s the next chapter.

Chapter Two gives a focused literature study and an international perspective on Technology Education to give some background to the researcher on the status of the subject in other parts of the world.

Chapter Three is devoted to the methodology and strategies used in developing the dissertation. It will indicate the population and sample used for the questionnaires and the structured interviews.

The results of the questionnaire and the responses of the interview participants are critically analysed and discussed in **Chapter Four.** General conclusions and recommendations are drawn from these responses.

Conclusions and recommendations are given in **Chapter Five.**

The next chapter will handle a literature review as well as an international perspective on Technology Education in developed countries and one developing country.

CHAPTER TWO

LITERATURE REVIEW AND AN INTERNATIONAL PERSPECTIVE ON TECHNOLOGY EDUCATION

2.1 TECHNOLOGY AS LEARNING AREA

2.1.1 Introduction

Every country and every nation has its own Educational System that is unique, though it is nevertheless tied to some representative educational pattern. The people and the history help to shape the educational system of a country. The South African Educational System has many facets that are of its own making, but also portrays much of the Western tradition in Education (Behr 1988:9).

South Africa's government inherited a divided and unequal system of education under Apartheid. There were eighteen different educational departments separated by geography, ideology and race. Children were prepared in different ways for the positions they were expected to occupy in social, economic and political life (DOE 2002:4).

The National Education and Training Forum began a process of syllabus revision and subject rationalization immediately after the election in 1994. This would lay the foundation for a single national core syllabus. For the first time curriculum decisions were made in a participatory and

representative manner, but this was not a curriculum development process.

The first major curriculum statement of a democratic South Africa was the *Lifelong Learning through a National Curriculum Framework* document (1996) that was informed by principles derived from the White Paper on Education and Training (1995), the South African Qualifications Act (No 58 of 1995) and the National Education Policy Act (No 27 of 1996). The White Paper emphasized the need for major changes in education and training in order to normalize and transform teaching and learning in South Africa. A shift from the traditional aims-and-objectives approach to an outcomes-based education was also stressed (DOE 2002:4).

The Cabinet, at a meeting on 25 July 2000, considered the review of C2005 and decided that since the recommendations of the C2005 Review Committee amount to a strengthening and streamlining of C2005 and not its phasing out, and therefore do not depart from the original underpinning principles, and since they maintain the thrust of the original educational and societal goals, there is no need to change the name of the curriculum to Curriculum 21 (The Teacher, 2000:23; Business Day, 2000:4).

In The Teacher (30 September 2000:8) Linda Chisholm, who headed the Curriculum 2005 review committee, expresses doubt that the current process of "streamlining" the curriculum will be the last:

"My view is that with every set of curriculum reviews and changes, new issues, problems and contradictions emerge. As soon as something is addressed, new problems will crop up".

The committee recommended that the learning areas of Technology and Economic and Management sciences be excluded, but the Cabinet did not endorse it, instead they will be implemented as planned. The reason for the recommendation is that there are not enough educators trained in these areas. However, chief director of general education and training, Edsent Williams (The Teacher, 30 September 2000:8), states that:

"The actual complexity of content in these learning areas for grades 4 and 8 are not beyond the teachers".

There will be an ongoing drive to build the capability of educators in this area, to coincide with their introduction in higher grades (The Teacher, 30 September 2000:8).

2.1.2 What is Technology?

"Broadly speaking, technology is how people modify the natural world to suit their own purposes. From the Greek word techne, meaning art or artifice or craft, technology literally means the act of making or crafting, but more generally it refers to the diverse collection of processes and

knowledge that people use to extend human abilities and to satisfy human needs and wants." (ITEA, 2001:1)

Appropriate definitions of Technology and Technology Education were supplied in Chapter One (Refer Chapter one, 1.4.1). According to Reddy (1995:126) Technology pervades all spheres of human endeavour. It helps to solve problems and widens human possibilities. It therefore has direct consequences for general education and the way the school system prepares the young for life.

People will always have needs and wants. Solutions are developed through activities that combine knowledge, skills and resources. The knowledge, skills and resources used today are different because of the accelerating developments in Technology. Today we live in a complex and diverse society.

Economic and environmental factors and a wide range of attitudes and values need to be taken into account when developing technological solutions. It is in this context that Technology is defined in The Revised National Curriculum Statement Grades R-9 as:

> *"The use of knowledge, skills and resources to meet people's needs and wants by developing practical solutions to problems while considering social and environmental factors."*
> (DOE, 2002:28).

Vines (2002:1) in his report states the following:

> *"On the whole, Technology is the modification of nature to meet human needs. However, most people still think of it only in terms of tangible products, like computers and microwave ovens. Technology also compromises the knowledge and processes necessary to create and operate such products, and the infrastructure necessary to design, make and repair them".*

2.1.3 Technology Education

The theme "Technology Education for a Changing Future: Theory, Policy and Practice" was addressed at the second Jerusalem Science and Technology Conference (JISTEC) held on 8-11 January 1996. There were over 1000 participants from more than 80 countries. The participants reached general consensus on what Technology Education is (Technology for all, 1996:1):

- Technology Education is an important element in the education of every student;
- Technology Education takes place in both formal and informal learning situations;
- Technology Education occurs in both school and out of school;

- Technology Education involves the entire continuum of educational programmes, beginning with the most general introductory overview and extending to specialisation including Technical Education, retraining and upgrading.

However, the participants acknowledged that there are different approaches to introducing Technology Education into the education system. For instance, Technology Education may be introduced:

- as an integral component of an interdisciplinary teaching approach
- as a separate subject
- as a theme for project work in the curriculum
- as an element of a particular school subject

UNESCO (see ORT-STEP Survey, 1994:5-8) undertook a study of Technology Education as part of general education in 37 countries, including developing and highly industrialised countries. The study demarcated the three main aspects of Technology Education:

- ***Knowledge items*** such as: literacy, technology, scientific principles and concepts, mathematical terms and models, environmental studies, agriculture, materials and economics.
- ***Skills items*** such as: observation, design and construction, data collection, analysis, interpretation, research skills, technical and cognitive skills (with respect to Technology and Science),

manipulative skills, teamwork, communication, graphic communication and safe work habits.

- ***Ways of thinking*** such as: critical thinking, reasoning, decision making, analytical skills, problem-solving skills, positive attitudes and values, and creative and innovative thinking.

The International Technology Education Association (ITEA, 2001:1) gives the following definition to Technology Education:

> *"A study of Technology, which provides an opportunity for students to learn about the processes and knowledge related to Technology that are needed to solve problems and extend human capabilities".*

HEDCOM (1996:12) defines Technology Education as concerning technological knowledge and skills; technological processes; and involves understanding the impact of Technology on both individual and society. It is also designed to promote the capability of the learner to perform effectively in the technological environment he/she lives in, and stimulates him/her to contribute towards its improvement.

The Outcomes of Technology Education according to the Department of Education (DOE, 2002:28) is as follows:

1. **Technological Processes and skills:** The learner is able to apply technological processes and skills ethically and responsibly using appropriate information and communication technologies.

2. **Technological Knowledge and Understanding:** The learner is able to understand and apply relevant technological knowledge ethically and responsibly.

3. **Technology, Society and Environment:** The learner is able to demonstrate an understanding of the interrelationships between Science, Technology, Society and the environment over time.

In conclusion the following statement by Vines (2002:1) takes the whole aspect and importance of Technology Education into consideration:

> *"Learning about Technology should begin in kindergarten, and its connection with all subjects should be emphasized throughout a student's education. Technology content should be infused into curricula, teaching materials and student assessments. And all educators should be better prepared to teach about the subject".*

2.1.4 The Historical Development of Technology Education: From Condorcet to Dewey

2.1.4.1 Introduction

From the colonial era, Western institutionalized education has been put into the service of civilization building by seeking to advance practical industrial needs. In the early Middle Ages education has not always had such an explicitly economic orientation and the purpose of education was conceived of primarily in terms of advancing spiritual well being, Church- or State-sponsored occupations, and socially "proper" forms of knowledge. Education began to become associated with citizenship, nation-building, practical and secular knowledge, and the advancement of a technological civilization and private enterprise, only when European nations embarked upon colonial expansion (Chafy, 1997:1).

Technology education has passed through many phases, from manual training through manual arts, through industrial arts to contemporary programs in industry and Technology. These phases have produced varied rationales because they were based on different psychologies. Since the 1900's, one common link has been that the field is an important part of general education since the 1900's, and therefore may provide a meaningful educational experience (Korwin and Jones, 1990:1).

Our understanding of science and Technology Education (referred to here simply as "Technology Education") owes much to Enlightenment-based assumptions in the writings of formative educational thinkers during the eighteenth and nineteenth centuries, especially the works of Antoine-Nicholas de Condorcet and John Dewey. In examining their beliefs we may bring into question certain fundamental assumptions embedded in the historical development of Technology education (Chafy, 1997:1).

2.1.4.2 Education, Technology, and Condorcet

Like other Enlightenment thinkers, Condorcet believed that there is no limit to the learning capabilities of the human mind and that progress meant the perfection of science and Technology. He also believed that all “men” are products of nature, with equal rights to the moral, practical and intellectual pursuits of reason. Human progress rests on an individual's ability to educate and refine himself in these three areas of human action. Colonization had proven the "superiority" of Western technology and such knowledge should be spread to all through education (Chafy, 1997:3).

Condorcet stated that progress constitutes ten stages of human development, or "civilization." (Condorcet, 1995:174 in Chafy, 1997:3). Condorcet views the African tribe as representative of this first stage of

human development, while he places European-based societies further up the evolutionary ladder:

> *"Will all nations one day attain that state of civilization which the most enlightened, the freest and the least burdened by prejudices, such as the French and Anglo-Americans, have attained already? Will the vast gulf that separates these peoples from the slavery of nations under the rule of monarchs, from the barbarism of African tribes, from the ignorances of savages, little by little disappear?"* (Condorcet, 1995:174 in Chafy, 1997:3).

As a culture moves from one stage to the next, Condorcet believed it develops more advanced technologies and bureaucratic political systems, and exhibits more personal freedom and democratic principles.

The tenth stage of civilization according to Condorcet is marked by liberty, equality, democracy and universal education for all.

> *"With greater equality of education there will be greater equality in industry and so in wealth; equality in wealth necessarily leads to equality in education: and equality between nations and equality within a single nation are mutually dependent"* (Condorcet, 1995:183-184 in Chafy, 1997:3).

Thus, a *"well directed system of education"* will result in *"progress"* in its most basic form and *"the absolute perfection of the human race"* (Condorcet, 1995:184 in Chafy, 1997:3).

Condorcet recognized the need for a linkage between science and the technological arts in education:

> *"If we turn now to the arts, whose theory depends on [the] sciences, we shall find that their progress depending as it does on that of theory, can have no other limits; that the procedures of the different arts can be perfected and simplified in the same way as the methods of the sciences; new instruments, machines and looms can add to man's strength and can improve at once the quality and the accuracy of his productions, and can diminish the time and labour that has to be expended on them. The obstacles still in the way of this progress will disappear, accidents will be foreseen and prevented, the unsanitary conditions that are due either to the work itself or the climate will be eliminated".* (Condorcet, 1995:187 in Chafy, 1997:4).

With this faith in Technology, Condorcet not surprisingly blended his understanding of education, technological progress, and reason with morality and happiness. Technological development might have limits

(such as through overpopulation and the lack of food), but Condorcet believed that human reason would solve those problems (Chafy, 1997:4).

Condorcet and the other Enlightenment thinkers had only a minor impact on education in Europe, but they planted important seeds of change that would ultimately transform the theory and practice of European and American institutionalized education (Chafy, 1997:4).

2.1.4.3 From Condorcet to Dewey

In the late nineteenth century one the most powerful calls for modernization came from the educational philosophy of John Dewey. In the early twentieth century elite and classical education was dominant. Dewey is often credited with leading the final assault on American religious and classical education:

> *"As the nineteenth century turned into the twentieth century the experimentation of John Dewey and his followers made it even more difficult for advocates of a closed intellectual system and conventional body of truth to hold their own"* (Butts, 1973:471 in Chafy, 1997:7).

Dewey is still regarded today as *the* proponent of democratic education and education for citizenship philosophies (Chafy, 1997:7).

Building upon the ideals of Condorcet, Dewey recognized the need for a more "cultural" education, one that combined theory and practice, to help create more well-rounded, intelligent, and adaptable citizens:

> *"When the school introduces and trains each child of society into membership within such a little community, saturating him with the spirit of service, and providing him with the instruments of effective self-direction, we shall have the deepest and best guaranty of a larger society which is worthy, lovely, and harmonious"* (Dewey, 1964:311 in Chafy, 1997:8).

According to Chafy (1997:8) the root of Dewey's pedagogy is his philosophy of science, a belief that the scientific methodology may be interpreted or translated into educational theory and practice, as well as in terms of human activity. Butts (1973:471 in Chafy, 1997:8) states:

> *"For more than fifty years Dewey was the chief apostle of modernity in American philosophy as well as in American education. He argued that schools should strive to emphasize moral goals based upon democratic, civic, and social experience, vocational and practical usefulness, and individual development in light of the rapid modernizing changes that were taking place in Western civilization"*

Chafy (1997:8) said that Dewey's perspective on civilizational advancement reflects the Enlightenment bias towards progress and "civilized" versus "savage" cultures. Thus, Dewey might be characterized as Condorcet's interpreter:

> *"A savage who has been shipwrecked on a river may note certain things that serve him as signs of danger in the future. But civilized man deliberately makes such signs; he sets up in advance of any particular shipwreck warning buoys, and builds lighthouses where he sees signs with great expertness; civilized man institutes a weather service by which signs are artificially secured and information is distributed in advance of the appearance of any signs that could be detected with special methods. A savage finds his way skilfully through a wilderness by reading obscure indications; civilized man builds a highway that shows the road to it all"* (Dewey, 1964:214 in Chafy, 1997:8).

Dewey said civilized man uses Technology to expand the capabilities inherent in the savage, and he makes a clear distinction between civilized–advanced and uncivilized–primitive, based upon relative measures of technological development (Chafy, 1997:9).

The pedagogy of Dewey is based on what he calls the "project method", linking scientific theory and technological practice. "Intellectual interest" is

therefore understood by Dewey purely in terms of scientific interest; the net result being that:

> *"Theoretical subjects will become more practical, because more related to the scope of life; practical subjects will become more charged with theory and intelligent insight. Both will be vitally and not just formally unified"* (Dewey, 1964:425 in Chafy, 1997:9).

2.1.4.4 Conclusion

Thus, although Condorcet and the other Enlightenment thinkers had only a minor immediate impact on education in Europe, they planted important seeds of change that would ultimately transform the theory and practice of European and American institutionalized education. Dewey's legacy is as a key figure in reflecting the undercurrents of turn-of-the-century industrial America and in the technical disciplines in modern American education (Chafy, 1997:9).

2.1.5 Science and Technology: Beyond the "Technology is Applied Science" Paradigm

2.1.5.1 How important is Science for Technological innovation?

In the development of a philosophy of Technology as a discipline, that reflects on Technology, one finds the opinion that Technology is applied

science (de Vries, 1996:1). Bunge in de Vries (1996:1) regards "Technology" and "applied science" as "synonyms". This opinion is encountered time and time again in later literature (de Vries, 1996:1). It is suggested that there is a more or less straightforward path from that scientific knowledge to the technological product. This opinion functioned for some time as a paradigm for the philosophy of Technology (de Vries, 1996:1).

Kuhn (1970) in de Vries (1996:1) states that nowadays we find much opposition against this paradigm and we are going through a revolution from one paradigm to the next. It is not always so clear what will be the next paradigm. Some recent literature tends to swing towards the opposite, and suggests that Technology precedes science. Examples to illustrate this are the steam engine and the development of a successful corkscrew by a Dutch company called Brabantia. De Vries (1996:1-2) states the following:

> *"Scientific knowledge had only a very limited influence on the development of the product and the explanation for the great success of the corkscrew is only to a small extent based on clever use of knowledge of natural phenomena. Rather the success is the result of a clever use of the combination of scientific-technological know-how and know-how of social (market, juridical) phenomena".*

2.1.5.2 Technology in Science Education

Traditional subjects like industrial arts or craft do reveal Technology, and elements of Technology are found in science education. The "technology is applied science" paradigm in the philosophy of Technology, is reflected in education:

> *"Science education for many years used to be a rather abstract subject where it was difficult for pupils to recognize the relationship between the knowledge that was taught in science lessons with their daily life. This relationship is found mainly through the technological products they find all around them and therefore a trend emerged in science education to show how scientific knowledge was applied in technological products. When one considers the course material that resulted, one can easily recognize the "technology is applied science" paradigm".* (De Vries, 1996:2)

The "technology is applied science" paradigm, as seen before, is challenged now. Can we move away from "science for all" and replace it by "Technology for all, science for some" or "Technology for all Americans" as is the title of a nationwide project in the USA? (De Vries, 1996:2).

2.1.5.3 The Role of Science In Technology

The relationship between science and Technology is to be considered somewhat more carefully. Science does play a role but not the only role. Often the example of the steam engine is quoted to attack the "technology is applied science" paradigm, but this is not sufficient to do away with this paradigm. A study of the development of the transistor in the Bell Laboratories shows the same phenomenon. It was only thanks to sophisticated scientific knowledge of microstructures that the product could be developed. In the case of the Brabantia corkscrew, market requirements had a practical impact on the product development from the very beginning of that process (De Vries, 1996:3).

De Vries (1996:3) says that the role that scientific knowledge plays, differs substantially between the various cases; sometimes it is dominant in the early and crucial stages of the development, sometimes it is almost absent.

> *"This makes it difficult to make any general statement about "the relationship between science and technology." In fact there appear to be several possible relationships between science and technology"* (De Vries, 1996:3).

According to De Vries (1996:3) one may identify at least three different types of technologies:

- Experience-based technologies (The Brabantia corkscrew)
- Macro technologies (mechanics, thermodynamics and electromagnetics)
- Micro technologies (Transistors and LCD's)

2.1.5.4 Consequences for Technology Education

It may be asked if our present practices are in line, or are changes necessary? De Vries (1996:4) states that pupils seem to have great difficulty in recognizing the role of science in technology and their opinions vary from "science and technology are the same" to "science and technology have nothing to do with each other."

Pupils do not always realize the variety of types of Technology; they mainly see Technology as "high tech" (or micro technology). People don't think of a wooden spoon or a plastic cup, examples of experience based technologies, as being Technology. Technology is presented as "high tech" in popular magazines, television programs, and so forth. Technology education has the task to make this concept of Technology broader and more varied and to differentiate between types of Technology.

De Vries (1996:5) states the following:

> *"We can only give pupils a proper understanding of the role of science in technological developments when we make them aware of the differences between different types of technology".*

2.1.5.5 A Separate Subject Technology?

It became evident that the danger of integrating Technology into science education is that it does not do justice to the real relationship between science and Technology. *"But how about the other option: making technology education a separate subject?"* (De Vries, 1996:5).

Herschbach (1995) in De Vries, (1996:5) states that this option is challenged by the question whether or not it is possible to define a body of knowledge and skills called "Technology" that may be treated as a separate subject. The answer to this question is more and more found in the design process as the heart of Technology. The academic background for the school subject Technology is far less than science education, but there is a growing discipline "design methodology" as part of the philosophy of Technology, that may serve as a resource for determining how pupils should be given a realistic image and experience of design (De Vries, 1996:5).

De Vries (1996:5) makes it clear that we should concentrate on experience-based and macro technologies in elementary and junior high school, because micro technologies are often too abstract and advanced to deal with in those classes. In senior high school the more differentiated the concept of Technology becomes. When training Technology educators, all types of technologies may be dealt with, and student educators should learn to understand the differences between them.

2.1.5.6 Conclusion

It is clear that we face the challenge to move Technology education beyond the "Technology is applied science" paradigm and it should not be assumed that science hardly plays a role in Technology. The majority of Technology educators not having a sound science background, may make this difficult to avoid. Science educators often hold the "Technology is applied science" idea. To strengthen the science-technology relationship there is a need for educational research with respect to how pupils see this relationship. The educational research basis for Technology still needs to be strengthened and extended (De Vries, 1996:7).

> *"In the building up of a sound educational research base for technology education and the translation of the outcomes to technology education and technology teacher training, there is certainly a challenge for all those who feel committed to*

technology education as a valuable contribution to the general education of all future citizens" (De Vries, 1996:7).

2.1.6 Curriculum Focus for Technology Education

2.1.6.1 Introduction

It must be understood what Technology education is supposed to achieve, as a profession, before focus of the curriculum for Technology education may be determined. Debate over the past decade has established a fairly consistent rationale for the study of Technology and the need for Technology education. Wright, Israel, & Lauda (1993) in Wicklein (1997:1) state:

"Technology is the practice used to develop, produce, and use artefacts and the impacts these practices have on humans and the natural world."

Technology education should encourage students to study the:

(a) processes used by practitioners (technologists) to develop new technology (this may include critical thinking and problem solving),

(b) areas of technology which represent the accumulated knowledge of practice (specific technological applications), and

(c) impacts of technology on society and the environment (Wright, 1992 in Wicklein, 1997:2).

With this as a starting point for the field, curriculum development can begin.

2.1.6.2 The Curriculum versus Application Gap

Wicklein (1997:2) highlighted the following important aspects:

- *"There is a serious duality between what professional educators say about curriculum in Technology education and what is done in the classroom.*
- *We say Technology education should encourage students to study the processes used by technologists to think critically and solve problems. However, at best we present rigid linear models that relegate students to prescriptive solutions as if there was only one approach to the problem.*
- *We say Technology education should encourage students to study the impacts of technology on society and the environment, yet we devote the vast majority of classroom time to specific and sometimes obscure technical skill development.*
- *The gap between what we say in curriculum designs and what we do in the classroom continues and may even be widening.*

- *The content of Technology education curricula today is more geared toward learning cognitive processes than what has existed in years past with industrial arts. However, the approach that many educators take to address this curriculum tends to concentrate on technical skill development, which differs little with the industrial arts programs of yesteryear.*
- *Keeping in mind that a large percentage of current Technology educators are "retooled" industrial arts educators, these differences in psychological types start to explain the reason for the gap in curriculum design and classroom application".*

2.1.6.3 Practice of Technology

When doing curriculum design in Technology education another critical issue is technical skill development. Current practices range from high-tech skill training to basic orientations with simple hand tools. The need to address the practice of Technology will remain as one of the constants within the curriculum, because this is one of the unique features of Technology education.

Over the years technical skills related to tool use have been an important motivator for many students and have unique and historical roots within the field of Technology education and industrial arts.

To what degree should the Technology curriculum be devoted to technical skill training? A balance of tool skills with other curriculum areas is a key to a healthy Technology curriculum (Wicklein, 1997:4).

2.1.6.4 Perspective of Technology

In a Technology curriculum there must be 'perspective'. Perspective, in this case, indicates the need to examine – not just the present and the future but also the past. Often critical for educators is the question of where to draw the line in the scope of studying the historical, present, and future issues within a given subject (Wicklein, 1997:5).

According to Postman (1992) in Wicklein (1997:5) "every teacher must be a history teacher." Without an understanding of the history of Technology we cannot completely understand humanity's confrontation with nature and learn of our limits with regard to nature. Wicklein (1997:5) asks the following questions:

> *"So where do we draw the proverbial line between past and present? Is there, in actuality, a line to be drawn? At what point do we limit our curriculum perspective of technology? Why should our technological past be compartmentalized within our curriculum? These questions lead us to an understanding that technology is relative to time and culture; we can learn important lessons from the many technological developments*

of our past. This is wonderful food for thought and makes the study of technology thoroughly enthralling to students".

2.1.6.5 Career Orientation Awareness

An essential ingredient of the Technology education curriculum is providing opportunities for students to be exposed to and learn about specific careers related to Technology. A point of concern for many Technology educators is the question about what type of technological experiences to include in the curriculum. A possible solution may be an up-to-date analysis of the critical technologies that are impacting on the national economy and to provide a strong basis for the technical and career options of the curriculum (Wicklein, 1997:6).

2.1.6.6 Conclusion

Wicklein (1997:6) states it is difficult to determine the curriculum focus for Technology education; the literature comprises a rather eclectic presentation of curriculum paths. If the profession attains the deep roots that are necessary to become a respected field of study, the obstacles preventing the creation of a strong curriculum theory for Technology Education, must be removed.

Technology education curricula have many options available for educators and students, and the potential to be strong and vital for all

schools. As Technology is a unique field of study it is imperative that the critical elements for our curriculum be understood and to implement a convergent curriculum that addresses Technology education comprehensively.

2.1.7 Critical Issues to Consider When Introducing Technology Education into the Curriculum of Young Learners

2.1.7.1 Introduction

At global level the importance of a sound technological education for learners in their teenage years of schooling becomes accepted. There is increasing interest and belief in the need to start Technology education at an earlier age, possibly as soon as children begin formal schooling or even nursery school or kindergarten. Some educators have warmly welcomed the challenge of introducing Technology education to children at an early age and they have found that it has allowed them to develop new dimensions to work already underway (Stables, 1997:1).

2.1.7.2 The Value of Including Technology in the Curriculum of Young Learners

Humans have the amazing capacity of creating in our "minds eye' new ideas and new configurations in order to make our world in the way we choose it to be. We are born with the potential to develop as technologists. It is not necessarily straightforward to create the right

conditions in which the potential can flourish. Technological capability will prosper with children who are given more support to find out how things work, to make things work, and to create and to express themselves.

The main function of formal schooling is to take control over the experiences children have and to attempt to provide some equity in opportunities. The earlier we, as educationalists, involve ourselves with Technology as an inherently important dimension of a child's curriculum, the better. Children engaged in technological activity regularly, may establish more confidence in their technological abilities. Where Technology has been introduced into the curriculum of primary schools, educators often comment that Technology activities are a valuable vehicle for all types of learning (Stables, 1997:2-3).

2.1.7.3 Critical Dimensions to Nurturing Technological Capability

The following are important aspects highlighted by Stables (1997:3) in learning situations for nurturing Technological capability:

- The Importance of a Holistic View
- Integrating Thought and Action
- The Importance of Play
- Building Positive Attitudes
- Being Aware of Value Positions
- Access for All

2.1.7.4 Appropriate Models of Teaching, Learning and Assessing

Children must develop a range of contributory skills - procedural, manipulative and communicative, in order to operate effectively. They must understand, both of how to make things work and how to meet people's needs and wants. Stables (1997:5) offers some examples to illustrate approaches drawn directly from the classroom:

- *Children as Active Learners*

  Schools must be seen as "child centred" and in which children are viewed as active learners.

- *Educational or Vocational / Instrumental Needs*

  Approaches to teaching and learning Technology in education must consider the often-conflicting claims for priority in addressing educational or vocational needs. For very young children, the focus and priority must be on their educational development.

- *Activity Driven by a Need to Know*

  The concept of teaching knowledge and skills in Technology on a need-to-know basis pays attention to the notion of readiness, but goes further to highlight the importance of teaching something new in context.

- *Problem Solving*

  Finding out by solving problems is a strategy used by very young children long before they engage in formal schooling. The solving of problems becomes a motivational hook and a sense of challenge and achievement.

- *Hands on Exploration*

  This kind of activity builds on the approach very young children adopt to find out about their world.

- *Modelling Ideas*

  Most important is that children express and develop ideas, and the ways in which they do this should be seen as a means to an end and not an end in itself.

- *The Importance of Context and the Use of Fantasy*

  Children need to develop new skills and understandings in order to realize their designs such as how to make a pointed roof, how to make a house on stilts that won't wobble, and how to make a fence that contains a hinged gate.

- *The Importance of Reflection*

  Children must be thinkers as well as doers. The teaching and learning approach needs to be structured to develop children's ability to reflect on their work.

- *Models for Monitoring and Assessing Work*

  By involving the children in the assessment process, they are empowered to take control over their own learning. Self-assessment, as well as assessment by the educator while children are working on a task , allows for "authentic assessment."

- *"Taught not Caught"*

  Educators need to structure activities and inputs for technological development in such a way, that what children learn, in terms of procedures, concepts and skills, is "taught not caught".

2.1.7.5 Addressing the Needs of the Educator

> *"Very few primary teachers have received formal training in the teaching of Technology education. Even those countries that have decided to introduce compulsory Technology education into their primary curriculum, and who have set up training programs to facilitate this, have a back log of unprepared Technology educators teaching in primary schools"* (Stables, 1997:11,12).

The key areas, suggested by Stables, to be addressed in helping educators move forward include:

- developing educators' understanding of what Technology education is;
- helping them see how the work they currently do, and the experience they already have, may be adapted to allow Technology activities to grow from the work already undertaken with the children;
- developing their confidence in their ability to build on and utilize their previous experience;
- identifying a broad but manageable range of activities for educators to start from, and providing them with personal, hands on experience with the activities before they embark on them with children;
- providing opportunities (through dialogue and printed materials) for educators to share good ideas and good practice and build a repertoire of successful activities.

2.1.7.6 Conclusion

It became evident that it is important to include Technology in the curriculum of young children because it will give them a broad based experience of Technology at a young age, which will lay the foundations of technological capability. The more young children engage in technological activity, the more their confidence in their technological abilities may be established.

Recent research has shown that England has been very concerned to develop both primary and secondary Technology education, yet less concerned to ensure that there is clear and smooth progression between the two phases. In particular, very different teaching (and hence learning) styles have developed, creating a discontinuity in the children's experience (Stables, 1997:14). It is very important to consider the developmental needs of a young child, rather than the vocational needs of the country. There must be a smooth progression between the different phases in our schools.

2.1.8 Introducing The Technology Learning Area in South African School Curriculum

2.1.8.1 Introduction

According to Reddy (1995:140) the Department of National Education states:

> *Technology's prime claim to a recognized place in the school curriculum lies in its contribution to the growth and development of individual learners. Both younger and older pupils enjoy taking part in the technological process, which makes the subject appropriate for all school phases as well for gifted and less gifted learners. Young people are entitled to a relevant education, which will empower them to a meaningful*

existence. Technology has an important and specific role to play in achieving this aim.

Technology Education as a new learning area in South Africa concerns technological knowledge and skill, as well as technological processes, and involves understanding the impact of Technology on both the individual and society. It is further on designed to promote the capability of the learner to perform effectively in the technological environment he/she lives in, and to stimulate him/her to contribute towards improvement.

This capability should be reflected in:

- The effective use of technological products and systems;
- The ability to evaluate technological products/processes from an aesthetic point of view; and
- The ability to design and build appropriate products to functional and aesthetic specifications set either by the learner or by others (HEDCOM, 1996:3,4).

2.1.8.2 Definition

Today's society is complicated and diverse. Economic and environmental factors and a wide range of attitudes and values need to be taken into account when developing technological solutions. The development of

products and systems in modern times must show sensitivity to these issues. It is in this context that Technology is defined in The Revised National Curriculum Statement Grades R-9 (Schools) (DOE, 2002:4) as:

> *The use of knowledge, skills and resources to meet people's needs and wants by developing practical solutions to problems, taking social and environmental factors into consideration.*

2.1.8.3 Purpose of Technology Learning Area

The Technology Learning Area will contribute towards learners' technological literacy by giving them opportunities to:

- develop and apply specific skills to solve technological problems;
- understand the concepts and knowledge used in Technology, and use them responsibly and purposefully; and
- appreciate the interaction between people's values and attitudes, Technology, society, and the environment.

The significance of the Technology Learning Area is directly related to the overall goal of the Revised National Curriculum Statement Grades R-9 (Schools), which is to develop citizens who can display the competencies and values encapsulated in the critical and developmental outcomes (DOE, 2002:4).

2.1.8.4 Unique Features and Scope

According to DOE (2002:5) The Technology Learning Area gives learners the opportunity to:

- learn by solving problems in creative ways;
- learn while using authentic contexts that are rooted in real situations outside the classroom;
- combine thinking and doing in a way that links abstract concepts to concrete understanding;
- carry out practical projects using a variety of technological skills - investigating, designing, making, evaluating, communicating - that suit different learning styles;
- use and engage with knowledge in a purposeful way;
- learn by dealing directly with inclusivity, human rights, social and environmental issues in their project work;
- use a variety of life skills in authentic contexts (e.g. decision making, critical and creative thinking, co-operation, needs identification); and
- create more positive attitudes, perceptions and aspirations towards technology-based careers.

2.1.8.5 Technology Learning Outcomes (Senior Phase Gr 7-9)

2.1.8.5.1 Introduction

A learning outcome is derived from the critical and developmental outcomes (See chapter 1, p 14-15). It is a description of what (knowledge, skills and values) learners should know, demonstrate and be able to do at the end of the General Education and Training band. A set of learning outcomes should ensure integration and progression in the development of concepts, skills and values through the assessment standards. Learning outcomes do not prescribe content or method (DOE, 2001:14).

In the Senior Phase, Technology will be developed as an extension to the groundwork laid previously, and in preparation for the manufacturing and engineering fields of the Further Education and Training Band. In this Phase of the General Education and Training Band, the Technology Learning Area is delivered through a separate Learning Programme.

The three Learning Outcomes in the Technology Learning Area are interrelated, and are based on the following:

- technological processes and skills;
- technological knowledge and understanding; and

- the interrelationship between technology, society and the environment.

The following, concerning Learning Outcomes, are extracts from DOE (2002:31-33):

2.1.8.5.2 Learning Outcome 1: Technological Processes and Skills

The learner will be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technologies.

This is the backbone outcome of the Technology Learning Area and should be used to structure the delivery of all the Learning Outcomes in an integrated way.

Investigating involves investigating contexts and needs, investigating or evaluating existing products in relation to key design aspects, and performing practical tests to develop understanding of particular aspects of the content areas, or determine the fitness for purpose of products. The learner should also be given the opportunity to engage with information technology (in its broadest sense) while performing these investigations.

Designing, Making and Evaluating is interrelated. The learner should be introduced to key aspects of design (design key words). As the learner progresses, she or he should be able to demonstrate increasing accuracy and skill, better organisation and safer working practices.

Communicating should also be seen as integral to the overall process. The learner should be recording and presenting progress in written and graphical forms on an ongoing basis.

2.1.8.5.3 Learning Outcome 2: Technological Knowledge and Understanding

The learner will be able to understand and apply relevant technological knowledge ethically and responsibly.

There are three core content areas in this Learning Outcome:

- Structures: including frame, shell and solid structures;
- Processing: including natural and synthetic materials or plant, animal, mineral and recyclable materials; and
- Systems and Control: including mechanical, electrical/electronic and hydraulic/pneumatic systems.

In ***Structures***, the learner should be exploring more complex person-made structures. The learner should be able to demonstrate awareness

of ways of strengthening and stabilising structures under various loading conditions.

Processing is seen as using chemical or physical methods to change or improve the properties of particular materials. The learner should investigate different processing techniques to produce products or materials that require specific properties (e.g. thermal insulation, water resistance, fire resistance).

Systems and Control involves mechanical advantage and change in the direction of movement. These mechanical systems could include cams, pistons, pulleys, pivot and slider, eccentric wheels, cranks, levers, linked levers, and so on. The learner should also explore electrical systems with more than one output in series and parallel. By practical experimentation, the learner should develop understanding of the operational difference of the outputs when connected differently.

2.1.8.5.4 Learning Outcome 3: Technology, Society and the Environment

The learner will be able to demonstrate an understanding of the interrelationships between science, technology, society and the environment.

The achievement of this Learning Outcome will ensure that learners are aware of:

- *indigenous technology and culture:* changes in technology over time,
- indigenous solutions to problems, cultural influences;
- *impacts of technology:* how technology has benefited or been detrimental to society and the environment; and
- *biases created by technology:* the influences of technology on values,
- attitudes and behaviours (gender, race, ethics, religion and culture).

There is a need for learners to understand the interconnection between Technology, society and the environment. The learner should be using factual evidence to express informed decisions, and make value judgements to minimise negative effects.

2.1.8.6 Assessment Standards

Assessment standards describe the level at which learners should demonstrate their achievement of the learning outcome(s) and the ways (depth and breadth) of demonstrating their achievement. They are grade specific and show how conceptual progression will occur in a Learning Area. They embody the knowledge, skills and values required to achieve learning outcomes. They do not prescribe method.

(DOE, 2001:14).

2.1.8.7 The Difference Between an Assessment Standard and a Learning Outcome

The learning outcomes describe what learners should know and be able to do. Assessment standards describe the minimum level, depth and breadth of what is to be learnt. In practical terms this means that learning outcomes can and will, in most cases, remain the same from grade to grade while assessment standards change from grade to grade. The assessment standards also contribute towards the qualification. In the case of the General Education and Training band, this means the General Education and Training Certificate. Learning support materials and educator development programmes will play an important role in interpreting and giving expression to the learning outcomes and assessment standards (DOE, 2001:14).

2.1.8.8 Learner Assessment

The assessment framework of the Revised National Curriculum Statement for Grades R-9 (Schools) is based on the principles of outcomes-based education. To assist in the process of learner assessment, this Revised National Curriculum Statement (DOE, 2002:53):

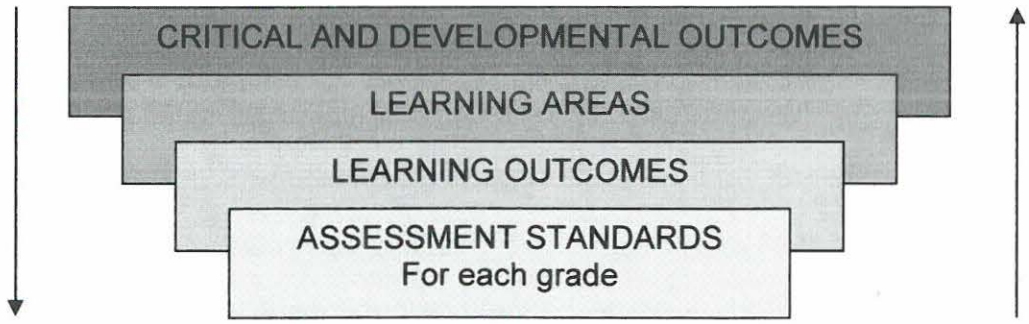
- outlines the Learning Outcomes and their associated Assessment Standards in each Learning Area and for each grade in the General Education and Training (Grades R-9) band;

- contextualises the Critical and Developmental Outcomes within the Learning Outcomes and Assessment Standards; and

- places Assessment Standards at the heart of the assessment process in every grade. Assessment Standards describe the level at which learners should demonstrate their achievement of the Learning Outcome(s) and the ways (depth and breadth) of demonstrating their achievement.

The following diagram illustrates the interaction between the design elements of this Revised National Curriculum Statement:

Figure 2.1



(DOE, 2002:53)

2.1.8.9 General Assessment Principles used in Outcomes-Based Education

2.1.8.9.1 Introduction

Is assessment an important part of an outcomes-based education approach? Or is the rumour that educators should abandon testing and examination in order to be good OBE educators, true?

Both these statements are partly true. Assessment is a vital part of OBE, but the nature of assessment practices must change too. In particular:

- Educators must reduce their reliance on written test and exam papers.
- Educators must increase their range of assessment styles.
- These styles must be appropriate to the outcomes educators are assessing.
- Assessment should be continuous and integrated into teaching.

(DOE, OBE 2, 1998:6)

2.1.8.9.2 Definition

Assessment is a continuous, planned process about the performance of learners measured against the Assessment Standards of the Learning Outcomes. It requires clearly defined criteria and a variety of appropriate

strategies to enable educators to give constructive feedback to learners and to report to parents, and other interested people (DOE, 2002:54)

2.1.8.9.3 Key elements in assessment

Assessment can be destructive and constructive. The Department of Education (OBE 2, 1998:9-10) gives the following examples:

Destructive assessment that de-motivates learners:

- The sarcasm and humiliation that educators throw at learners. This is often done in assessments (either through comments on scripts or verbal comments in classrooms).
- The lack of guidance in assessment comments given by educators.
- The ranking of their marks classifies the majority of learners as 'average' or 'weak'. Generally classes don't have high numbers or 'excellent' performers.

Constructive assessment that motivates learners:

- Give positive feedback and constructive advice on scripts
- Encourage and support learners verbally
- Teach learners how to improve their self-assessment skills.

A good rule for feed back, whether written or spoken, is to find something to praise, and to point out at least one area where more work is needed.

Assessment is essential to outcomes-based education because it must be possible to assess when a learner has achieved what is required in each grade. To help learners to reach their full potential, assessment should be:

- transparent and clearly focused;
- integrated with teaching and learning;
- based on predetermined criteria or standards;
- varied in terms of methods and contexts; and
- valid, reliable, fair, learner-paced, and flexible enough to allow for expanded opportunities (DOE, 2002:54).

2.1.8.9.4 Different kinds of assessment and their purpose

Baseline assessment of prior learning

Baseline assessment usually takes place at the beginning of a grade or phase to establish what learners already know. It assists educators to plan learning programmes and learning activities.

Diagnostic assessment

Diagnostic assessment is used to find out about the nature and cause of barriers to learning experienced by specific learners. It is followed by guidance, appropriate support and intervention strategies.

Formative assessment

Formative assessment monitors and supports the process of learning and teaching, and is used to inform learners and educators about learners' progress so as to improve learning. Constructive feedback is given to enable learners to grow.

Summative assessment

Summative assessment gives an overall picture of learners' progress at a given time, for example, at the end of a term or year, or on transfer to another school.

Systemic assessment

Systemic assessment is a way of monitoring the performance of the education system. One component of this is the assessment of learner performance in relation to national indicators. Systemic assessment is conducted at the end of each phase of the General Education and Training band (DOE, 2002:54-55).

2.1.8.10 Continuous Assessment

Assessment is a way of finding out what a person knows, understands and thinks, and what he or she can do. Continuous assessment is simply a matter of being constantly aware of how learners are developing, and keeping a record of this development. All assessment, even examinations, should be designed to form a part of active learning, and not be treated as a separate activity (DOE, OBE 2, 1998:12).

Continuous assessment is the chief method by which assessment takes place in the Revised National Curriculum Statement. It covers all the outcomes-based education assessment principles and ensures that assessment:

- *takes place over a period of time and is ongoing:* Learning is assessed regularly and the records of learners' progress are updated throughout the year.
- *supports the growth and development of learners:* Learners become active participants in learning and assessment, understand the criteria that are used for assessment activities, are involved in self-evaluation, set individual targets for themselves, reflect on their learning, and thereby experience raised self-esteem.
- *provides feedback from learning and teaching:* Feedback is a crucial element in formative assessment. Methods of feedback include appropriate questioning, focusing the educator's oral and written

comments on what was intended to be achieved by an assessment activity, and encouragement to a learner.

- *allows for integrated assessment:* This may include assessing a number of related Learning Outcomes within a single activity, and combining a number of different assessment methods. Competence in particular Learning Outcomes may be demonstrated in many different ways, and thus a variety of assessment methods and opportunities must be provided through which learners can demonstrate their ability.
- uses strategies that cater for a variety of learner needs (language, physical, psychological, emotional and cultural): Continuous assessment allows educators to be sensitive to learners with special education needs and to overcome barriers to learning through flexible approaches.
- *allows for summative assessment:* The accumulation of the results of continuous assessment activities provides an overall picture of a learner's progress at a given time. Summative assessment needs to be planned carefully from the beginning of the year, to include a variety of assessment strategies – for example, exercises, tasks, projects, school and class tests - which will provide learners with a range of opportunities to show what they have learned.

(DOE, 2002:55).

2.1.8.10.1 Assessment Strategies

The choice of what assessment strategy to use is a subjective one, unique to each educator, grade and school, and dependent on the educator's professional judgement. The methods chosen for assessment activities must be appropriate to the Assessment Standards to be assessed, and the purpose of the assessment must be clearly understood by all the learners and educators involved. Competence may be demonstrated in a number of ways (DOE, 2002:56).

Thus a variety of methods is needed to give learners an opportunity to demonstrate their abilities more fully. The following are examples:

- Methods

  Portfolios (individual work files), practical work, written tests, art work, presentations, oral work, music, drama.

- Techniques

  Observation, interviews, self-assessment, tests, oral questioning.

- Tools

  Assignments, project, worksheets, journals, observation sheets. (DOE, 2001:91)

2.1.8.10.2 The Common Assessment Task

Common Tasks for Assessment may be set at national, provincial, district or cluster level, are conducted at school level, and are moderated externally. The purpose of Common Tasks for Assessment is to:

- ensure consistency in educator judgments;
- promote common standard setting;
- strengthen the capacity for school-based continuous assessment;
- increase the accuracy of the assessment process and tools;
- ensure that the school-based assessment tasks properly assess competencies and achievements; and
- ensure expanded opportunities for learners.
- (DOE, 2002:55).

2.1.8.11 Conclusion

Each Learning Area Statement includes a detailed section on assessment. Within an outcomes-based framework the most suitable assessment methods that accommodate divergent contextual factors are used. Assessment should provide indications of learner achievement in the most effective and efficient manner, and ensure that learners integrate and apply knowledge and skills. All assessment comments must include suggestions on what learners should do in order to improve their performances.

Assessment should also help students to make judgments about their own performance, set goals for progress and provoke further learning. Learners must be helped to build a picture of their own learning development. This involves developing the skills of self-assessment and peer assessment.

Good educators will work down from Critical Outcomes to Specific Learning Outcomes to Assessment Criteria to Performance Indicators in their planning. But then they will check back, from Performance Indicators to an integrated Critical Outcome (DOE, OBE 2, 1998:25).

2.2 CONCLUSION

In the previous pre-democratic school system the subject Technology Education did not exist. There was no "general technical subject" that prepared learners for more specialized subjects.

At the start of the democratic era the South African education system was also democratized and reconstructed in order to bring it into accordance with the needs and aspirations of all citizens. This was the first time that Technology as learning area was introduced in the school curriculum in South Africa.

Technology Education has passed through many phases, from manual training through manual arts, through industrial arts to contemporary

programs in industry and Technology. Since the 1900's this field was an important part of general education in Western civilization. Technology is a unique field of study and its curricula have many options available for educators and students, and the potential to be strong and vital for all schools.

It became clear that it is important to include Technology in the curriculum of young children because it will give them a broad based experience of Technology at a young age, which will lay the foundations of technological capability. We also face the challenge to move Technology Education beyond the "Technology is applied science" paradigm. Science educators often hold this idea.

To see the implications of Technology Education in the RSA in perspective it is important to look at the stance of Technology Education in some countries. In the next section an international perspective on Technology Education is presented.

2.3 AN INTERNATIONAL PERSPECTIVE ON TECHNOLOGY EDUCATION

2.3.1 INTRODUCTION

Over the past 15 years Technology Education has experienced a dramatic evolution within educational circles that in many cases bordered on revolution.

John Williams et al (1996:266) mention that most countries do not state a single rationale for Technology Education, nor do they have one organizational approach. Each country builds on its history of technical education and develops an approach to suit the perceived needs of society and the individual. It seems that Technology Education is more dynamic than its technical predecessors, and that current Technology is more dynamic than in the past. Thus changes in what is considered appropriate content and best practice in Technology Education could also be expected to change rapidly.

Although Technology Education was introduced in developed countries a long time ago, it was not without mistakes. South Africa cannot afford to repeat these mistakes and it is vital that lessons are learnt from them in order to avoid the same pitfalls. To save a substantial amount of time, energy and resources, South Africa should not try to re-invent the wheel (Potgieter, 1994:22).

Dr. Paul Black (1998:1), Emeritus Professor in the School of Education at King's College in London, United Kingdom, stated the influence and problems as follows:

> *"Technology is a peculiar subject in that its status and its nature have been subject to radical changes in recent years. The subject is seen to serve several aims, which are given different relative priorities in different countries, and there are*

many traditions that are associated with competing pressures in the re-definitions of the subject. These changes and varieties are further complicated by the different curriculum models within which a reformed subject is meant to fit and play a specific role. It is suggested that the tensions between instrumentalist and humanist models for the subject may be dissolving, but that there are deeper problems about the nature of the learning involved in the fields of practical application. However, the most intractable problem is to implement very new pedagogy when the teaching force may be ill-prepared and where the classroom experience needed to temper and transform novel plans is lacking."

The following section deals briefly with the Technology Education in a number of countries. The Technology Education curricula of four different countries were studied: The United States, England, Australia, and Botswana. The rationale for choosing these four countries was that their technology education programs have developed rapidly over the past ten years and profound research, experimental programs, and the development of learning materials have been undertaken, especially in Australia, England, and the United States. The aim was not to conduct a comparative study of the curricula of other countries. Rather, it was to synthesize theory and practice. Different countries use different terms to describe Technology Education, such as Technics, Design and

Technology, Technology Education, and Technological Education. In this study these titles are considered to be synonymous.

The following aspects as part of this research will be handled:

- History
- Curriculum
- Current status

The following sources were used for curriculum information in this study:

- **United States:** Technology for all Americans: A rationale and structure for the study of technology (ITEA, 1996).
- **United States:** Standards for technological literacy: Content for the study of technology (ITEA, 2000).
- **England:** Design and Technology in the National Curriculum 2000 (QCA, 2000).
- **Australia:** A statement on technology for Australian schools, A joint project of the States, Territories and the Commonwealth of Australia (AEC, 1994).
- **Botswana:** Botswana Ministry Of Education (BMOE, 1995) Curriculum Blueprint: Ten Year Basic Education Programme.

Botswana Ministry Of Education (BMOE, 1998) Curriculum Blueprint: Senior Secondary School Programme.

Botswana Ministry Of Education (BMOE, 1994) Botswana General Certificate Of Secondary Education: Teaching Syllabus - Design And Technology.

2.3.2 UNITED STATES OF AMERICA

The educational system in the USA is decentralised with each state responsible for its own education, though federal government provides some general control through funding guidelines (Williams, 1996:269).

2.3.2.1 History

De Miranda and Folkestad (UNESCO, 1999:1) state that from a historical perspective it is generally agreed upon that a majority of today's educators and leaders in Technology Education were educated and trained in programs that emphasized Industrial Arts, Vocational Education, Industrial Technology, or Trade and Industrial Education. Evidence exists that a substantial number of publications and manuscripts had written about the historical evolution of Technology Education from the early days of manual training through Industrial Arts education.

The educational program now known as T*echnology Education* in the US had generally been referred to as *industrial arts* from the depression era until the mid-1980s. In recent years the efforts of professional, national

and leadership organizations like International Technology Education Association, Technical Foundation of America, National Association of Industrial Technology, American Vocational Association, National Science Foundation, and the National Aeronautic and Space Administration have been focused on developing a unified position for Technology Education.

2.3.2.2 Curriculum

The principal rationale for Technology Education in the United States is that every citizen should be technologically literate and thereby be able to use, manage, and understand technology. Technology is defined as human innovation in action (ITEA, 2000). The framework for technology education is based on the universals of technology.

Technology Education has the following goals in the USA:

- technology should be integrated as one of the core subjects from kindergarten to junior and senior high schools, and even beyond

- technology education can be integrated with other school subjects, especially with science and mathematics

- technology should be compulsory at every study level, for girls as well as boys

- local conditions, aspirations of individuals, career goals, and abilities should influence the development of the curriculum for technological literacy

- the ultimate goal is to realize technological literacy for all

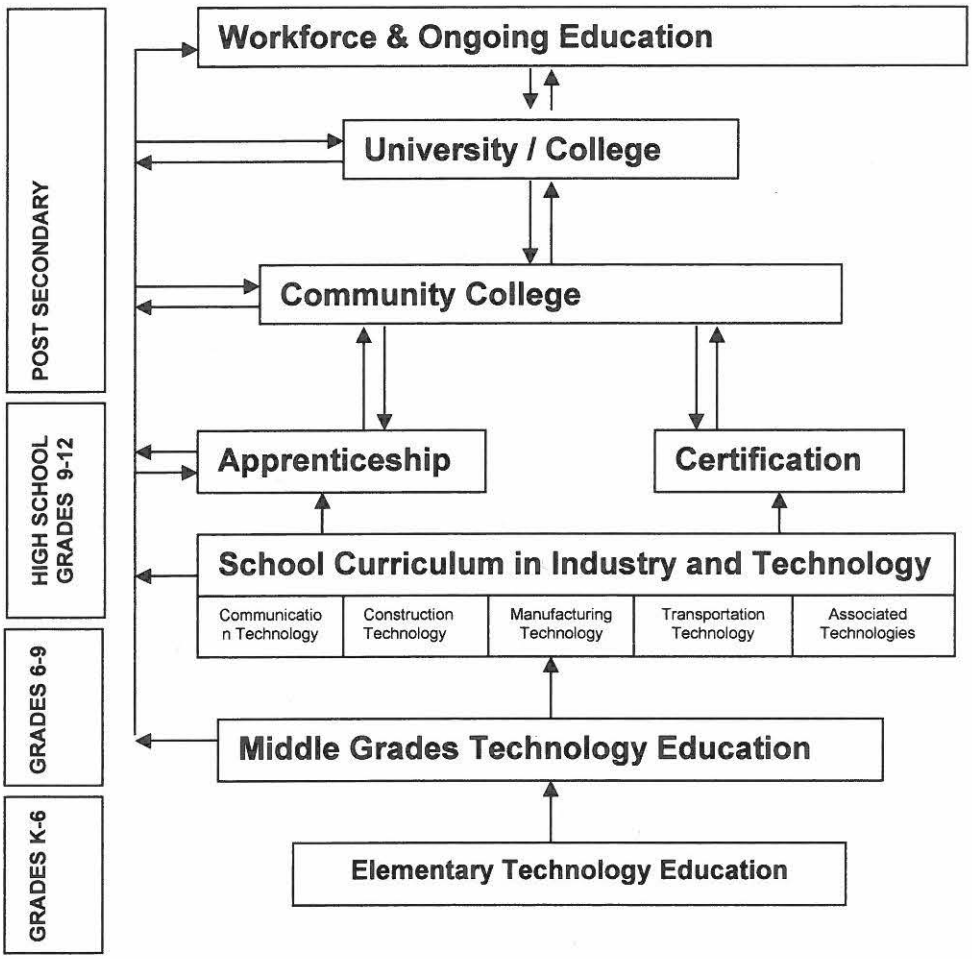
The Standards for Technological Literacy underwent an extensive review and consensus-building process that extended over a lengthy period of time. The National Academy of Engineers and the National Research Council, very influential and important organizations, were closely involved in the development of the Standards (Rasinen, 2003:9,10)

2.3.2.3 Current status of Technology Education in the USA

The United States uses national standards for various core subjects. The most recent subject for which standards were developed is Technology Education. They were approved at the beginning of the year 2000. The Technology for All Americans Project has been engaged for the past several years in research and development for technology education. In 1996, an initial statement and policy document called Technology for All Americans: A Rationale and Structure for the Study of Technology was published. This publication provided the basis for technology education in the United States and became the philosophical foundation for the Standards for Technological Literacy: Content for the Study of Technology (ITEA, 2000).

Figure 2.2 below gives a General Organization of Technology Education in the United States:

Figure 2.2



(De Miranda, UNESCO, 1999:6)

2.3.2.4 Conclusion

A policy document called Technology for All Americans: A Rationale and Structure for the Study of Technology, was published in 1996. The United States of America accentuates Technology Education in the curriculum of

pre-college programs. Many states are working to move the study of Technology forward into the mainstream in order to afford all learners the opportunity to experience Technology Education. All states try to make all learners technologically literate by means of Technology Education as a means for preparing their youth as future citizens who live in a technological world, who will also be producers and consumers of the new technologies of the future (The Technology Teacher, 2001:6).

Similar to the United States, South Africa also published a policy document for Technology Education as part of General Education and Training under the National Education Policy Act of 1996 (NDE, 1996).
All learners must become technologically literate by means of Technology Education in South Africa who will also be producers and consumers of the new technologies of the future.

2.3.3 ENGLAND

2.3.3.1 History

For the past 25 years there was a developing Technology curriculum in England and Wales with a variety of forms for the subject (e.g., Craft Design and Technology, or Control Technology), moving away from long-established work on making set-piece artefacts to develop skills in fashioning wood and metal. A new unified subject was created for all

pupils who are 5 to 16 years of age in 1990 under the new national curriculum (Black in JTS, 1998:5)

Former educators of craft, design, and technology and of home economics (dealing with wood and textiles) and educators of business studies and of art and design had to come together to implement a new subject. Much criticism came from particularly professional engineers, who feared that the broad range and the early emphases on social needs and on discussing the nature of Technology would weaken the teaching of skills of design and construction.

The Technology Curriculum was implemented for the first time in 1990 and went through a difficult few years experiencing a lot of criticism and implementation problems (Williams et al, 1996:277). The curriculum was revised by the Department of Education in 1995, and was narrower in scope, with a clear emphasis on designing and making and with the comprehensive statement of aims in relation to technology and society all removed (Black in JTS, 1998:5 and Williams et al, 1996:277).

2.3.3.2 Curriculum

The National Curriculum has evolved over time and is a mandatory program for all state primary and secondary schools. It includes Technology as a foundation (core) subject "which requires pupils to apply knowledge to solve practical problems" (National Curriculum Council,

1990). Technology is divided into two components: Design and Technology capability and Information Technology capability. (Wright, 1993:2).

According to Rasinen (2003:5) the overall rationale for Design and Technology education is the need to prepare pupils to participate in tomorrow's rapidly changing technologies. Through Technology Education they learn to think and intervene creatively to improve the quality of life. They become autonomous and creative problem solvers, as individuals and as members of a team. Through needs, desires, and opportunities they develop a range of ideas in order to design and make products and systems. They combine practical skills, aesthetics, social and environmental issues, and reflect on and evaluate present and past design and technology, its uses and effects. Through Design and Technology learners become innovators and discriminating and informed users of products. Specifically, pupils should be taught to:

- develop, plan, and communicate ideas
- work with tools, equipment, materials, and components
- evaluate processes and products
- know and understand materials and components

The National Curriculum for Design and Technology in England consists of four key stages with nine attainment targets (The National Curriculum online). The specific objectives become more demanding with each

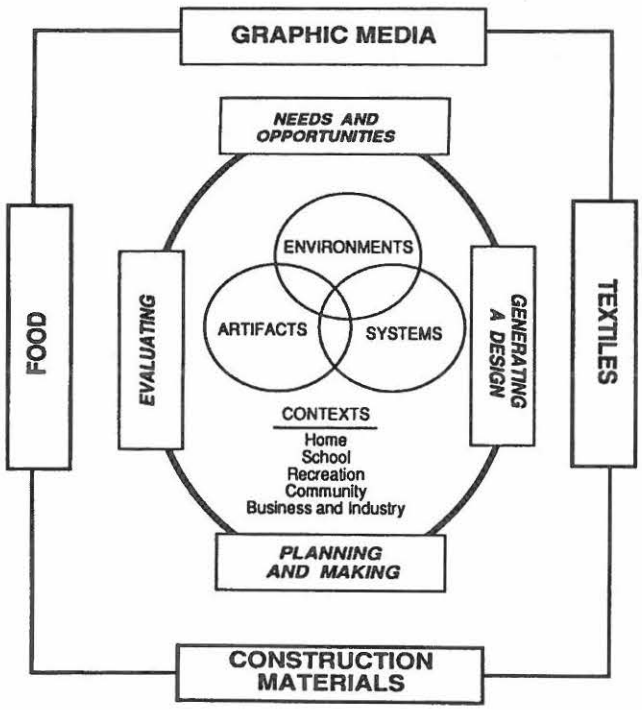
higher Key Stage. At Key Stage Four one more objective is added: to know and understand systems and control.

Technology Education has the following goals in England:

- Technology is one of the core subjects in the schools and is to be studied by both girls and boys.
- A national examination is required, resulting in a General Certificate of Education upon completion of compulsory education.
- Technology education is to be integrated where convenient, for instance with the arts, mathematics, and science (Rasinen, 2003:5).

Figure 2.3 shows the National Curriculum Model for Design and Technology:

Figure 2.3



Design And Technology Design Cycle (Wright, 1993:3)

2.3.3.3 Current status of Technology Education in England

The National Curriculum in England was revised in 2000 and did gradually become statutory over a three-year period.

Compulsory schooling was divided into four Key Stages:

- Key Stage One (grades 1-2, ages 5-7)
- Key Stage Two (grades 3-6, ages 8-11) concentrate on English, mathematics, science, design and technology, information and communication technology (ICT), history, geography, art and design, music, and physical education.
- Key Stage Three (grades7-9, ages 11-14)
- and Key Stage Four (grades 10-11, ages 14-16), citizenship and modern languages are added, with one language required (QCA, 2000).

Wright (1993:4) says that the exposure students have to Technology varies among schools. Secondary students have Technology for two to three periods per week. Students are given a design challenge and are encouraged to seek appropriate information as they address the problems they encounter in developing their solutions.

It is expected of the students to document their work as they move through the four areas of needs and opportunities, generating a design,

planning and making, and evaluating. Most of the laboratory work is completed with simple hand tools and very limited machine use. Most class activities seem to be restricted to using paper, plywood, and hardboard because of the limited emphasis on producing devices, and very small supply budgets.

2.3.3.4 Conclusion

Technology Education in England developed over a long period of time. In 1990 it was established and implemented under the new curriculum. It went through a difficult few years and experienced a lot of criticism and implementation problems (See 2.3.3.1).

There are four key stages and nine attainment levels in Technology Education in England that become hierarchically more difficult. Very specific information on the quality of pupils' performance is included. The specifications for the ninth level are very rigorous (Rasinen, 2003:5).

In South Africa, similar to England, together with a new curriculum Technology was also included as a foundation (core) subject which requires pupils to apply knowledge to solve practical problems. Technology Education in England went through difficult years and experienced a lot of criticism and implementation problems.

In this study the researcher investigated the implementation of Technology Education in schools in the Free State Province (Urban Areas) where also criticism and implementation problems were experienced. Technology Education needs to prepare pupils to participate in tomorrow's rapidly changing technologies.

2.3.4 AUSTRALIA

Australia's six states and two territories are educationally independent and therefore have quite different educational systems, though the basic structure is six or seven years of primary and five or six years of secondary schooling. Within this diversity there are a number of common trends in Technology Education.

2.3.4.1 History

Technology education as a learning area in Australian schools is relatively new. In 1987, The Australian Educational Council (AEC) began with a series of initiatives, and the states co-operated in the development of a statement for Technology Education. This project was completed in 1994. The statement provides a framework for curriculum development (Williams et al, 1996:283, 284). Williams and Kierl (2001:153) state the following:

"For the first time, Technology Education has received national research attention in Australia. An investigation of the teaching and learning of technology in Australian primary and secondary schools has recently been completed. A national task force conducted the research, guided by a steering committee and responded to by a group of critical friends. A range of both qualitative and quantitative methodologies were utilised in reporting on these deliverables, including surveys, interviews, document analysis, focus groups and data analysis".

Technology as a learning area had profound implications. Prior to the 1990's Technology was addressed in a very limited way in the school curricula. Technology was referred to in elective or optional syllabuses. In 1990 the K-12 (kindergarten to Year 12) Technology Curriculum Map (AEC) revealed a shift in emphasis in many schools toward gender equality, flexible outcomes and a variety of teaching and assessment strategies. The 1994 documents extended this trend (Williams & Kierl, 2001:154).

Technology Education has developed, at the secondary school level, out of vocational studies such as home economics, industrial arts, agriculture and business education as well as other technical studies such as computing, information technology, media and control technology.

2.3.4.2 Curriculum

Rasinen (2003:3,4) gives the following explanation of the Technology Education curriculum of Australia. Technology is one of eight broad areas of study:

- the arts
- English
- health and physical education
- languages other than English
- mathematics
- science
- society and environment
- technology

Technology Education is divided into four content areas, called strands:

- designing, making, and appraising;(process strand)
- information;
- materials;
- systems.

The strands are interrelated and are the basis for curriculum monitoring, revision, and reform. The curriculum is based upon the rationale that

people face technology everyday and therefore they must learn about it (AEC, 1999:3).

The following learning area statement is from the Technology and Enterprise Curriculum Statement of Western Australia:

> *"In the Technology and Enterprise learning area, students apply knowledge, skills, experience and resources to the development of technological solutions that are designed to meet the changing needs of individuals, societies and environments. Students become innovative, adaptable and reflective as they select and use appropriate materials, information, systems and processes to create solutions that consider the short- and long-term impact on societies and environments".*

The Australian Education Council (AEC, 1999:2) set the overall goal for Technology Education to respond to the current and emerging economic and social needs of the nation, and to provide those skills which will allow students maximum flexibility and adaptability in their future employment and other aspects of life.

This includes the development in the student of:

- Skills of analyzing and problem solving
- Skills of information-processing and computing

- An understanding of the role of science and technology in society, together with development of scientific and technological skills
- An understanding of and concern for a balanced development of the global environment
- A capacity to exercise judgment in matters of morality, ethics, and social justice

2.3.4.3 Current status of Technology Education in Australia

The theory and practice of Technology are integrated and study is to be interdisciplinary. Further on Technology involves the development and application of ideas and principles from other areas of learning such as the applied sciences, engineering, and business and commerce.

Both girls and boys study technology during the compulsory years of schooling (years 1-10). Secondary school programs are more specialized, often leading to discrete programs as students progress toward year twelve. In upper secondary years, many Technology programs focus on further education and life and work outside school. In the secondary school, Technology Education includes a number of different areas of study.

- agriculture
- computing/information technology
- home economics

- media
- industrial arts, manual arts, design and technology (Rasinen, 2003:3,4).

2.3.4.4 Conclusion

The development of a statement for Technology Education was completed in 1994. Technology Education in Australia is one of eight broad areas of study and is divided into four content areas, called strands.

Technology programs in primary schools give learners a broad foundation for further learning. They are taught by classroom educators, sometimes in association with specialists or resource people, with varying allocations of time to allow different activities (Rasinen, 2003:4).

In Australia prior to the 1990's, Technology was addressed in a very limited way in the school curricula and was referred to in elective or optional syllabuses. This differs a lot from the South African curriculum where it is a compulsory learning are in the GET phase.

At the secondary school level in Australia and South Africa, Technology Education developed out of vocational studies such as home economics, industrial arts, agriculture and business education as well as other

technical studies such as computing, information technology, media and control technology.

2.3.5 BOTSWANA

2.3.5.1 History

Education in Botswana has been traditionally highly academic, catering only for the academically inclined. Since independence in 1966 the Botswana government has given education the highest priority. Pre-vocational education at secondary level has experienced an expansion and a shift from traditional craft subjects, namely woodwork and technical drawing, to Design and Technology (Williams et al, 1996:280).

Molwane (1993:1) mentions the following in his article on developing Technology Education in Botswana:

> *"Botswana's leadership has identified Technical and Vocational Education and Design and Technology as strategic components of the nation's development".*

Technical studies were offered in 1987 in the junior secondary school, and in 1988 Craft Design and Technology was introduced as largely a content-based subject. Botswana based its Design and Technology on the British system, and placed it in an appropriate local context (Williams

et al, 1996:280). In 1990 the subject was piloted in five senior secondary schools (out of 23) and in 16 Community Junior Secondary Schools (out of 140 at the time). Since then it gradually replaced traditional craft subjects at both levels (Ndaba, 1994:110).

Two major developments were taking place in Botswana. Firstly, the rapid expansion of secondary education, particularly at junior secondary level and secondly, because of the mineral gains, the economy was thriving and therefore transforming from a predominantly agrarian to an industrially based one. There was a need for technological 'know how', and reforming technical education was one way of achieving the desired effect. This was why Design and Technology was adopted (Ndaba, 1994:110).

The introduction of Design and Technology had many problems. One of the biggest problems was the shortage of Design and Technology trained educators. It is complicated by the fact that trained Design and Technology educators are very scarce in Southern African countries. These countries do not offer Design and Technology in their curricula. South Africa has only just begun with the subject. As a result expatriates are recruited and then given in-service training in Design and Technology at the expense of the Botswana government (Ndaba, 1994:111).

In Botswana two institutions have been providing pre-service educator training for local educators. Molepolole College of Education (MCE) runs

a three year diploma course in Design and Technology for Community Junior Secondary School (CJSS) educators. Botswana Polytechnic runs a five year B.Ed programme for senior secondary educators. Since inception in 1985, Molepolole College of Education (MCE) has been producing an average of 25 educators each year (Ndaba, 1994:111). The University of Botswana is also offering Technology programmes at their east campus in the Department of Technology and Educational Studies (Botswana University, Website).

2.3.5.2 Curriculum

The Design and Technology Curriculum in Botswana is designed to meet the requirements of the Revised National Policy on Education (Government Paper No 1 of 1994) (BMOE, 1994). Design and Technology has been declared a core curriculum subject, with effect from January 1996 (Government Paper No 2:1994). This will further remove it from the category of optional subjects, which it shares with Home Economics, Art and Religious Education (Ndaba, 1994:110).

Design and Technology was introduced to encourage students to think of design as a logical process in which a number of different steps may be identified. Four major skills were identified:

- Enquiry and exploratory skills
- Communication and manipulative skills

- Evaluative skills
- Discriminatory skills

Design and Technology is a compulsory subject in lower secondary schools. The general goals are mainly vocational in context of discussion about technological literacy and problem solving for all (Williams et al, 1996:280). The focus at this level will be more towards the development of the pre-requisite skills for the junior secondary curriculum. At senior secondary schools Design and Technology is an optional subject in the group of creative, technical and vocational subjects (BMOE, 1998:19).

The aims of the senior secondary Design and Technology Programme according to the Syllabus (BMOE, 1994:ii) are as follows:

- a range of knowledge and skills applicable to further training, higher education and/or employment
- an understanding of concepts and principles of systems including mechanical, electrical and electronic
- understand the properties of a variety of materials in order to apply processes appropriate to their manipulation and transformation
- understand the origins of technology and its impact on our lives and how it has influenced today's world
- technological literacy by applying various communication skills and information systems
- effectively manage available resources

- entrepreneurial skills that are relevant to the world of marketing and production
- demonstrate dexterity, critical thinking, ingenuity, initiative, resourcefulness and discrimination as learners purposefully design and make useful products for their communities
- adapt different technologies to suit local context
- capabilities for safe manipulation of materials, tools and equipment
- sound fabricational skills to work with a variety of materials, tools and equipment
- positive values and attitudes of social responsibility and co-operation
- understand and apply the basic principles of problem-solving processes
- responsible for own development.

2.3.5.3 Current status of Technology Education in Botswana

The Senior Secondary Programme builds on the Ten Year Basic Education programme and seeks to provide quality learning experiences. It aims to prepare the learners for the world of work, further education and lifelong learning. The Senior Design & Technology Programme is designed to build on knowledge and skills acquired in the Junior Secondary education in order to prepare young male and female Batswana for the demands of the technological world of the 21st century. It will therefore equip them with a variety of knowledge, skills and

attitudes that not only prepare them for further training and employment but for life in general (BMOE, 1994:1).

Figure 2.4 below reflects the subject groupings at senior secondary level.

CORE GROUP	OPTIONAL GROUPS			
	HUMANITIES AND SOCIAL SCIENCES	**SCIENCES**	**CREATIVE, TECHNICAL AND VOCATIONAL**	**ENRICHMENT**
English	History	Single Science	*Design and Technology* Agriculture	Third Language
Setswana	Geography	Double Science	Art Food and Nutrition	Physical Education
Mathematics	Social Studies	Chemistry	Computer Studies Fashion and Fabrics	Music
	Development Studies	Physics	Business Studies Home Management	Religious Education
	Literature in English	Biology		Moral Education
		Human and Social Biology (private candidates)		

NOTE: Subgroup **ENRICHMENT** to cover general skills development courses, small entry subjects and non examinable subjects (BMOE, 1995:11).

2.3.5.4 Conclusion

The introduction of Design and Technology in 1990 had many problems, of which one of the biggest was the shortage of Design and Technology trained educators. The subject was piloted in five senior secondary schools.

It was further complicated by the fact that trained Design and Technology educators were very scarce in Southern African countries. South Africa only piloted Technology Education in the year 2000.

Like in Botswana the introduction of Technology Education in South Africa had many problems (See chapter 4, section 4.5 question 14). There is also a shortage of trained Technology educators in South Africa because it is a relatively new learning area that was only implemented in 2001.

2.3.6 CHAPTER CONCLUSION

Only when developed countries are competitive in the international arena, and are developed, can they aspire to become winning nations.

At this stage South Africa will have more success if it looks towards other developing nations, which are transforming or have transformed themselves into developed nations. By following the examples of these

countries, and by adapting their technologies and methodologies to suit local needs, will South Africa be better positioned to achieve similar success.

In the Chapters that follow the researcher investigated the implementation of Technology Education in the South African context and specifically in schools in the Free State Province urban areas.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

In chapter two a literature review and international perspective on Technology education was done. From the literature study we saw that Technology is a well-established subject in different countries in the world.

South Africa has had no formal subject known as Technology in its schools until the introduction of Curriculum 2005 and Outcome-based Education (OBE). Educators at schools were caught unprepared, as they had to teach a subject that most were not conversant with.

It was the aim of the researcher to investigate due implications of the introduction of Technology as a subject in schools and what the attitudes of educators are towards Technology as a subject, and OBE in general.

Chapter three concentrated on an empirical investigation regarding Technology education in secondary schools in the Free State province (Urban areas) in South Africa. Questionnaires were issued to educators, principals/deputy principals and heads of departments of Technology education at schools. Interviews were also held with educators and deputy principals at some schools.

This chapter further outlined the structure of the questionnaires and interviews and data process. The results of the questionnaires and interviews were discussed in chapter four.

3.2 RESEARCH METHODOLOGY IMPLEMENTED IN THIS STUDY

3.2.1 RESEARCH PROCESS AND APPROACH

From a methodological point of view, qualitative research is a loosely defined collection of approaches to inquiry, all of which rely on verbal, visual, tactile, auditory, olfactory and gustatory data. These data are preserved in descriptive narratives like field notes, recordings from audio and videotapes, other written records and pictures or films. The qualitative research paradigm is largely an investigative process, and a qualitative strategy intends to understand a particular social situation, event, role group or interaction (Cresswell, 1994:61).

The approach followed in this study was mainly qualitative and a non-experimental research was conducted. The following research instruments were utilised to collect data: a literature study, questionnaires and individual interviews.

This study necessitated the obtaining of information from persons who were directly involved with the implementation and teaching of Technology. Through questioning and interviewing these people, a

picture of their subjective ideas on how they understand and experience the subject, could be formed.

The population of this study was determined by means of cluster sampling. Secondary schools in the Free State Province situated in the Bloemfontein, Welkom and Kroonstad area were selected. Thirty-five secondary schools were listed in the different districts.

In the school districts with multiple secondary schools, each with a number of Technology educators, were listed and sequentially numbered. A simple random sampling technique was applied to the representative "clusters" to select the desired number of Technology educators that will participate in the study. Every Technology educator in the chosen school became a participant in the study. The total sample consisted of 60 educators, of which 30 were from former white schools and 30 from previously disadvantaged schools.

3.2.2 RESEARCH DESIGN

It was necessary to obtain as much information as possible directly from educators (Vice-principals, heads of departments and educators) who are involved in Technology Education. Consequently, questionnaires and interviews were used to obtain such information.

3.2.2.1 Pilot study

In spite of the wealth of literature which may exist in any discipline, it usually represents only a section of knowledge of people involved daily in the specific field. Tapping the experience of experts usually offers many more advantages than disadvantages, and therefore this aspect should be encouraged as part of the pilot study (De VOS, 1998:180,181).

The researcher conducted personal interviews with experts to bring unknown perspectives to the fore or to confirm or reject the researcher's own views.

The research questionnaire was piloted amongst educators that were teaching at a school that was part of the pilot project for Technology Education in the Motheo district of the Free State Education department. This exercise proved to be very useful and enlightening in that problems relating to questionnaire design were revealed, for example misinterpretation and wrong spelling. Additional questions and ideas were also received from educators involved with the pilot study.

Three Technology educators and two vice principals that were involved with the Technology Education-pilot project participated in the pilot study. On the basis of feedback from these respondents, the questionnaire was amended. For the final version of the **Questionnaire for Technology Educators**, see annexure 6.

3.2.2.2 The questionnaire

A questionnaire is defined as "a set of questions on a form which is completed by the respondent in respect of a research project" (New dictionary of social work, 1995:51 in De Vos, 1998:152). The objective of a questionnaire is to obtain facts and opinions from people who are informed on a particular issue.

One may apply questionnaires in various ways, but it should not be confused with the research interviews (as data-gathering method within the qualitative approach), for which interview schedules are necessary (De Vos, 1998:153). Gall and Borg (1996:289) define questionnaires as documents that ask the same questions of all individuals in the sample.

In the study data was obtained from the responses to the investigation by the use of questionnaires. Data sometimes lies buried deeply within the minds or within the attitudes, feelings or reactions of men and women. Questionnaires are completed without any outside influence and the information directly given by people may be converted into data.

3.2.2.3 Purpose of the questionnaire

Since the study is concerned with the analysis of essential aspects on the implementation of Technology Education in secondary schools in the Free State province (Urban areas), and the attitudes of educators

towards Technology as subject, the purpose of the questionnaire was to collect data concerning the perceptions and understanding of Technology Education from educators involved with the subject.

3.2.2.4 Questionnaire design

The questionnaire namely: **"Questionnaire for Technology Educators"**, was structured in such a way as to obtain information of the objectives and research question. The designing of the questionnaire took into consideration the fact that the information obtained from the questionnaire responses, forms one of the primary sources of data. Therefore, consideration was given, amongst others, to the introduction, format, sequence of questions, content of the questionnaire, type of questions, length of questions, instructions and cover letter. The questionnaire was developed for the educators (Principals/vice principals, heads of departments and educators) who are involved with the implementation as well as the teaching of the subject Technology.

(a) Introduction

The introduction to the questionnaire, contained in the covering letter, was brief and concisely worded to explain the purpose of the questionnaire to the respondents. The wording of the questionnaires was kept as clear as possible and guidelines for completing the questionnaire were also given.

(b) Format

The questionnaire was carefully constructed. The format, design and typing of the questionnaire were given consideration. Care was taken to ensure that the questionnaire did not appear cluttered and that time was not wasted in responding to questions.

(c) Sequence of questions

Consideration was given to the order in which questions were placed in the questionnaire. Personal and background information was asked first, followed by information about the school /institution and then specific statements regarding Technology Education where respondents had to indicate on a scale of 0-4 which statements are true, true to a large extent or not at all true. The last part of the questionnaire was where respondents had to give their opinion on questions regarding Technology Education (See annexure 6).

(d) Content of the questionnaire

The content of the questionnaire focused mainly on the implementation and teaching of Technology Education at secondary schools in the Free State province (Urban areas). Although there were other questions, their primary aim was to get first-hand information concerning the perceptions,

understanding and opinions on Technology Education that were considered important.

The questionnaire was accompanied by a cover letter to explain its purpose to the respondents. The next part was a general orientation, and guidelines for completing the questionnaire.

The following three (3) sections formed the content of the questionnaire:

Section A: Personal and background information

This section of the questionnaire was designed to obtain information about the educators' gender, teaching experience, the level that they are teaching at, the average number of pupils in a class, qualifications and their position at the schools. These details were integral to the research, as they affect the understanding and knowledge concerning Technology Education.

Section B: School / Institution

This section of the questionnaire was designed to obtain information about the current status of Technology Education at the different schools.

General information was obtained through the following questions:

- Does your school offer Technology Education at present?
- Since when has your school presented Technology Education?
- Was your school one of the pilot schools with the implementation of Technology Education?
- Current level of Technology Education, according to you, at your school?
- Readiness of staff to present Technology Education when it was introduced at your school?
- Current capability of staff who present Technology Education at your school?
- Does your school cover all aspects of Technology Education?
- How much did the school/institution do to prepare for the implementation of Technology Education?
- How do you feel about the new Curriculum 2005?

Section C: Questionnaire items

Section C was divided into C1 and C2. Section C1 consists of 35 general statements concerning Technology Education and Curriculum 2005. Respondents were asked to indicate the truth of the statements on a scale rating from not at all - to a large extent.

Section C2 consists of 18 questions on Technology Education and Further Education and Training (FET). There was also space for a definition of Technology Education (Open ended).

(e) Length of the questionnaire

The length of the questionnaire was seriously considered. The questionnaire was long enough to include all the relevant questions necessary for the investigation. It took the respondents approximately fifteen minutes to complete the questionnaires.

(f) Instructions of questionnaire

Although the questionnaire is self-explanatory, general instructions were given at the beginning. Subsequently the instructions for answering were repeated with each section (See Annexure 6).

(g) Cover letter

Each questionnaire was accompanied by a cover letter. (See Annexure 5). The purpose of the investigation was explained in the cover letter in order to remove doubts and fear in the minds of the respondents, and to ensure a high response rate.

3.2.2.5 Interviews

"An interview is defined as a specialised form of communication between people for a specific purpose associated with some agreed subject matter" (Anderson 1998:190). Interviews have many advantages as a method of data collection and people are more easily engaged in an

interview than in completing a questionnaire. More complete information is also obtained by interviews (Anderson, 1998:190).

An interview guide or schedule is often a very useful tool for the researcher to use in the interviewing situation. A guide or schedule for interviews is a relatively brief series of topics or questions, which the researcher uses to guide the conversation.

In this study, the researcher used an interview schedule to prepare his interview questions (Annexure 7). The structured nature of the interview eliminated some of the problems of an entirely unstructured interview, that is, a huge amount of information with no time to explore it and gaps in the information. The fact that the framework was established beforehand facilitated analysis. This was particularly helpful because of the limited of time to gather data. Interviews were conducted individually at different schools with different educators, heads of departments and vice principals/principals. An audiotape was used during interviews to collect data, which was later transcribed verbatim. See Annexure 8 with the verbatim transcriptions ready for data analysis.

The interviews were conducted during the last quarter of 2003. The interviews were held while the researcher visited different schools for distributing the research questionnaires in the Bloemfontein, Welkom and Kroonstad areas. The participants involved with Technology Education were chosen randomly and interviewed individually in a suitable

classroom or office. A total of 10 participants were interviewed of which only one could not be transcribed because of inaudible recording.

3.2.3 DATA COLLECTION

3.2.3.1 Introduction

Data from people may be collected in different ways, for example through interviews, various group method discussions techniques, questionnaires, attitude scales, tests and other such measures (Anderson, 1998:163).

The population of this study was 35 secondary schools in the Free State Province situated in the Bloemfontein, Welkom and Kroonstad area. Technology educators, heads of departments and principals/vice principles in secondary schools were part of the sample for the data collection.

Two groups of educators were used in the collecting of data (former white schools and previously disadvantaged schools). The total group consists of 60 educators, of which 30 were from former white schools and 30 from previously disadvantaged schools.

3.2.3.2 Restrictions experienced with the questionnaires

The number of alternative answers to some of the questions ought to have been increased to obtain more accurate answers. The questionnaire covered only important information on the implementation and teaching of Technology Education and background information on educators and schools.

The questions were grouped at the end into ten main areas of importance. These were then further reduced to correlate with the objectives. There were too many questions to discuss each of them, and the same kind of question was asked at different places in the questionnaire to provide the necessary control measures or cross referencing in the results. Participation in a research project like this is always a voluntary exercise, viewed from the respondents' point.

3.2.3.3 Procedures of gathering data

The questionnaires were administered and taken personally to schools in the Bloemfontein, Welkom and Kroonstad area of the Free State province at the end of November 2003. The researcher asked permission at each school by handing over the letter of permission for completion of the research questionnaire and the letter of registration of a research project, granted by the Free State Province Education Department to do research at schools in the Free State province, to the headmaster of each school.

Thereafter, the researcher gave the questionnaires to the educators involved with Technology Education at the specific school. They were asked to complete the questionnaire, if possible, while the researcher waited to collect it again. In some cases arrangements were made to collect the completed questionnaires later on.

The researcher also conducted interviews randomly at different schools, while waiting for the completion of the questionnaires. Given the scope of the sample across the urban areas, the procedure and administration of the questionnaires were regarded as successful.

3.2.4 DATA ANALYSIS

3.2.4.1 Introduction

To analyse literally means to take apart words, sentences and paragraphs, which is an important act in the research project in order to make sense of, interpret and theorise those data (Henning, 2004:127). This is done by organising, reducing and describing the data.

According to De Vos (1998:337) there is no right or wrong approach to data analysis in qualitative research. There are general guidelines that a researcher may adhere to, as well as strategies for analysis that have been utilised by qualitative researchers. The important issue is that a researcher should be able to logically account for stages in data analysis and that the final conclusions be based on generated data.

3.2.4.2 Procedure of analysis

The fieldwork process resulted in the collection of data that were ready for analysis. New or better theories could be synthesised from the participants' experiences, and by standing back and reflecting on the fieldwork and the data gathered one could begin to come to conclusions, explanations and theories. At this stage the analysis of data became imperative.

The researcher numbered the interview schedules as IR 1 to IR 10 (IR = interview response). The interview responses helped to clarify responses from the questionnaire survey. The data obtained from the interviews was transcribed, numbered, compared and analysed. The full version of the interview schedule is given in Annexure 7.

The questionnaire was encoded (See annexure 6) with help from the statistician, and questions that relate to each other were rationalised and grouped in key areas of concern. A Likert-scale was used to obtain the opinions of the educators. The rationalisation of the questions was connected with the objectives of the study.

A five (5) point Likert-scale that stretches from 0 = not at all to 4 = to a great extent was used in the questionnaire (section C). The 5 point scale was changed to a 3 point scale and as follows: Codes 0 and 1 (not at all to a lesser extent), code 2 (average extent) and codes 3 and 4 (above

average to a greater extent). The reason for this was, seeing that the groups are relatively small (30 each), there is a great possibility that the number of persons per cell will be lower than 5, and therefore the result of the statistical test that will be used will be declared invalid. Furthermore, two groups (old regime and previously disadvantaged group) were regularly compared with regard to the questions. To determine whether there are differences in the proportion of persons' (in the two groups) opinions regarding the questions that occur, the χ^2–value (Chi-square test) for homogeneity (Howell, 1997) was used. The Chi-square test has been developed to answer the question whether any results obtained by data analysis are statistically significant, i.e. are they meaningful and not caused by chance. This test is executed on what is called a "level of significance" (De Vos,1998:233).

To also deliver findings about the practical importance of statistical significant results that would be found by the investigation, account will also be taken of the practical significance of the results. As a measuring-rod of the practical significance the effect size will be calculated. By the determination of the χ^2-value (Chi-square test), the effect size (w) will be calculated as follows (Steyn, 1999):

$$w = \sqrt{\chi^2 / N}$$

To interpret this effect size, the following guideline values can be used:

$w = 0,1$: little effect

$w = 0,3$: medium effect

$w = 0,5$: great effect

Only when statistically significant results (on the 1%- of 5% level) are found, will the corresponding effect sizes be calculated. All the statistical procedures were executed with the help of SAS-programming (SAS Institute, 1985).

3.2.5 CONCLUSION

The purpose of this study was to examine the implementation of Technology Education as a new learning area in schools in the urban areas of the Free State Province. The mentioned objectives in paragraph 1.3.4 were further refined by the following research questions:

- Are all educators equipped to teach Technology Education?
- Is technology implemented according to curriculum 2005 requirements (OBE)?
- Do problems and difficulties cause educators to fall back on earlier didactics methodology?
- Are educators willing to undergo retraining?

The main questions of the study, namely how successful the introduction of Technology Education in Secondary Schools in the Free State Province (Urban areas) was and how the subject is taught and what problems are experienced, envelope the afore-mentioned four questions.

This study had a predominantly qualitative approach with a non-experimental research to collect data. A criteria group design was used.

The following research techniques were utilised to collect data: a literature study, questionnaires and individual interviews. Thirty five (35) schools were involved in the study, with sixty (60) respondents to the questionnaires, and ten (10) persons were interviewed.

An analysis of the data was done as follows. The data obtained from the questionnaires was statistically processed with the help of SAS-programming (SAS Institute, 1985). The data obtained from the interviews was transcribed, numbered, compared and analysed. The interview responses helped to clarify responses from the questionnaire as indicated in chapter 3.

The next chapter focused on the processing, analysis and interpretation of the data obtained. Data from the questionnaires were analysed and interpreted to obtain general conclusions.

CHAPTER FOUR

ANALYSIS AND INTERPRETATION OF THE DATA COLLECTED

4.1 INTRODUCTION

The analysis of the questionnaire and interview data is done in this chapter.

Since this study is concerned with Technology education in secondary schools in the Free State province, the objectives are to:

- investigate the current stance of Technology Education in Free State secondary schools (Urban areas)
- determine educators' perceptions of the old curriculum versus the curriculum 2005
- get the opinion of educators towards the meaning/role of Technology Education
- determine the level of training of educators for the new curriculum
- determine the perception of educators regarding the teaching of Technology Education
- investigate the opinion of educators regarding the role of Technology Education in Further Education and Training (FET)
- determine the functioning of Technology Education in schools

The findings of the research by means of questionnaires will be presented and elaborated on in this chapter. The kind of research is non-experimental and a criteria group design was used (Huysamen, 1993).

4.2 COMPOSITION OF THE INVESTIGATION GROUP

The total group consists of 60 educators, of which 30 are from former white schools and 30 from previously disadvantaged schools. The biographical changeables of the investigation group are indicated in table 4.1.

Table 4.1: Frequencies regarding biographical changeables of respondents

Biographical changeables	Old regime		Previously disadvantaged		Total	
	N	%	N	%	N	%
SEX:						
Male	26	86,7	21	70,0	47	78,3
Female	4	13,3	9	30,0	13	21,7
Highest Qualification						
Std 10	2	6,7	2	6,7	4	6,7
PTC	0	0,0	1	3,3	1	1,7
PTD	5	16,7	4	13,3	9	15,0
Degree only	3	10,0	3	10,0	6	10,0
PTD+degree	6	20,0	4	13,3	10	16,7
Post graduate diploma	6	20,0	7	23,3	13	21,7
Higher degree	**7**	**23,3**	**1**	**3,3**	8	13,3
Other training	1	3,3	8	26,7	9	15,0
Position						
Educator	21	70,0	28	93,3	49	81,7
Principal	0	0,0	0	0,0	0	0,0
HOD	**7**	**23,3**	**2**	**6,7**	9	15,0
Other	2	6,7	0	0,0	2	3,3

The information in table 4.1 indicates that:

- In both groups the majority of educators are male and that more ladies seem to be involved in the previously disadvantaged group than in the old regime group.
- More educators, 7 (23,3%) from the old regime has a higher qualification than from the previously disadvantaged group, 1 (3,3%).
- With regard to position, there is more HOD's, 7 (23,3%) from the old regime than from the previously disadvantaged group, 2 (6,7%).

With regard to two of the biographical changeables, the averages and standard divergences for the total as well as the two groups have been calculated and are shown in table 4.2.

Table 4.2: Averages (X) and standard deviations (s) regarding years of teaching experience and number of learners in class for the total and two subgroups.

Biographical changeables	Old regime		Previously disadvantaged		Total		t-test
	X	s	X	s	X	s	t
Years of service	17,57	7,62	10,43	9,15	14,00	9,09	3.28
Number of learners	38,93	7,69	44,90	15,10	42,07	12,43	-1.85

It is clear that with regard to both changeables, reasonable differences in the averages of the two groups exist. With regard to years of service, the difference between averages for the two groups are significant (*t*=3,28 for

58 degrees of freedom). It is clear that the group from the old regime has a higher number of service years than those from the previously disadvantaged group. Although the average number of learners per class is higher in the previously disadvantaged group than that of the old regime, this difference is not significant in the 5% level (t= -1,85 for 58 degrees of freedom).

4.3 STATISTICAL ANALYSIS

Both descriptive and inferential statistics were used in the study. The difference between descriptive and inferential statistics is based precisely upon the distinction between samples and populations. Descriptive statistics is concerned with describing or summarising a sample (e.g. groups described in terms of frequencies). Inferential statistics is concerned with going beyond the sample to make predictions about the population from which the sample is drawn (e.g. hypotheses on the situation in schools. See 1.6)

The Chi-square test (De Vos, 1998:233) of statistical significance, were also used to answer the question whether any results obtained by data analysis are statistically significant, i.e. are they meaningful and not caused by chance.

To determine whether there are differences in the proportion of persons' (in the two groups) opinions regarding the questions that occur, the χ^2–value for homogeneity (Howell, 1997) will be used.

To also deliver findings about the practical importance of statistically significant results that may be found by the investigation, account will also be taken of the practical significance of the results. As a measuring-rod of the practical significance the effect size will be calculated. By the determination of the χ^2-value, the effect size (w) will be calculated as follows (Steyn, 1999):

$$w = \sqrt{\chi^2 / N}$$

To interpret this effect size, the following guideline values can be used:

$w = 0,1$: little effect

$w = 0,3$: medium effect

$w = 0,5$: great effect

Only when statistically significant results (on the 1%- of 5% level) are found, will the corresponding effect sizes be calculated. All the statistical procedures were executed with the help of SAS-programming (SAS Institute, 1985). The results will now be discussed.

4.4 FINDINGS

4.4.1 Stance of Technology Education in Free State (urban areas)

Firstly an explanation of the view of the educators regarding the stance of Technology Education in the Free State and implementation plans, will be given. This information was obtained from the 60 educators by using Section B (see Annexure 6) of the questionnaire and their response is discussed thoroughly. Before discussing the opinions of the educators regarding Technology Education , it is important to mention that 34 (57%) of the educators indicated that their schools already presented Technology Education in 2000, while 23 (38%) indicated that their schools began the teaching in 2001. Only 5% of these educators' schools began with Technology Education teaching in 2002.

To get the opinion of the educators regarding the stance of Technology Education some questions were formulated. These questions were judged on a 5-point scale (regularly changed to a 3-point scale by adding codes 0 and 1 as the lower point of the scale and codes 3 and 4 as the upper point of the scale). Code 2 stays the centre point of the scales. The χ^2-test was used for this goal, and the result of this joined with the frequencies and row percentages of the particular questions, are given in table 4.3.

Table 4.3: Number of persons in the different categories for the two groups regarding the stance of Technology Education in Free State

Question	Group 1			Group 2			χ^2	W
	0, 1	2	3, 4	0, 1	2	3, 4		
Question 1.3	7 (23,3)	10 (33,3)	**13** (43,3)	6 (20,0)	12 (40,0)	**12** (30,0)	0,299	
Question 1.4	1 (3,3)	9 (30,0)	**20** (66,7)	4 (13,3)	14 (46,7)	**12** (40,0)	4,887	
Question 1.5	7 (23,3)	11 (36,7)	**12** (40,0)	15 (30,0)	8 (26,7)	**13** (43,3)	0,764	
Question 1.6	1 (3,3)	5 (16,7)	24 (80,0)	1 (3,3)	9 (30,0)	20 (66,7)	1,506	
Question 1.7	1 (3,3)	2 (6,7)	**27** (90,0)	2 (6,7)	9 (30,0)	**19** (63,3)	6,179*	0,32

** $p \leq 0,01$ * $p \leq 0,05$

Regarding the stance of Technology Education in the Free State, the following may be said for the whole group:

(a) only 25 (13+12) (41,7%) of the total group of 60 educators feel that the implementation of Technology Education in schools over the past two years has been successful to very successful.

(b) 32 (20+12) (53,3%) of the total group of 60 educators are of the opinion that the level of training in Technology Education is average to very good.

(c) only 25 (12+13) (41,7%) of the total group of 60 educators are of the opinion that the staff, of schools where Technology Education was implemented, was ready for it.

(d) 46 (27+19) (76,7%) of the total group of 60 educators are of the opinion that the schools cover all the aspects of Technology Education to a great extent.

From table 4.3, there seems to be a significant difference in the proportions (on the 5% level) between the two groups regarding question 1.7 (Does your school cover all aspects of Technology Education?) This difference has a medium effect measurement. A greater proportion educators in group 1 (old regime) than from group 2 (previously disadvantaged) feel that their schools cover all the different aspects of Technology Education –training.

To find out how the implementation of Technology Education was planned, the response to question 1.8 of the two groups were investigated and this information shows in table 4.4.

Table 4.4: Number of persons in the different categories for the two groups regarding the implementation of TE

Question	Group 1		Group 2		χ^2	*W*
	Yes	No	Yes	No		
Question 1.8.1	**19** (65,5)	10 (34,5)	**16** (53,3)	14 (46,7)	0,907	
Question 1.8.2	**11** (37,9)	18 (62,1)	**2** (6,7)	28 (93,3)	8,390**	0,38
Question 1.8.3	**22** (75,9)	7 (24,1)	**14** (46,7)	16 (53,3)	5,284*	0,30
Question 1.8.4	19 (65,5)	10 (34,5)	26 (86,7)	4 (13,3)	3,644	
Question 1.8.5	**23** (76,7)	7 (23,3)	**26** (86,7)	4 (13,3)	1,002	

** $p \leq 0,01$ * $p \leq 0,05$

Regarding the preparation of schools for the implementation of Technology Education , the following may be seen for the whole group.

(a) only 13 (11+2) (21,7%) of the educators indicated that the classrooms were equipped.

(b) 35 (19+16) (58,3%) of the educators indicated that educators were already trained to implement Technology Education, while 49 (23+26) (81,7%) indicated that educators were already trained to implement OBE.

(c) 36 (22+14) (60,07%) of the educators indicated that Technology programme/projects were designed and meant for the implementation of Technology Education.

From table 4.4 there seems to be a significant difference in proportions (on the 1% level) between the two groups regarding question 1.8 and on the 5% level regarding question 1.8.3. These differences all show medium effect measurements. Question 1.8.2 (Classes were equipped) a greater proportion educators in group 1 (old regime) than in group 2 (previously disadvantaged) indicated that it was the case. Question 1.8.3 (Technology programmes/projects were planned and designed) also indicates that a greater proportion of educators from group 1 (old regime) than group 2 (previously disadvantaged) agree that that was the case.

Next, the perception regarding the former education system and the Curriculum 2005 was investigated, and is discussed in the following paragraph.

4.4.2 The perceptions of educators regarding the former curriculum versus Curriculum 2005

Firstly the opinion of the educators about the Curriculum 2005, as indicated in question 1.9, will be discussed. The scale on this question differs from the scale with regard to the other questions on this aspect. The results of question 1.9 occur in table 4.5.

Table 4.5: Number of persons in the different categories of the two groups regarding their opinion of the curriculum 2005.

Question	Group 1			Group 2			χ^2	W
	Yes	No	Uncertain	Yes	No	Uncertain		
Question 1.9.1	**4** (13,8)	16 (55,2)	9 (31,0)	**14** (46,7)	8 (26,7)	8 (26,7)	8,266*	0,37
Question 1.9.2	19 (65,5)	5 (17,2)	5 (17,2)	10 (33,3)	17 (56,7)	3 (10,0)	9,824**	0,41
Question 1.9.3	24 (82,8)	2 (6,9)	3 (10,3)	28 (93,3)	0 (0,0)	2 (6,7)	2,391	
Question 1.9.4	**26** (86,7)	2 (6,7)	2 (6,7)	**21** (70,0)	5 (16,7)	4 (13,3)	2,484	
Question 1.9.5	**25** (86,2)	2 (6,9)	2 (6,9)	**17** (56,7)	10 (33,3)	3 (10,0)	7,042*	0,35

** $p \leq 0,01$ * $p \leq 0,05$

Regarding the feeling of the educators about the new curriculum, the following may be seen for the whole group:

(a) only 18 (4+14) (30,0%) of the educators feel that the new curriculum is good for the 21st century,

(b) 47 (26+21) (78,3%) of the educators feel that the new curriculum is confusing to educators,

(c) 42 (25+17) (70,0%) of the educators feel that the new curriculum is based on systems from other countries.

Table 4.5 indicates that there is a significant difference in proportions (on the 5% level) between the two groups regarding questions 1.9.1 (The curriculum is good for the 21st century). These differences have medium effect measurements. Question 1.9.1 shows that a greater proportion of educators from group 2 (previously disadvantaged) than group 1 (old regime) feel that curriculum 2005 is good for the 21st century. Question 1.9.5 shows that a greater proportion of educators in group 1 (old regime) than in group 2 (previously disadvantaged) feel that it is based on education systems from other countries.

Furthermore there is also a significant difference in the proportions (on the 1% level) between the two groups regarding question 1.9.2 (It is too early to introduce curriculum 2005). A greater proportion of educators in group 1 (old regime) than in group 2 (previously disadvantaged) are of the opinion that it is too early to implement curriculum 2005.

The opinions of the educators regarding the former and new curriculum were investigated further by obtaining their opinions on a 5-point scale

(Section C). As in the former cases this scale was also changed to a 3-point scale as given in paragraph 4.4.

The relevant questions are indicated in table 4.6, together with the comparison that was done with regard to the two groups.

Table 4.6: Number of persons in the different categories for the two groups regarding their opinions on the former and new curriculum.

Question	Group 1			Group 2			χ^2	*W*
	Not at all to little extent	Average extent	Above average to a large extent	Not at all to little extent	Average extent	Above average to a large extent		
Former curriculum:								
Question 2	**14** (46,7)	6 (20,0)	10 (33,3)	**11** (36,7)	9 (30,0)	10 (33,3)	0,960	
Question 7	16 (53,3)	3 (10,0)	**11** (36,7)	8 (26,7)	3 (10,0)	**19** (63,3)	4,800	
Question 16	7 (23,3)	4 (13,3)	**19** (63,3)	5 (16,7)	7 (23,3)	**18** (60,0)	1,179	
New Curriculum								
Question 5	**18** (60,0)	7 (23,3)	5 (16,7)	**17** (56,7)	8 (26,7)	5 (16,7)	0,095	
Question 10	5 (17,2)	4 (13,8)	**20** (69,0)	0 (0,0)	6 (20,0)	**24** (80,0)	5,748*	0,31
Question 11	16 (53,3)	10 (33,3)	4 (13,3)	17 (56,7)	11 (36,7)	2 (6,6)	0,745	
Question 18	1 (3,3)	5 (16,7)	**24** (80,0)	0 (0,0)	5 (16,7)	**25** (83,3)	1,020	
Question 19	20 (66,7)	6 (20,0)	4 (13,3)	12 (40,0)	8 (26,7)	10 (33,3)	4,857	

** $p \leq 0,01$ * $p \leq 0,05$

Regarding the old curriculum, the following may be seen:

(a) 25 (14+11) (41,7%)of the educators are of the opinion that the old system could not at all, or to little extent, make learners passive in class.

(b) 30 (11+19) (50,0%) of the educators are convinced in an above average to a greater extent, that with the old system, the educators and handbooks were the only source of information to the learners.

(c) 37 (19+18) (61,7%) of the educators are above average to a greater extent convinced that the old system encouraged learners to be responsible for their own learning.

Regarding the new Curriculum (2005), the following may be seen in the group:

(a) 44 (20+24) (73,3%) of the educators are above average to a greater extent of the opinion that the new system is learner centred.

(b) 49 (24+25) (81,7%) of the educators are above average to a greater extent convinced that the new system will encourage educators to be facilitators in class.

(c) 35 (18+17) (58,3%) of the educators see the new system as being exam driven in a little extent to not at all.

Table 4.6 indicates a significant difference in proportions (on the 5% level) between the two groups regarding question 10 (Curriculum 2005 is learner-centred). This difference has a medium effect measurement. A greater proportion of educators in group 2 (previously disadvantaged) than in group 1 (old regime) are in a greater extent of the opinion that Curriculum 2005 is learner-centred.

There are still big differences of opinion regarding the old curriculum and Curriculum 2005. This will definitely influence the teaching and standard of Technology Education in schools.

4.4.3 The opinion of educators regarding the meaning/role of Technology Education

The opinions of the educators regarding the meaning/role of Technology Education will de discussed next. This information is shown in table 4.7.

Table 4.7: Number of persons in the different categories for the two groups regarding their opinions on the meaning/role of Technology Education

Question	Group 1			Group 2			χ^2	W
	Not at all to little extent	Average extent	Above average to a large extent	Not at all or little extent	Average extent	Above average to a large extent		
Question 1	13 (43,3)	12 (40,0)	5 (16,7)	12 (40,0)	7 (23,3)	11 (36,7)	3,606	
Question 3	1 (3,3)	5 (16,7)	**24** (80,0)	0 (0,0)	2 (6,7)	**28** (93,3)	2,593	
Question 6	4 (13,3)	13 (43,3)	13 (43,3)	0 (0,0)	11 (39,3)	17 (60,7)	4,637	
Question 8	1 (3,4)	2 (6,9)	**26** (89,7)	1 (3,3)	2 (6,7)	**27** (90,0)	0,002	
Question 9	0 (0,0)	4 (13,3)	**26** (86,7)	0 (0,0)	5 (16,7)	**25** (83,3)	0,131	
Question 12	7 (23,3)	6 (20,0)	17 (56,7)	3 (10,0)	11 (36,7)	16 (53,3)	3,101	
Question 13	7 (23,3)	4 (13,3)	**19** (63,3)	1 (3,3)	3 (10,0)	**26** (86,7)	5,732*	0,31
Question 17	4 (13,3)	2 (6,7)	**24** (80,0)	2 (6,7)	4 (13,3)	**24** (80,0)	1,333	
Question 30	1 (3,3)	5 (16,7)	**24** (80,0)	1 (3,4)	4 (13,8)	**24** (82,8)	0,094	
Question 34	4 (13,3)	5 (16,7)	**21** (70,0)	0 (0,0)	4 (13,3)	**26** (86,7)	4,643	

** $p \leq 0,01$ * $p \leq 0,05$

Regarding the meaning/role of Technology Education, the following may be seen for the whole group:

(a) Respectively 53 (26+27) (88,3%) and 52 (24+28)(86,7%) of the educators are above average to a greater extent convinced that Technology affects the working world and that a Technology Education -programme must work closely with the industry.

(b) 51 (26+25) (85,0%) of the educators are above average to a greater extent convinced that Technology Education does include science.

(c) 48 (24+24) (80,0%) of the educators are above average to a greater extent convinced that Technology Education broadens the ability of the learners to modify the world.

(d) 48 (24+24) (80,0%) of the educators are above average to a greater extent convinced that Technology Education encourages learners to work together with their class mates.

(e) 47 (21+26) (78,3%) of the educators are above average to a greater extent convinced that Technology Education should be a relevant subject in general teaching.

(f) 45 (19+26) (75,0%) of the educators are above average to a greater extent convinced that Technology Education encourages learners to solve their own problems.

Table 4.7 indicates a significant difference in proportions (on the 5% level) between the two groups regarding question 13 (Technology Education encourages learners to solve their own problems). This

difference has a medium effect measurement. A greater proportion of educators in group 2 (previously disadvantaged) than in group 1 (old regime) is of a greater opinion that Technology Education encourages learners to solve their own problems.

These results indicate a general positive attitude towards Technology Education and that Technology Education is of great value to all learners.

4.4.4 Training of educators for the new Technology curriculum

Attention was now given to the opinion of the educators with regard to their training for the implementation of the new curriculum. The results are seen in table 4.8.

Table 4.8: Number of persons in the different categories for the two groups regarding their opinion on the training of educators

Question	Group 1			Group 2			χ^2	W
	Not at all to little extent	Average extent	Above average to a large extent	Not at all or little extent	Average extent	Above average to a large extent		
Question 23	0 (0,0)	2 (6,7)	**28** (93,3)	0 (0,0)	0 (0,0)	**30** (100)	2,069	
Question 27	1 (3,3)	2 (6,7)	**27** (90,0)	0 (0,0)	2 (6,7)	**28** (93,3)	1,018	
Question 28	0 (0,0)	2 (6,7)	28 (93,3)	0 (0,0)	1 (3,3)	29 (96,7)	0,351	
Question 29	18 (60,0)	3 (10,0)	9 (30,0)	9 (30,0)	12 (40,0)	9 (30,0)	8,400*	0,38
Question 31	1 (3,3)	2 (6,7)	**27** (90,0)	0 (0,0)	1 (3,4)	**28** (96,6)	1,335	
Question 44	**13** (43,3)	9 (30,0)	8 (26,7)	**19** (63,3)	10 (33,3)	1 (3,3)	6,622*	0,34
Question 45	1 (3,3)	5 (16,7)	**24** (80,0)	1 (3,3)	2 (6,7)	**27** (90,0)	1,462	

** $p \leq 0,01$ * $p \leq 0,05$

Regarding the training of educators for the new curriculum, the following may be seen for the total group:

(a) 58 (28+30) (96,7%) of the educators are above average or to a greater extent convinced that educators need training to implement the new curriculum. Together with this, 55 (27+28) (91,7%) indicated that educator development is important during the introduction of the new curriculum in schools.

(b) 55 (27+28) (91,7%) of the educators are above average to a greater extent convinced that formal training for Technology Education is necessary.

(c) 51 (24+27) (85,0%) of the educators are above average to a greater extent convinced that staff should still be subjected to Technology Education training.

(d) 32 (13+19) (53,3%) of the educators are to a lesser extent to not at all convinced that the staff at their schools were adequately trained for Technology Education when it was introduced to their schools.

From table 4.8 it is evident that significant differences in proportions (on the 5% level) between the two groups regarding question 29(Educators will adapt easily to curriculum changes) and question 44 (Do you think staff at your school were fully equipped to present Technology Education when it was introduced) exist. Both differences have medium effect measurements.

A greater proportion of educators in group 1 (old regime) than in group 2 (previously disadvantaged) are, to a lesser extent to not at all, of the opinion that educators will easily adjust to the curriculum change. A greater proportion of educators in group 1 (old regime) than in group 2 (previously disadvantaged) are to a greater extent convinced that educators were adequately trained for the implementation of the Technology curriculum.

A general perception exists amongst educators that educators were not trained adequately for the implementation/teaching of Technology. There is a big demand for in service training in Technology Education.

4.4.5 The perception of educators regarding the teaching of Technology Education

Attention was subsequently given to the perceptions of the educators about the manner in which Technology Education teaching should happen. The results are revealed in table 4.9.

Table 4.9: Number of persons in the different categories for the two groups regarding their opinion about the teaching of Technology Education

Question	Group 1			Group 2			χ^2	w
	Not at all to little extent	Average extent	Above average to a large extent	Not at all or little extent	Average extent	Above average to a large extent		
Question 14	5 (16,7)	2 (6,7)	23 (76,7)	6 (20,0)	6 (20,0)	18 (60,0)	2,701	
Question 20	**17** (56,7)	6 (20,0)	7 (23,3)	**17** (56,7)	5 (16,7)	8 (26,7)	0,158	
Question 21	0 (0,0)	2 (6,7)	**28** (93,3)	0 (0,0)	4 (13,3)	**26** (86,7)	0,741	
Question 22	3 (10,0)	9 (30,0)	18 (60,0)	2 (6,7)	7 (23,3)	21 (70,0)	0,681	
Question 24	1 (3,3)	5 (16,7)	**24** (80,0)	3 (10,0)	5 (16,7)	**22** (73,3)	1,087	
Question 26	0 (0,0)	1 (3,3)	**29** (97,7)	3 (10,0)	4 (13,3)	**23** (76,7)	5,492	
Question 42	5 (16,7)	6 (20,0)	19 (63,3)	6 (20,0)	5 (16,7)	19 (63,3)	0,182	
Question 48	3 (10,3)	5 (17,2)	**21** (72,4)	0 (0,0)	0 (0,0)	**30** (100)	9,574**	0,40

** $p \leq 0,01$ * $p \leq 0,05$

Regarding the perceptions of the educators towards the teaching of Technology Education, the following may be seen:

(a) 54 (28+26) (90,0%) of the educators are above average to a greater extent convinced that Technology Education should be taught by qualified educators.

(b) 52 (29+23) (88,3%) of the educators are above average to a greater extent convinced that the incorporation of Technology Education in schools will need curriculum development.

(c) 51 (21+30) (85,0%) of the educators are above average to a greater extent convinced that Technology Education is an important learning area.

(d) 34 (17+17) (56,7%) of the educators are to a lesser extent to not at all convinced that Technology Education should be taught in a regular class. Furthermore 46 (24+22) (77% is of the opinion that Technology Education should take place in a specialised class.

From the above results it is clear that educators feels that Technology Education should be taught by qualified educators in specialised classrooms. There is also a need for more specific detail about the curriculum for Technology Education and correlation between schools (Syllabus content).

4.4.6 Role of Technology Education in Further Education and Training

Next, attention was given to the perceptions of the educators regarding the role of Technology Education in FET. The results in table 4.10.

Table 4.10: Number of persons in the different categories for the two groups regarding the role of Technology Education in FET

Question	Group 1			Group 2			χ^2	W
	Not at all to little extent	Average extent	Above average to a large extent	Not at all or little extent	Average extent	Above average to a large extent		
Question 36	4 (13,3)	3 (10,0)	**23** (76,7)	2 (6,7)	2 (6,7)	**26** (86,7)	1,050	
Question 39	3 (10,0)	4 (13,3)	**23** (76,7)	0 (0,0)	6 (20,0)	**24** (80,0)	3,421	
Question 40	12 (40,0)	4 (13,3)	**14** (46,7)	5 (16,7)	4 (13,3)	**21** (70,0)	4,282	
Question 51	8 (27,6)	8 (27,6)	13 (44,8)	5 (16,7)	12 (40,0)	13 (43,3)	1,476	
Question 54	6 (20,0)	8 (26,7)	16 (53,3)	2 (6,7)	6 (20,0)	22 (73,3)	3,233	
Question 53	2 (6,7)	10 (33,3)	**18** (60,0)	0 (0,0)	4 (13,3)	**26** (86,7)	6,026*	0,32

** $p \leq 0,01$ * $p \leq 0,05$

Regarding the perceptions of the educators on the role of Technology Education in FET, the following is evident:

(a) 49 (23+26) (81,7%) of the educators are above average to a greater extent convinced that Technology Education should be an elective subject in FET.

(b) 47 (23+24) (78,3%) of the educators are above average to a greater extent convinced that Technology Education is relevant in FET.

(c) 44 (18+26) (73,3%) of the educators are above average to a greater extent convinced that Technology Education will also form part of other learning areas in FET.

(d) 35 (14+21) (58,3%) of the educators are above average to a greater extent convinced that Technology Education taught in grade 8 and 9 will prepare the learners in the learning areas of FET.

From table 4.10 it is evident that significant differences (on the 5%-level) between the two groups regarding question 53 (Do you think Technology Education will be part of other learning areas in FET?) exist. These differences have a medium effect measurement. A greater proportion of educators from group 2 (previously disadvantaged) than in group 1 (old regime) are above average to a greater extent convinced that Technology Education will also form part of other learning areas of FET.

4.4.7 Functioning of Technology Education in schools

Lastly, an investigation was also done on the perceptions of educators regarding the functioning of Technology Education in schools. The results may be seen in table 4.11.

Table 4.11: Number of persons in the different categories for the two groups regarding the functioning of TE in schools

Question	Group 1			Group 2			χ^2	W
	Not at all to little extent	Average extent	Above average to a large extent	Not at all or little extent	Average extent	Above average to a large extent		
Question 43	1 (3,3)	5 (16,7)	**24** (80,0)	1 (3,3)	1 (3,3)	**28** (93,3)	2,974	
Question 46	0 (0,0)	3 (10,0)	**27** (90,0)	0 (0,0)	1 (3,3)	**29** (96,7)	1,071	
Question 49	19 (63,3)	9 (30,0)	2 (6,7)	13 (43,3)	14 (46,7)	3 (10,0)	2,412	
Question 54	3 (10,0)	2 (6,7)	**25** (83,3)	4 (13,3)	2 (6,7)	**24** (80,0)	0,163	

** $p \leq 0,01$ * $p \leq 0,05$

Regarding the perceptions of the educators about the functioning of Technology Education in schools, the following may be seen:

(a) 56 (27+29) (93,3%) of the educators are above average to a greater extent convinced that these schools need a specific workshop / laboratory for Technology Education.

(b) 52 (24+28) (86,7%) of the educators are above average to a greater extent convinced that improvement in the quality of Technology Education is necessary in schools.

(c) 49 (25+24) (81,7%) of the educators are above average to a greater extent convinced that schools are still experiencing problems with the teaching of Technology.

From table 4.11 it is evident that no significant differences in proportions between the two groups exist. Most educators feel that the current functioning of Technology Education in schools are negatively affected by the lack of facilities and specialised training of educators in Technology Education.

4.5 ANALYSIS OF THE INTERVIEW DATA

The researcher interviewed ten different members of staff involved with Technology Education at different schools. The interviewees varied from normal Technology educators to heads of department and in some cases deputy principals. (See Annexure 8 for complete transcriptions of the interviews)

The researcher numbered the interview schedules as IR 1 to IR 10 (IR = interview response). The interview responses helped to clarify responses from the questionnaire survey. The full version of the interview schedule is given in Annexure 7.

The participants responded as follows to the sixteen (16) interview questions:

(1) Sir/Madam, what is your main duty at this school?

From the responses we may see the involvement of the respondents in Technology Education – five are ordinary educators, three are heads of department and two are deputy principals.

(2) What is Technology Education all about?

IR 6: It's the aspects of problem solving and teaching the child hand-skills and to broaden his knowledge of problem solving and all the different aspects of Technology.

IR 7: You teach children to think for themselves and use their hands and studies together.

IR 9: I see Technology Education as that learning area that deals with everything that man created or planned to create to ease his life on earth – and Technology Education is supposed to deal specifically with that.

The above and similar explanations reflect that most participants had a general idea of what Technology Education is about. An important aspect arising from most respondents is that the subject consists of theory,

practicals, problem solving, use of apparatus, skills development and "combine science with engineering" (IR 10).

(3) Do you use a prescribed syllabus or have you developed your own?

50% of the interviewees answered that they use a prescribed syllabus and the other 50% said they do not. Responses varied from "prescribed syllabus is very vague, doesn't say much, CTA's are forced on us", "self-developed syllabus", "own syllabus", "nothing from the department", "prescribed", "supposed to use the curriculum statement of 1996".

From the responses we may clearly see that there are big differences of opinion and on the "syllabus" that is used by the different schools in Technology Education.

(4) Are there other teachers who helped you to implement Technology Education at this school?

The respondents were again divided in their answers on this question. It seems that educators had to implement Technology Education on their own and that some schools worked together.

Interview Respondent five (IR 5) mentioned that they went for training together and learned from each other, while respondent one (IR 1) said

that they received a "packet" from the department, but they had to get their own information.

(5) Is Technology Education a subject on its own?

The respondents agreed that the subject is a subject on its own. Only one said: "Not quite. You can combine it with natural science" (IR 10).

It is thus very clear that Technology Education is regarded as a subject on its own.

(6) How receptive are other teachers to Technology Education ?

Most respondents answered "not so much receptive" (IR 1, IR 5, IR 6), "negative about Technology, something completely new, not trained to present", "technical-stigma" (IR 1, IR 2, IR 3), and "don't have a technological background" (IR 2, IR 7, IR 8). Only two respondents said that educators were receptive to Technology Education (IR 9, IR 10). Both of them are teaching at Technical schools.

What emerges from the responses to this question is that most educators (eight of the Interview Respondents) were not very receptive to Technology Education. A lack of training or technological/technical background seems to be a big concern. It is clear that technical schools are "quite familiar with a lot of the stuff" (IR 9).

(7) What were the stumbling blocks for the implementation of Technology Education at your school?

From the responses of the participants we may summarize the stumbling blocks for the implementation of Technology Education into five key areas of concern, as follows:

- No syllabus / No clear guidelines from department (IR's 2, 3, 5, 8)
- Poor training / Don't know what to do / Time frame for implementation too short (IR's 3, 5, 6, 9)
- Facilities / Not sufficient equipment (IR's 1, 6, 7, 10)
- Class sizes too big (IR'S 1, 8)
- Too much theory – not enough practicals (IR 1)

A general conclusion regarding the stumbling blocks for the implementation of Technology Education is that educators are not trained, classes are too big, classes are not equipped, and no clear syllabus / guidelines exists.

(8) What level of education or qualification must teachers have in order to implement Technology Education?

All the respondents agreed that Technology Education "has quite a wide field" (IR 7) of different specialist areas. Most respondents suggested that educators should have tertiary training in Technology Education.

(9) How receptive are learners of Technology Education?

The responses were again about 50/50 in favour of the subject and vice versa. Again the lack of facilities and equipment seems to play a role in the negativity towards the subject. Another important aspect is the way that the educator presents the subject so that it is interesting for the children. This again refers to the capability of educators to present Technology Education and that they should be trained to do so. A further remark is that boys are more receptive to the subject.

(10) How involved are parents in Technology programmes at your school?

80% (8 of 10) of the respondents were of the opinion that parents are not involved in Technology Education at their schools. Some indicated that one could see from the tasks that learners have to perform on their own, that the parents did help them.

From the responses we saw that parent involvement in Technology Education is very low.

(11) What is your advice in respect of resources for schools, which do not have resources to implement Technology Education? Should the schools wait to be resourced?

All the respondents agreed that schools must have a specific Technology classroom / laboratory or workshop that are fully equipped, to present the subject successfully. The opinion of the majority of Technology educators is that one should have enough resources to present Technology Education.

(12) How should classes be organized so that they are manageable in implementing Technology Education (teacher-learner ratio)?

The majority of the respondents felt that the classes are too big to work effectively, especially where practicals are involved. They suggested that the average number of learners in a Technology class should be between 20-25. The number of learners in a class group is a general problem for Technology educators. "To do practicals becomes impossible in big classes" (IR 8).

(13) Do you organize learners to work in groups?

All the respondents indicated that they make use of group work in their Technology classes. Some use it on a regular basis and some only with certain aspects of the subject.

Class discipline is a problem for some educators in the use of group work in their Technology classes. In general it seems that educators try to overcome the problem of big classes by using group work.

(14) What problems do you still experience with Technology Education?

The responses of the educators highlighted the following problems that are still being experienced with Technology Education:

- Educators don't know exactly what to do
- Need set guidelines from Department of Education (Syllabus?)
- Group work – some do the work and everybody receives the marks
- Language used in Common Task Assessment too high for children
- Big classes
- Learners not responsible enough – see OBE as where you may be "happy-clappy" (IR 9) in class.
- Resources and equipment in classrooms
- Children from poor community do not have sufficient resources and equipment at home.

From the above mentioned problems we may see that there are still a lot of problems / shortcomings regarding the subject Technology Education at schools. This confirms the responses to question 7 regarding the stumbling blocks with the implementation of Technology Education.

The following questions highlighted several problems regarding a part (25% Common Task Assessment – Refer to chapter 2, 2.1.8.10.2) of the assessment of Technology Education.

(15) What do you think about the CTA's? (Common Task Assessment)

The majority of those interviewed indicated that there are a lot of mistakes in the CTA's, some parts are not clear, language used is to difficult for children, and that the 25% weight that it carries is not enough to motivate the children to study for it.

A look at all the problems that educators experience with the CTA's, indicates that a possible solution to their problems and concerns may be a set syllabus from the Department of Education and a CTA that carries more weight in the final marks of Technology.

(16) Do you think it is too much like a comprehension test?

The general opinion amongst the respondents was that the Common Task Assessment was too much like a comprehension test. One of the respondents mentioned again that a prescribed syllabus would eliminate a lot of problems with Technology Education.

4.6 CHAPTER CONCLUSION

The discussion in this chapter focused on the processing, analysis and interpretation of the data obtained. Data from the questionnaires were analysed and interpreted to obtain general conclusions.

The researcher experienced that one may collect a lot of information and data from a personal interview and that one gets a glimpse of someone's world, thinking, knowledge and feelings.

According to the interviews the implementation of Technology Education had some stumbling blocks. After three years of implementation there are still problems and stumbling blocks, for example no set guidelines from the Department of Education, insufficient resources and equipment in classrooms, and insufficient training of educators.

The last chapter attempted to answer the research questions, tests the hypotheses and gives conclusions and recommendations.

CHAPTER FIVE

DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

In this final chapter a brief overview of the study will be given as well as a short look at the experiences of other countries regarding Technology Education. Thereafter conclusions on the results of chapter four will be drawn. Further on the chapter will test the hypotheses and research questions. Finally recommendations will be given derived from the study.

5.2 A BRIEF OVERVIEW

It was the aim of the researcher to investigate the implications of the introduction of Technology as a subject in schools and what the attitudes of educators are towards Technology as a subject and Outcomes-Based Education in general. The main aim of this study may be summarized by the following question: How successful was the introduction of Technology Education (in Secondary Schools in the Free State Province urban areas), how is the subject being taught and what problems are experienced? (Refer to chapter 1.6.1).

The objectives of this study were:

- To investigate the current stance of Technology Education in Free State secondary schools (Urban areas)
- To determine educators' perceptions of the old curriculum versus the curriculum 2005
- To get the opinion of educators towards the meaning/role of Technology Education
- To determine the level of training of educators for the new curriculum
- To determine the perception of educators regarding the teaching of Technology Education
- To investigate the opinion of educators regarding the role of Technology Education in Further Education and Training (FET)
- To determine the functioning of Technology Education in schools (Refer to chapter 1.3.4)

Further goals of this study were to:

- To give a general overview of Technology Education as a new learning area.
- To get an international perspective on Technology Education.
- To investigate the perceptions of teachers of Technology Education.
- To provide guidelines to educational authorities with regard to Technology Education.

- To give conclusions, discussions and recommendations about Technology Education as a possible new learning area in Further Education and Training (FET).

5.3 EXPERIENCES FROM OTHER COUNTRIES

Based on the research done in chapter two the following conclusions may be drawn regarding Technology Education in other countries:

- The four countries chosen in this research are at different stages of developing their Technology Education programs. In the USA Technology Education has generally been referred to as Industrial Arts from the depression era until the mid 1980's. In England the subject also took a long time to develop and was formally implemented for the first time in 1990, and the curriculum was revised in 1995. Australia began in 1987 with a project to develop Technology Education and it was completed in 1994. In Botswana Design and Technology has been declared a core subject since 1996 (See 2.3.2.1, 2.3.3.1, 2.3.4.1 and 2.3.5.1).

- Different countries use different terms to describe Technology Education such as, Design and Technology, Technology Education, and Technological Education. In all the countries the subject evolved from vocational subjects such as Industrial Arts, Vocational Education, Industrial Technology and Industrial Education. The

structure of the curriculum differs from one country to another. Although the countries under study are separated geographically at quite a distance from one another and their cultures also differ, there are several similar features in their curricular objectives, methods, and content (See 2.3.1, 2.3.2.1, 2.3.3.1, 2.3.4.1 and 2.3.5.1).

- Technological literacy is a universal goal. Principal objectives include:

  - understanding the role of science and technology in society
  - the balance between technology and the environment
  - the development of technological literacy
  - the development of skills such as planning, making, evaluating, social/moral/ethical thinking, innovativeness, awareness, flexibility, and entrepreneurship (See 2.3.2.2, 2.3.3.2, 2.3.4.2 and 2.3.5.2).

- The most significant content includes:

  - systems and structures of technology
  - professions in technology and industry
  - safety practices
  - ergonomics
  - design

- construction techniques
- assessment practices
- the role and history of technological development
- problem-solving strategies
- evaluating and valuing the relationship between society and nature (See 2.3.3.2, 2.3.4.2, 2.3.5.2).

- The list of content included in the curricula of the four countries was quite broad and extensive, making it very difficult to condense.

- The way in which Technology Education has been organised differs from country to country. For the most part, Technology Education at the primary level is integrated with other subjects, such as handicrafts and science. However, in England, where the practice is already several years old, Technology Education at the primary level is taught as a separate subject (See 2.3.2.2, 2.3.3.1, 2.3.4.2 and 2.3.5.2).

- Specialized subject educators (Former Industrial Arts, Vocational Education, Industrial Technology etc) usually teach Technology Education in the junior and senior secondary schools in the countries studied (See 2.3.2.1, 2.3.3.1, 2.3.4.3 and 2.3.5.1).

- Since Technology Education does not have a long tradition, the standards of teaching vary widely. The extent to which Technology

Education has evolved varies from one country to another, ranging from the highly developed programs in England to those less developed in other countries (See 2.3.1).

- The governments of industrialized countries increasingly acknowledge the central role of science and technology in transforming economic growth. If one looks at developed countries such as the USA, England, Australia etc., one finds that Technology Education is treated with respect and it is a national priority. National development and planning are geared towards human resources development through relevant Technology Education (See 2.3.2.2, 2.3.2.3, 2.3.3.2, 2.3.3.3, 2.3.4.1, 2.3.5.1 and 2.3.5.2).

- The implementation of Technology in other countries had many problems, one of the biggest being the shortage of Technology trained educators (See 2.3.1, 2.3.3.1 and 2.3.5.1).

General conclusion

In relation to this study the researcher has learned that from the above-mentioned conclusions it is evident that other countries studied in this research had similar experiences when they introduced Technology Education for the first time.

Technology Education evolved from vocational subjects, and the universal goal is to get all learners technologically literate and develop skills such as planning, making, evaluating, social/moral/ethical thinking, innovativeness, awareness, flexibility, and entrepreneurship.

Technology Education should be treated with respect and taught by specialised trained educators.

5.4 ANSWERS TO RESEARCH QUESTIONS

This section seeks to establish whether all research instruments were correctly applied, inclusive of textbooks, journals, articles, theses, etc. The specific research problem was stated in section 1.3, and further research questions in section 1.6.1. Both annexure 6 and 7 were used as reference for the formulation of questions to address the stated research problems. The responses to the questionnaire are given in section 4.4 and those to the interview questions in section 4.5.

To determine whether the findings of this research are valid and/or reliable, consider Table 5.1 below, which sets out the responses to the research problems and questions.

Table 5.1: Items related to research problem and research questions

RESEARCH PROBLEM (1.3) RESEARCH QUESTIONS (1.5.1)	QUESTIONNAIRE (ANNEXURE 6) AND QUESTIONNAIRE FINDINGS (5.4)	INTERVIEW (ANNEXURE 7) AND INTERVIEW RESPONSES (6.5)
How successful was the introduction of Technology Education?	**Section B** – Question 1.3,1.4,1.5,1.6,1.7,1.8 (1.8.1-1.8.5) **Chapter 4** - section 4.4.1, Table 4.3	Question 3 Question 4 Question 6 Question 9
How is the subject been taught?	**Section C** – Question 1, 3, 4, 9, 12, 13, 14, 17, 20, 21, 24, 34 **Chapter 4** – section 4.4.3, Table 4.4 and 4.4.5, Table 4.9	Question 3 Question 5 Question 12 Question 13
What problems are experienced?	**Section C** – Question 43, 46, 49, 54 **Chapter 4** – 4.4.7, Table 4.11	Question 7 Question 14 Question 15 Question 16
Are all educators equipped to teach Technology Education?	**Section B** – Question 23, 27, 28, 29, 31 **Section C** – Question 44, 45 **Chapter 4** – 4.4.4, Table 4.8	Question 7 Question 8
Is Technology implemented according to Curriculum 2005 requirements (OBE)?	**Section B** - Question 1.8.1, 1.8.4, 1.8.5, 1.9 (1.9.1-1.9.5), 23, 27, 28, 29, 31 **Section C** – Question 44 **Chapter 4** - section 4.4.1, Table 4.4	Question 5
Are educators willing to undergo training?	**Section B** – Question 23, 27, 28, 29, 31 **Section C** – Question 45	Question 6 Question 7 Question 8

- **How successful was the introduction of Technology Education?**

A very low percentage of educators (41.7%) feel that the implementation of Technology Education was successful and that schools were ready for it (Table 4.3). From the results to questions 3,4,6,9 and 14 in the

interviews it became evident that the situation / level / standard of Technology Education in different schools are not the same.

There were a lot of stumbling blocks for the implementation of Technology Education in schools (Section 4.5, question 7).

From these results we can see that the implementation of Technology Education was not that successful according to the educators that was involved and who teach the subject.

- **How is the subject been taught?**

Technology Education is a subject on its own and there are big differences in the syllabus that is used in different schools (Section 4.5, question 3and 5). Classes are very big and learners are organized into groups (Section 4.5, question 12 and 13).

Only 21.7% of the educators indicated that classrooms were equipped to teach Technology Education and 58,3% of the educators indicated that educators were already trained to implement Technology Education (Table 4.4) .

It is clear that educators feel that Technology Education should be taught by qualified educators in specialised classrooms. There is also a need for

more specific detail about the curriculum for Technology Education and correlation between schools (Results from table 4.9).

- **What problems are experienced?**

Most educators feel that the current functioning of Technology Education in schools are negatively affected by the lack of facilities and specialised training of educators in Technology Education (Results from table 4.11).

From the results in section 4.5, question 14 we saw that there are still a lot of problems / shortcomings regarding the subject Technology Education at schools. This confirms the responses to question 7 regarding the stumbling blocks with the implementation of Technology Education. Question 15 and 16 in section 4.5 highlighted several problems regarding with the assessment of Technology Education.

In conclusion we saw that there were problems experienced with the implementation of Technology Education and that there are still existing problems with Technology Education at schools.

- **Are all educators equipped to teach Technology Education?**

From the results in table 4.8, 85,0% of the educators were convinced that staff should still be subjected to Technology Education training and 53,3% of the educators are not convinced that staff at their schools were

adequately trained for Technology Education when it was introduced to their schools. Again can we refer to the stumbling blocks (Section 4.5, question 7) with the implementation of Technology Education.

Educators felt that they should have had formal training to implement Technology Education. There is a big demand for in service training in Technology Education (Section 4.5, question 8).

From these results it is clear that all educators are not fully equipped to present Technology Education at schools.

- **Is Technology implemented according to Curriculum 2005 requirements (OBE)?**

Technology is a subject on its own according to Curriculum 2005. The respondents agreed that it is a subject on its own (Section 4.5, question 5). 81,7% of the respondents indicated that educators were already trained to implement OBE (Results in table 4.4).

- **Are educators willing to undergo training?**

A high percentage (91,7%) of the respondents indicated that educator development was important during the introduction of the new curriculum in schools and also convinced that formal training for Technology Education is necessary (Results in table 4.8).

5.5 HYPOTHESES TESTING

The research hypotheses were stated in section 1.5 and used as a framework for designing the interview schedule and survey questionnaire. Table 5.2 outlines the hypotheses and indicates which survey and interview questions relate to particular hypothesis.

Table 5.2 Hypotheses testing through questionnaire and interview

HYPOTHESES	QUESTIONNAIRE (ANNEXURE 6) AND QUESTIONNAIRE FINDINGS (5.4)	INTERVIEW (ANNEXURE 7) AND INTERVIEW RESPONSES (6.5)
The current situation / level / standard of Technology in different secondary schools will not be the same. (Show big differences)	**Section B** – Question 1.3,1.4,1.5,1.6,1.7,1.8 (1.8.1-1.8.5) **Chapter 4** - section 4.4.1, Table 4.3+4.4	Question 3 Question 4 Question 6 Question 9 Question 14
The composition of Technology learning material will be different in schools.	**Section C** – Question 1.7, 49, 50, 51 **Chapter 4** – section 4.4.1, Table 4.3	Question 2 Question 3 Question 7 Question 14
The teaching of Technology does not take place according to OBE and C2005 in all schools.	**Section B** – Question 1.8 (1.8.1-1.8.5) 1.9 (1.9.1-1.9.5) **Chapter 4** - section 4.4.1, Table 4.4+4.5	Question 3 Question 6 Question 7 Question 9 Question 14

First hypothesis

The current situation / level / standard of Technology in different secondary schools will not be the same. (Show big differences)

From table 4.3 on the responses in the questionnaire [1.3,1.4,1.5,1.6,1.7,1.8 (1.8.1-1.8.5)] a very low percentage of educators feel that the implementation of Technology Education was successful and that schools were ready for it. About half of the respondents are of the opinion that the level of training is average to good, and a greater proportion of educators in group 1 (old regime) than from group 2 (previously disadvantaged) feel that their schools cover all aspects of Technology Education (4.4.1 table 4.3). From the results to questions 3,4,6,9 and 14 in the interviews it becomes evident that the situation / level / standard of Technology Education in different schools is not the same. This information confirms hypothesis one and two.

Second hypothesis

The composition of Technology learning material will be different in schools.

It already became clear that hypothesis two was confirmed by the information from table 4.3 from the questionnaire data. The following interview questions, question 2 (perception of Technology Education), question 3 (on syllabus that is used), question 7 (stumbling blocks) and

question 14 (problems with Technology Education) further confirm that Technology learning material will be different in schools.

From table 4.4 there seems to be a significant difference in proportions between the two groups regarding question 1.8 (How much did the school/institution do to prepare for the implementation of Technology Education?) and on question 1.8.3 (Technology programs and/or projects were planned and designed). These differences all show medium effect measurements. Question 1.8.2 (Classes were equipped) a greater proportion educators in group 1 (old regime) than in group 2 (previously disadvantaged) indicated that it was the case. Question 1.8.3 (Technology programmes/projects were planned and designed) also indicates that a greater proportion of educators from group 1 (old regime) than of group 2 (previously disadvantaged) agree that that was the case. This information again confirms hypothesis two that Technology learning material will be different in schools.

Third hypothesis

The teaching of Technology does not take place according to OBE and C2005 in all schools

There is a significant difference in proportions between the two groups regarding questions 1.9.1 (The curriculum is good for the 21st century). These differences have medium effect measurements. Question 1.9.1 shows that a greater proportion of educators from group 2 (previously

disadvantaged) than group 1 (old regime) feel that curriculum 2005 is good for the 21st century. Question 1.9.5 shows that a greater proportion of educators in group 1 (old regime) than in group 2 (previously disadvantaged) feels that it is based on education systems from other countries.

Furthermore there is also a significant difference in the proportions between the two groups regarding question 1.9.2 (It is too early to introduce curriculum 2005). A greater proportion of educators in group 1 (old regime) than in group 2 (previously disadvantaged) are of the opinion that it is too early to implement curriculum 2005.

From the responses in the questionnaires in table 4.4,4.5 and 4.6 it becomes clear that there are still big differences of opinion regarding the old curriculum, Curriculum 2005 and Outcomes-Based Education in general. This will definitely influence the teaching of Technology Education in schools and confirms hypothesis three.

Responses to the interview questions, question 3 (on syllabus that is used), question 6 (receptiveness of educators), question 7 (stumbling blocks), question 9 (receptiveness of learners) and question 14 (problems with Technology Education) further confirm that the teaching of Technology may not always take place according to Curriculum 2005 and Outcomes-Based Education in schools.

5.6 CONCLUSIONS ON QUESTIONNAIRE AND INTERVIEWS

5.6.1 Biographical changeables of respondents

From table 4.1 in section 4.2 it is clear that the majority of Technology educators are male, but more ladies are involved in the previously disadvantaged group. Educators from the old regime have higher qualifications and more heads of departments involved with Technology Education than educators from the previously disadvantaged group. The old regimes educators also have more years of teaching experience than those of the previously disadvantaged group (See table 4.2 in section 4.2). Teachers, heads of department and in some cases deputy principals are involved with Technology Education (4.5 question 1).

5.6.2 Stance of Technology Education in Free State schools (Urban areas)

The schools used in this investigation indicate as follows in section 4.4.1 as to when they started with Technology Education:

- 57% in 2000
- 38% in 2001
- 5% in 2002

A very low percentage of educators (41,7%) feel that the implementation of Technology Education was successful and that schools were ready for it. About half of the respondents (53,3) are of the opinion that the level of

training is average to good, and a high percentage of the educators (76,7%) are of the opinion that schools cover all aspects of Technology Education (4.4.1 table 4.3).

5.6.3 Preparation of schools for the implementation of Technology Education

Most of the educators (79,3%) indicated that classes were not equipped for Technology Education. Only 58,3% indicated that they were trained to implement Technology Education, while 81,7% indicated that they were already trained to implement Outcomes-Based Education (See section 4.4.1, table 4.4).

5.6.4 Perceptions of educators on Curriculum 2005 versus former curriculum

Only a few educators (30%) feel that the new curriculum is good for the 21st century, and most of them (78,3%) feel that the new curriculum is confusing to educators while 70% said it is based on systems from other countries (4.4.2, table 4.5). In the old curriculum 41.7% of educators feel that the system does not make learners passive in class and 50% of educators feel that educators and handbooks was the only source of information to learners. Further on 61,7% of educators were convinced that the old system encourages learners to be responsible for their own learning (4.4.2, table 4.6).

There are still big differences of opinion regarding the old curriculum and Curriculum 2005 (Section 4.4.2, table 4.5 and 4.6). This will definitely influence the teaching and standard of Technology Education in schools.

5.6.5 The meaning/role of Technology Education

Most participants had a general idea of what Technology Education is about. An important aspect arising from responses of most respondents is that the subject consists of theory, practical, problem solving, use of apparatus, skills development and "combine science with engineering" (IR 10) (See section 4.5, question 2).

There is a general positive attitude towards Technology Education, and agreement that it is of great value to learners (See results from table 4.7, section 4.4.3).

5.6.6 Educator training for implementation/teaching of Technology Education

A very high percentage (96,7%) of educators are convinced that educators need to be trained and developed (91,7%) to implement the new curriculum, and 91,7% are convinced that formal training is necessary for Technology Education. A further 85% of educators feel that staff should still be subjected to Technology Education training. Some educators (53,3%) are convinced that staff were not adequately trained

for Technology Education when it was introduced (Section 4.4.4, table 4.8).

A general perception exists amongst educators that educators were not trained adequately for the implementation/teaching of Technology. There is a big demand for in-service training in Technology Education (4.5 question 4 and 6).

5.6.7 Teaching of Technology Education

Technology Education is a subject on its own (4.5, question 5), should be taught by qualified educators (90% of responses), and curriculum development is needed (88,3% of responses). There are big differences in the "syllabus" that is used by different schools in Technology Education (6.5, question 3). Most educators (85,0%) agreed that Technology Education is an important learning area and that it should take place in specialised classroom (77% of responses) (4.4.5, table 4.9).

5.6.8 The role of Technology Education in Further Education and Training (FET)

According to the educators Technology Education does have a place in the FET sector. They are convinced (81,7%) that Technology Education should be an elective subject in FET. 78,3% are convinced that Technology Education is relevant to FET and that it will also form part of

other learning areas in FET (73,3%). Fewer educators (58,3%) are convinced that Technology Education prepares learners for the learning areas in the FET (4.4.6, table 4.10).

5.6.9 Functioning of Technology Education in schools

Educators (93,3%) feel that the current functioning of Technology Education in schools are negatively affected by the lack of facilities, and that specialised training of educators is necessary to improve the quality of Technology Education (86,7% of responses). Schools are still experiencing problems with the teaching of Technology Education (81,7% of responses table 4.11, 4.5 question 14).

5.6.10 Syllabus for Technology Education

There are big differences of opinion regarding the "syllabus" for Technology Education that is used by different schools (4.5 question 3, IR 5 question 6 in annexure 8). It seems that schools do not use the same "syllabus" (4.5 question 9, IR 5 question 6 and 8 in annexure 8).

5.6.11 Stumbling blocks for the implementation of Technology Education

There were different stumbling blocks for the implementation of Technology Education (See five key areas in section 4.5 question 7).

A general conclusion is that educators are not trained, classes are too big, classes are not equipped, and no clear syllabus / guidelines exists.

5.6.12 Training of educators for Technology Education

Most respondents (91,7%) suggested that educators must have tertiary training in Technology Education (4.5 question 8 and 4.4.4 table 4.8). Staff should still be subjected to Technology Education training (85,0% of responses in section 4.4.4).

5.6.13 Learners' receptiveness to Technology Education

From the responses about 50% concerned were in favour of the subject and 50% not in favour of the subject. The capability (training) of educators seems to have played a role in this (4.5 question 9).

5.6.14 Parent involvement in Technology Education at schools

Parent involvement is very low in Technology Education according to the interview respondents (4.5 question 10).

5.6.15 Resources and specific classrooms for Technology Education

Schools need to be resourced to present Technology Education effectively (4.5 question 11). Most educators (93,3% of respondents) are

convinced that schools need a specific workshop/laboratory for Technology Education (4.4.7).

5.6.16 Educator-learner ratio for Technology Education

According to the responses of the interviews an average size of a Technology class must be between 20 to 25 learners to make it possible for the practical parts of the subject (4.5 question 12). Educators should make use of group work on a regular base (4.5 question 13).

5.6.17 Problems still experienced with Technology Education

There are still a lot of problems / shortcomings regarding the subject Technology Education at schools (4.5 question 14). This confirms the responses regarding the stumbling blocks with the implementation of Technology Education (4.5 question 7).

5.6.18 Common Task Assessment (CTA) of Technology Education

The CTA's does not carry enough weight to motivate learners to study for them, and the lack of a clear syllabus from the Department of Education seems to be a problem for the preparation for the CTA's. Many mistakes in the CTA's and its comprehension test nature are also a concern (4.5 question 15, 16).

5.6.19 Conclusion

When we analyse these general conclusions, the purpose (1.3.3) of this study as well as the objectives (1.3.4) were reached. Furthermore, the research questions (1.6.1) were also addressed and answered. (5.4)

5.7 RECOMMENDATIONS

Based on the findings the researcher offers the following recommendations with regard to:

5.7.1 Stance of Technology Education at schools

Educators are of the opinion that the implementation of Technology Education was not that successful and that schools were not ready for it (5.4.2, 5.4.3). There are also big differences of opinion regarding Curriculum 2005 (5.4.4).

It is recommended that the Department of Education should provide assistance to schools that are still experiencing problems in this regard. Technology Education subject advisors/facilitators should visit schools several times per year for guidance, assistance and standard/level control.

5.7.2 Role of Technology Education

The learning area should be developed to its full potential for all learners because it plays an important part in problem solving, use of apparatus and skills development. Most educators (85%) agreed that Technology is an important learning area, same as in other countries. There is a positive attitude towards the Learning area of Technology and it is of great value to learners because it covers such a variety of topics (5.4.5).

5.7.3 Classrooms / laboratories and resources

Technology should be taught in a specialised classroom (5.4.7). Educators (93,3%) are convinced that schools need a specific workshop/laboratory for Technology Education (5.4.15). The lack of facilities has a negative effect on the teaching of Technology (5.4.9).

Schools need resources to present Technology Education (5.4.15). Technology classrooms should be fully equipped and resourced to present Technology effectively. 79,3% of educators indicated that classes were not equipped for Technology Education (5.4.3). In this regard industry may be incorporated to finance the specialized classrooms and equipment.

5.7.4 Curriculum

Further curriculum development is needed for Technology Education (5.4.7). There are big differences between schools on the specific work that is done in Technology Education (5.4.7).

5.7.5 Syllabus

There should be a specific syllabus for Technology Education so that all schools may do the same work. This will result in the fact that educators will know exactly what to do and that it will not be a problem if a learner moves from one school to another (5.4.10, 5.4.11).

5.7.6 Educators training for Technology Education

Qualified educators should teach Technology (5.4.7). Educators need to be formally trained to present Technology and in service training is still necessary for Technology educators. 96,7% of the respondents are convinced that educators need to be trained and developed (5.4.6), and 91,7% suggested that educators must have tertiary training in Technology Education (5.4.12). Learners' attitude towards the subject will improve if the subject is presented by qualified educators (5.4.13).

5.7.7 Educator-learner ratio

The educator-learner ratio for Technology classes should be not more than 1: 20-25 learners per class. Technology has practical components and it is impossible to do practicals if class sizes are too big (5.4.16).

5.7.8 Common Task Assessment (CTA)

Common Task Assessment must carry more weight and a common syllabus for all schools is necessary (5.4.18).

5.7.9 Parent involvement in Technology Education

Educators should try and get parents more involved in Technology programmes at their schools (5.4.14).

5.7.10 Stumbling blocks

The stumbling blocks that existed with the implementation of Technology Education should be removed (5.4.11). The following key areas were identified:

- No syllabus / No clear guidelines from department (IR's 2, 3, 5, 8)
- Poor training / Don't know what to do / Time frame for implementation too short (IR's 3, 5, 6, 9)

- Facilities / Not sufficient equipment (IR's 1, 6, 7, 10)
- Class sizes too big (IR'S 1, 8)
- Too much theory – not enough practicals (IR 1).

5.7.11 Problems still experienced with Technology Education

Schools and the Department of Education should work together and try to solve the existing problems with Technology Education.

The following problems do still exist. Most of them have already been addressed in the previous recommendations.

Existing problems:

- Educators don't know exactly what to do
- Need set guidelines from Department of Education (Syllabus?)
- Group work – some do the work and everybody receives the marks
- Language used in Common Task Assessment too high for children
- Big classes
- Learners not responsible enough – see OBE as where you may be "happy clappy" (IR 9) in class.
- Resources and equipment in classrooms
- Children from poor communities do not have a lot of resources and equipment at home.

5.7.12 Technology Education in Further Education and Training

Technology Education should be an elective learning area in Further Education and Training (5.4.8).

5.8 FURTHER RESEARCH

The Technology programmes of other countries studied in this research indicated that Technology is a learning area from primary school to the end of secondary school (Grade 1 – 12).

In South Africa Technology Education is only a compulsory learning area from grade 1 to grade 9. An area for further research will definitely be to look at the inclusion of Technology Education as an elective learning area in the Further Education and Training sector (FET).

The following areas are recommended for further research:

- Technology educator training in South Africa
- The retraining of Technology educators by means of in-service training programmes based on OBE principles
- The development of a Technology Education curriculum for the FET
- Technology Education as an elective learning area in the FET

5.9 CHAPTER CONCLUSION

In the final chapter of this study a brief overview of the most important activities of the research was given. The research questions and hypotheses were also tested. Conclusions on experiences of other countries were drawn, as well as the conclusions based mainly on the research objectives formulated in chapter one, and further objectives in chapter one. This was followed by recommendations with regard to the study and possible future research.

Finally, as UNESCO (Project 2000+:1983) stated, by the year 2001, there should be in place appropriate structures and activities to foster science and technology literacy for all. South Africa did implement Technology Education in the schools as a new learning area and part of Curriculum 2005. South Africa will have more success if it looks towards other developing nations, which are transforming or have transformed themselves into developed nations. By following the examples of these countries, and by adapting their technologies and methodologies to suit local needs, South Africa will be better positioned to achieve similar success.

From the results of this study it is evident that the implementation of Technology Education in secondary schools in the Free State Province was not that successful.

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(2 June 2003)

ANNEXURE 1

Letter to Department of Education (Questionnaire)

Tel. 082 825 1376
E-mail heymansd@tfs.ac.za

PO Box 20127
Willows
BLOEMFONTEIN
9320

21 October 2003

The Head
Free State Department of Education
Private Bag X20565
BLOEMFONTEIN
9300

For attention: Chief Education Specialist: IRRISS
Room 1204
Provincial Government Building
Tel: (051) 404 8077
Fax:(051) 404 8074

RE: PERMISSION FOR COMPLETION OF RESEARCH QUESTIONNAIRE

Dear Sir / Madam

I hereby apply for permission to use some schools in the Free State urban areas as my subject and/or population for a questionnaire as part of a research project for my Magister Technologiae: Education thesis with Technikon Free State on the the implementation of Technology Education as part of Curriculum 2005 project. The title of my dissertation is: **The Implementation Of Technology Education In Secondary Schools In The Free State Province (Urban Areas).**
My study leader is Prof AJ Pienaar. Attached you will find a model of my questionnaire and interviews.

Thanking you in anticipation.

Yours faithfully

JH Heymans

ANNEXURE 2

Letter of approval from Department of Education

FREE STATE PROVINCE

Enquiries : Mrs M V Wessels/
Reference no. : 16/4/1/45-2003

Tel :(051) 404 8075
Fax :(051) 4048074

2003-10-22

Mr JH Heymans
PO Box 20127
WILLOWS
9320

Dear Mr Heymans

REGISTRATION OF RESEARCH PROJECT

1. This letter is in reply to your application for the registration of your research project.

2. Research topic: **The implementation of Technology Education in secondary schools in the Free State Province.**

3. Your research project has been registered and you may conduct research in the Free State Department of Education under the following conditions:

   3.1 Educators participate voluntarily in the project.
   3.2 The names of all schools and educators involved remain confidential.
   3.3 This letter is shown to all participating persons.

4. You are requested to donate a report on this study to the Free State Department of Education. It will be placed in the Education Library, Bloemfontein.

5. Once your project is complete, we should appreciate it if you would present your findings to the relevant persons in the FS Department of Education. This will increase the possibility of implementing your findings wherever possible.

6. Would you please write a letter **accepting the above conditions**? Address this letter to:

   The Head: Education, for attention: CES: IRRISS
   Room 1204, Provincial Government Building
   Private Bag X20565, BLOEMFONTEIN, 9301

7. We wish you every success with your research.

Yours sincerely

JS Tladi
Chief Director: Strategic Management Services

cc Directors of Districts: Motheo and Lejweleputswa

ANNEXURE 3

Letter to Department of Education (Accept conditions)

Tel. 082 825 1376
E-mail heymansd@tfs.ac.za

PO Box 20127
Willows
BLOEMFONTEIN
9320

04 November 2003

The Head
Free State Department of Education
Private Bag X20565
BLOEMFONTEIN
9300

For attention: Chief Education Specialist: IRRISS
Room 1204
Provincial Government Building
Tel: (051) 404 8077
Fax:(051) 404 8074

RE: REGISTRATION OF RESEARCH PROJECT

Dear Sir / Madam

I refer to your letter Ref no.: 16/4/45-2003. I hereby accept the conditions in your letter for my research project.

Yours sincerely

JH Heymans

ANNEXURE 4

Letter to Headmasters for permission to complete questionnaire

Tel: (051) 522 9733 (h)
(051) 507 3241 (w)
Cell 082 825 1376
Fax: (051) 507 3320 (w)
E-mail heymansd@tfs.ac.za

PO Box 20127
Willows 9320
BLOEMFONTEIN

12 November 2003

RE: PERMISSION FOR COMPLETION OF RESEARCH QUESTIONNAIRE

Dear Sir/Madam,

I hereby apply for permission to use educators at your school to complete a research questionnaire and participate in interviews.

My research project evaluates the implementation of Technology Education in Secondary Schools in the Free State Province urban areas as part of Curriculum 2005 project. My promoter is Prof. AJ Pienaar

Attached please find a copy of permission from the Free State Department of Education to conduct research in schools.

Thanking you in anticipation.

Yours faithfully

JH Heymans

ANNEXURE 5

Cover letter for questionnaire

Technikon Free State
Private Bag X20539
Bloemfontein
9300
10 November 2003

Dear Sir/Madam

The Department and the Ministry of Education has launched the new curriculum (Curriculum 2005) with eight learning areas. For the first time in the history of our education, Technology Education as a new learning area was implemented in secondary schools in 2001. Some schools in the Free State province have already started with Technology programmes in their curricula during 2000.

To help realise the vision of providing a lifelong education to our learners through the implementation of Technology Education, and realising that your school/institution is committed to implementing Technology Education as a new field of study, you are hereby (through your permission) requested to give your candid, honest opinion of Technology programmes and/or curriculum 2005 in effect as educator by filling-in the questionnaire which will help evaluate Technology Education programmes at your school/institution.

You are therefore, requested to give a few minutes of your time, (approximately fifteen minutes) to complete the questionnaire. I trust you will be willing to cooperate towards realising what the status of Technology Education at our schools is.

Thank you for the courtesy of your assistance.

Yours sincerely

JH Heymans (Mr)

ANNEXURE 6

Example of questionnaire

QUESTIONNAIRE FOR TECHNOLOGY EDUCATORS

TECHNIKON FREE STATE

THE IMPLEMENTATION OF TECHNOLOGY EDUCATION IN SECONDARY SCHOOLS IN THE FREE STATE PROVINCE. (URBAN AREAS)

JH Heymans **20259778**

Supervisor: **Prof AJ Pienaar**

Technikon Free State
Private Bag X20539
Bloemfontein
9300
10 November 2003

Dear Sir/Madam

The Department and the Ministry of Education has launched the new curriculum (Curriculum 2005) with eight learning areas. For the first time in the history of our education, Technology Education as a new learning area was implemented in secondary schools in 2001. Some schools in the Free State province have already started with Technology programmes in their curricula during 2000.

To help realise the vision of providing a lifelong education to our learners through the implementation of Technology Education, and realising that your school/institution is committed to implementing Technology Education as a new field of study, you are hereby (through your permission) requested to give your candid, honest opinion of Technology programmes and/or curriculum 2005 in effect as educator by filling-in the questionnaire which will help evaluate Technology Education programmes at your school/institution.

You are therefore, requested to give a few minutes of your time, (approximately fifteen minutes) to complete the questionnaire. I trust you will be willing to cooperate towards realising what the status of Technology Education at our schools is.

Thank you for the courtesy of your assistance.

Yours sincerely

JH Heymans (Mr)

1. ORIENTATION

This research questionnaire is part of Magister Technologiae: Education degree with Technikon Free State in the faculty of Human Sciences. The purpose of the research is to collect data information regarding the implementing of Technology Education in Secondary schools. The information collected will be used as a guideline in the evaluation of the implementation of Technology Education and the current status of the subject as part of the Curriculum 2005 in Secondary schools in the Free State Province (Urban areas).

2. CONFIDENTIALITY

You are assured that your answers in respect of this questionnaire will be dealt with confidentially. To ensure the confidentiality of all information your name and that of the school need not appear on the questionnaire. Also do not consult fellow teachers when you answer the questionnaire.

3. GUIDELINES FOR COMPLETING THE QUESTIONNAIRE

Circle the number corresponding to your answer. In **Section 1,** circle the applicable or one number per block where necessary

EXAMPLE

1. Male | 1 |
   Female | 2 |
   (If male, **circle 1**)

2. Your age in years | 3 | 0 |
   (Fill in 30, if you are 30 years old)

3. Your teaching experience. | 0 | 2 |
   (Fill in 02, if you have 2 complete years teaching experience)

SECTION A: PERSONAL AND BACKGROUND INFORMATION

OFFICE USE

[1-2]

1. Gender (**Circle** your answer)

Male	1
Female	2

[3]

2. Years of teaching experience (Please fill in complete years)
e.g. fill in **03** if you have 3 yrs experience

[4-5]

3. At what phase /level do you mainly teach? (**Circle** your answer)

Primary Phase	1
Secondary Phase	2

[6]

4. Number of pupils in your class

[7-8]

5. Highest Education level

Standard 10	1
PTC	2
PTD	3
Degree only	4
PTD + Degree (e.g. BA)	5
Post Graduate Diploma (HED)	6
Higher Degree (Hons)	7
Other training (specify):	8

[9]

6. Occupation:

Teacher/Educator/Lecturer/Tutor	1
Principal	2
HOD	3
Other (specify):	4

[10]

SECTION B: SCHOOL/INSTITUTION

1. Does your school offer Technology Education at present?
   Please **encircle** the appropriate code

Yes	1
No	2

[11]

1.1 Since when has your school presented Technology Education?

Please **encircle** the appropriate code

2000	1
2001	2
2002	3

[12]

1.2 Was your school one of the pilot schools with the implementation of Technology Education?

Please **encircle** the appropriate code

Yes	1
No	2

[13]

1.3 Rate the success of the introduction of Technology Education at your school during the first two years of implementation (Please **encircle** the appropriate number)

Not so successful						Very successful
	0	1	2	3	4	

[14]

1.4 Current level of Technology Education, according to you, at your school?

Not so good						Very good
	0	1	2	3	4	

[15]

1.5 Readiness of staff to present Technology Education when it was introduced at your school

Not ready						Ready
	0	1	2	3	4	

[16]

1.6 Current capability of staff who present Technology Education at your school

Not so good	0	1	2	3	4	Very good

[17]

1.7 Does your school cover all aspects of Technology Education?

Not at all	0	1	2	3	4	To a large extent

[18]

1.8 How much did the school/institution do to prepare for the implementation of Technology Education? (Please **encircle** the appropriate code)

	Yes	No	
1.8.1 Teachers were trained to implement Technology Education	1	2	[19]
1.8.2 Classes were equipped	1	2	[20]
1.8.3 Technology programs and/or projects were planned and designed	1	2	[21]
1.8.4 Teachers were trained to implement Curriculum 2005	1	2	[22]
1.8.5 Teachers were trained to implement OBE	1	2	[23]

1.9 How do you feel about the new Curriculum 2005? (Please **encircle** the appropriate number)

	Yes	No	Uncertain	
1.9.1 The curriculum is good for the 21st Century	1	2	3	[24]
1.9.2 It is too early to introduce Curriculum 2005	1	2	3	[25]
1.9.3 Educators need thorough training in Curriculum 2005	1	2	3	[26]
1.9.4 Curriculum 2005 is confusing to teachers	1	2	3	[27]
1.9.5 Curriculum 2005 is based on foreign education systems	1	2	3	[28]

SECTION C: QUESTIONNAIRE ITEMS

C1. According to your present knowledge to what extent are the statements below TRUE?
(Please **encircle** the appropriate number)

1. Technology Education involves the use of computers in class?

Not at all	0	1	2	3	4	To a large extent	[29]

2. The old Curriculum/education system encourages learners to be passive in class

Not at all	0	1	2	3	4	To a large extent	[30]

3. A School technology programme should operate closely with the industry

Not at all	0	1	2	3	4	To a large extent	[31]

4. Technology Education must be a compulsory learning area at primary school level

Not at all	0	1	2	3	4	To a large extent	[32]

5. Curriculum 2005 is exam-driven

Not at all	0	1	2	3	4	To a large extent	[33]

6. Technology education is need or want driven

Not at all	0	1	2	3	4	To a large extent	[34]

7. According to old curriculum, teachers and textbooks are the only source of knowledge for learners

Not at all	0	1	2	3	4	To a large extent	[35]

8. Technology affects society and the world of work

Not at all	0	1	2	3	4	To a large extent	[36]

9. Technology Education involves Science

Not at all	0	1	2	3	4	To a large extent	[37]

10. Curriculum 2005 is learner-centred

Not at all	0	1	2	3	4	To a large extent	[38]

11. Curriculum 2005 is teacher-centred

Not at all	0	1	2	3	4	To a large extent	[39]

12. Technology involves art

Not at all	0	1	2	3	4	To a large extent	[40]

13. Technology Education encourages learners to solve their own problems

Not at all	0	1	2	3	4	To a large extent	[41]

14. Technology Education should be taught as part of other subjects e.g. science, maths, art at primary level.

Not at all	0	1	2	3	4	To a large extent	[42]

15. Teachers will adapt easily to Outcomes-Based Education

Not at all	0	1	2	3	4	To a large extent	[43]

16. The old curriculum encourages learners to take responsibility for their learning

Not at all	0	1	2	3	4	To a large extent	[44]

17. Technology Education encourages learners to work with others in class

Not at all	0	1	2	3	4	To a large extent	[45]

18. Curriculum 2005 encourages teachers to act as facilitators in class

Not at all	0	1	2	3	4	To a large extent	[46]

19. Curriculum 2005 enforces individual learning

Not at all	0	1	2	3	4	To a large extent	[47]

20. Technology Education should be taught in a regular classroom

Not at all	0	1	2	3	4	To a large extent	[48]

21. Technology Education should be taught by qualified teachers

Not at all	0	1	2	3	4	To a large extent	[49]

22. Technology Education encourages learners to generate their own problems in class

Not at all	0	1	2	3	4	To a large extent	[50]

23. Teachers need training in order to implement Curriculum 2005

Not at all	0	1	2	3	4	To a large extent	[51]

24. Technology Education must be taught in a specialised classroom

Not at all	0	1	2	3	4	To a large extent	[52]

25. Technological literacy must become a central concern of the education system

Not at all	0	1	2	3	4	To a large extent	[53]

26. Incorporating Technology Education into every school system will require curriculum development

Not at all	0	1	2	3	4	To a large extent	[54]

27. Introducing Technology Education into the school curriculum will require teacher development.

Not at all | 0 | 1 | 2 | 3 | 4 | To a large extent [55]

28. Introducing a new curriculum (Curriculum 2005) will require dedicated teaching staff

Not at all | 0 | 1 | 2 | 3 | 4 | To a large extent [56]

29. Teachers will adapt easily to curriculum changes

Not at all | 0 | 1 | 2 | 3 | 4 | To a large extent [57]

30. Technology extends people's ability to modify the world

Not at all | 0 | 1 | 2 | 3 | 4 | To a large extent [58]

31. Formal training of staff is needed for Technology Education

Not at all | 0 | 1 | 2 | 3 | 4 | To a large extent [59]

32. Schools organised INSET programs for staff in Technology Education

Not at all | 0 | 1 | 2 | 3 | 4 | To a large extent [60]

33. There were problems when introducing Technology Education in grade 8 and 9

Not at all | 0 | 1 | 2 | 3 | 4 | To a large extent [61]

34. Technology Education is a relevant subject in general education

Not at all | 0 | 1 | 2 | 3 | 4 | To a large extent [62]

35. Technology Education is a compulsory subject in the senior phase of GET

Not at all | 0 | 1 | 2 | 3 | 4 | To a large extent [63]

C2. Please <u>encircle</u> the appropriate number to give your opinion on the following questions

36. Do you think Technology Education must be an elective subject in FET?

Not at all | 0 | 1 | 2 | 3 | 4 | To a large extent [64]

37. Do you think Technology Education belongs to schools with a technical character?

Not at all | 0 | 1 | 2 | 3 | 4 | To a large extent [65]

38. If there were a choice, would you choose that your school continue with Technology Education or not?

Not at all | 0 | 1 | 2 | 3 | 4 | To a large extent [66]

39. Is there any relevance for Technology Education in FET at your school?

Not at all	0	1	2	3	4	To a large extent	[67]

40. Do you think Technology Education in grades 8 and 9 prepares learners for learning areas in FET?

Not at all	0	1	2	3	4	To a large extent	[68]

41. Do you think Technology Education cover the introduction/preparation of a variety of specialist learning areas?

Not at all	0	1	2	3	4	To a large extent	[69]

42. Do you regard Technology Education as just a broadening of general knowledge for all learners?

Not at all	0	1	2	3	4	To a large extent	[70]

43. Do you think there is room for improvement in the quality of Technology Education at your school?

Not at all	0	1	2	3	4	To a large extent	[71]

44. Do you think staff at your school were fully equipped to present Technology Education when it was introduced at your school?

Not at all	0	1	2	3	4	To a large extent	[72]

45. Do you think staff can still undergo training in Technology Education?

Not at all	0	1	2	3	4	To a large extent	[73]

46. Do you think a school needs a specific workshop/laboratory for Technology Education?

Not at all	0	1	2	3	4	To a large extent	[74]

47. Does your school have a specific workshop/laboratory for Technology Education?

Not at all	0	1	2	3	4	To a large extent	[75]

48. Do you regard Technology Education as an important learning area?

Not at all	0	1	2	3	4	To a large extent	[76]

49. Do you think that all schools cover all the aspects of Technology Education?

Not at all	0	1	2	3	4	To a large extent	[77]

50. Does your school cover all the aspects of Technology Education?

Not at all	0	1	2	3	4	To a large extent	[78]

51. Does your school only do parts of Technology Education that are applicable for FET?

Not at all	0	1	2	3	4	To a large extent	[79]

52. Do you think Technology Education is going to continue in the FET as a learning area?

Not at all	0	1	2	3	4	To a large extent	[80]

53. Do you think Technology Education will be part of other learning areas in FET?

Not at all	0	1	2	3	4	To a large extent	[81]

54. Do you think schools still experience problems with Technology Education?

Not at all	0	1	2	3	4	To a large extent	[82]

55. According to your own view, what is ***"Technology Education":*** _____

_____

_____

_____

_____

THANK YOU FOR YOUR TIME AND CO-OPERATION

Information needed in respect of questionnaire

Key/Information	Question No.
1. Personal and background information of teachers	**Section A:** 1 - 6
2. Perception and/or definition of Technology Education	**Section C:** 1, 6, 7, 8, 9, 13, 14, 15, 19, 30, 31
3. a) Perception about old system of Education/curriculum 2005 b) Perception about new system of Education/curriculum 2005	**Section C:** 2, 5, 10, 12, 21, 49
4. Information regarding new approach to learners (new curriculum)	**Section C:** 11; 15; 16; 18, 22, 25, 42
5. Information regarding educators/teachers and learners (new curriculum) Knowledge teachers have, and training received (new curriculum)	**Section C:** 9,14, 17, 18, 25, 20, 23, 28, 29, 44, 45, 48
6. Information regarding implementing Technology Education as a new learning area in the general curriculum and school programme	**Section B:** 1.1 – 1.8 **Section C:** 4, 5, 6, 26, 27, 28, 31, 32
7. Teacher opinion on Technology Education in general and at schools	**Section B:** 1.9.1 – 1.9.5 **Section C:** 3, 4, 29, 36, 37, 38, 39, 40, 41, 42, 43, 52, 53
8. Information regarding institutions	**Section B:** 1.1 – 1.8 **Section C:** 43, 46, 47, 49, 50, 51, 54
9. Educational facts	**Section C:** 21, 23, 24, 25, 26, 30, 31, 33, 34, 35, 40, 54
10. Current status of Technology Education at schools	**Section B:** 1.4, 1.6, 1.7 **Section C:** 32, 34, 35, 39, 43, 45, 47, 49, 50, 51

ANNEXURE 7

Example of interview schedule (English and Afrikaans)

Interview: Technology Teacher

QUESTION: Sir/Madam, what is your main duty at this school?

QUESTION: What is TE all about?

QUESTION: Do you use a prescribed syllabus or have you developed your own?

QUESTION: Are there other teachers who helped you to implement TE at this school?

QUESTION: Is TE a subject on its own?

QUESTION: How are other teachers receptive to TE?

QUESTION: What were the stumbling blocks for the implementation of TE at your school?

QUESTION: What level of education or qualification must teachers have in order to implement TE?

QUESTION: How receptive are learners of TE?

QUESTION: How involved are parents in technology programmes at your school?

QUESTION: What is your advice in respect of resources for schools, which do not have resources to implement TE. Should the schools wait to be resourced?

QUESTION: How should classes be organized so that they are manageable in implementing TE (teacher-learner ratio)?

QUESTION: Do you organize learners to work in groups?

QUESTION: What problems do you still experience with TE?

QUESTION: What do you think about the CTA's? (Common Task Assessment)

QUESTION: Do you think it is too much like a comprehension test?

Onderhoud: Tegnologie onderwyser

VRAAG:	Meneer /Mevrou, wat is u hooftaak by die skool?
VRAAG:	Wat behels TO?
VRAAG:	Gebruik u 'n voorgeskrewe syllabus of het u u eie syllabus ontwikkel?
VRAAG:	Was daar ander onderwysers wat u gehelp het om TO by die skool te implementer?
VRAAG:	Is TO 'n vak op sy eie?
VRAAG:	Is ander onderwysers ontvanklik vir TO?
VRAAG:	Wat was die struikelblokke met die implementering van TO by u skool?
VRAAG:	Wat se vlak van opvoeding of kwalifikasie moet onderwysers hê om TO te implementer?
VRAAG:	Hoe ontvanklik is leerlinge vir TO?
VRAAG:	Hoe betrokke is ouers by TO programme by u skool?
VRAAG:	Dink u 'n skool moet eers toegerus wees en die nodige hulpmiddele hê vordat TO geimplementeer kan word?
VRAAG:	Hoe moet klasse ingedeel word sodat hulle hanteerbaar is vir die implementering van TO?
VRAAG:	Deel u leerlinge in groepe om te werk?
VRAAG:	Wat se probleme ondervind u steeds met TO?
VRAAG:	Wat dink u van die GTA's? (Gemeenskaplike Taak Assessering)
VRAAG:	Sou u sê dit is te veel soos 'n begripstoets?

ANNEXURE 8

Transcripts of interviews

Interview Respondent 1: Technology teacher

VRAAG: *Wat is u hoof taak by die skool?*

Antwoord: Ek gee ook Tegnologie en die aanbied van klasse vir die Graad 9's om Tegnologie aan te bied op 'n daaglikse basis volgens die riglyne wat ons self saamgestel het en nie deur die Departement saamgestel is nie.

VRAAG: *Wat in u woorde sou u sê behels Tegnologie onderwys?*

Antwoord: Om spesifieke uitkomstes te bereik. Daar is verskeie fasette by betrokke en ek weet nie presies hoe u dit wil hê nie maar die vak is baie wyd en hy raak baie rigtings aan, Inligtingstegnologie, daar is prakties by betrokke, Teorie ens. 'n Mens sou net graag dit beter wou kombineer. Dis nie altyd moontlik nie.

VRAAG: *Werk u volgens 'n voorgeskrewe sillabus of het u u eie sillabus ontwikkel vir tegnologie onderwys?*

Antwoord: Aanvanklik het ons 'n voorgeskrewe sillabus wat baie vaag was, wat baie wyd was, om nou eerlik te sê wat nie baie veelseggend was nie. Om te begin om ons eie sillabus te implimenteer wat nie net die teorie insluit nie maar die eindproduk in praktyk meegebring het waar die kind teorie gedoen het en daarna die praktiese deel daarvan ek dit was baie suksesvol. Ons kon ongelukkig nie voortgaan om dit te doen nie want daar is 'n CTA op ons afgedruk wat al die kinders moet doen. Ons kon

nie daardie program voltooi nie wat eintlik baie jammer vir my was want dit was uiters suksesvol vir die kinders. Hulle het ongelooflik baat gevind daarby. Al die uitkomste is aangeraak en behalwe dit die kinders het baie belang gestel en was baie gemotiveerd gewees.

VRAAG: *Goed. Was daar ander onderwysers wat u gehelp het toe Tegnologie onderwys geïmplimenteer is by die skool?*

Antwoord: Nee. Die skool self het nie. Jy moes maar self jou eie inligting kry en aan die gang kom. In verband met Tegnologie hulle het vir ons ons die pakket deurgegee van die Departement af maar die res moet jy maar self voorsien.

VRAAG: *Is Tegnologie Onderwys dan nou 'n vak op sy eie in die skool?*

Antwoord: Ja dit word aangebied as 'n vak op sy eie van Graad 8 tot 9 en hardloop apart ja.

VRAAG: *Is ander onderwysers aanvanklik vir die vak Tegnologie Onderwys?*

Antwoord: Nie baie nie omdat dit eintlik 'n heeltemal nuwe vak is waarvoor daar nie baie inligting beskikbaar in die skool opset nie. Die ander leer areas skakel baie in met die vakke wat reeds aangebied was baie makliker vir die onderwysers om dit te implimenteer maar Tegnologie is heeltemal losstaande en die probleem is dat die onderwysers het nie die ondervinding en die opleiding om van die aspekte aan te bied nie want

jy kry die gevalle waar jy nou die houtwerkonderwyser moet nou byvoorbeeld voedsel en kleding aanbied waarvan hy niks weet nie en dieselfde geld vir die huishoudkunde juffrou wat nou moet tegniese tekening en houtwerk tipe van inligting aanbied.

VRAAG: *Wat sal u dan as van die hoof strykelblokke beskou met die implementering van 'n vak soos Tegnologie Onderwys vir die skool?*

Antwoord: Wat my betref hang dit totaal in die lig ek sien Tegnologie as 'n uitstekende vak met baie moontlikhede maar met die grootte van die klasse en die totale ontoereikende toerusting aan die klasse en so aan is dit baie moeilik dan nly dit maar weereens 'n teoretiese vak waar ek nou gesien het waar ek dink daar behoort baie meer prakties gerig te gewees maar dit impliseer onkostes.

VRAAG: *Wat se vlak van opvoeding of kwalifikasies sal u sê moet 'n onderwyser hê om Tegnologie Onderwys aan te bied?*

Antwoord: Dit is vir my moeilik om te sê want ek twyfel of daar werklike opleiding is as jy die volle omvang van tegnologie wil aanbied. Dit is maklik om te sê gee vir 'n onderwyser enige inligting hy kan dit aanbied maar as jy nie werklik kennis het van 'n vak en die ondervinding en agtergrond het nie dan bly dit altyd moeilik want en gaan daar inligting verlore vir die kinders.

VRAAG: *Hoe ontvanklik was die leerlinge vir Tegnologie?*

Antwoord: Ek moet eerlik sê nie baie positief nie. As ek kyk na die CTA wat ons moet doen. Dit is eintlik baie niksseggend. Dis lei nie werklik tot iets nie. Dit is 'n blote begripstoets wat jy moet antwoord. Met ander woorde wat my betref is dit nie tegnologie nie. Dis 'n leer en spel toets.

VRAAG: *Goed. Verder wat se betrokkenheid het u van ouers ten opsigte van die Tegnologie Onderwys Program?*

Antwoord: Op hierdie stadium niks nie.

VRAAG: *Dink u 'n skool moet eers toegerus wees en die nodige hulpmiddele hê voordat Tegnologie Onderwys geimplimenteer kan word?*

Antwoord: Ja maar behalwe dit dink ek daar moet baie definitiewe riglyne van die Departement se kant af kom want nie een skool doen dieselfde nie – as die kind van een skool na 'n ander skool beweeg het hy nie dieselfde inligting nie want skole doen verskillende goed of hulle doen dit glad nie want hulle weet nie wat om te doen nie. So ek dink dit is 'n primêre probleem en daarna dink ek sodra dit vasgemaak word dan kan 'n mens bepaal of dan voel ek moet die kurses nie so wyd wees nie want daar is te veel inligting wat daarmee betrokke is wat mens kan aanvul en die senior aspekte aanraai en dan jou klas daarvolgens inrig en die program hardloop en ek dink dan sal dit baie beter gaan.

VRAAG: *Sal u dan sê dat soos hulle in die ou dae gepraat het van die tipiese akademiese skole met sekere dele van Tegnologie aanbied en dan jou ander skole soos Tegnigiese skole wat meer verskillende Tegniese vakke gehad het moet dan ander dele soos wat u wat in kort sê dit kan nie dieselfde wees vir alle skole nie?*

Antwoord: Ek weet nie ek dink tog as jy die program reg benader en jy stel die inligting reg saam en jy gee die regte sillabus deur sal jy dit by al die skole dieselfde kon aanbied alhoewel ek nie heeltemal seker is van daardie vraag nie maar ek dink tog jy kan by daardie skole afhangende van wat jy gaan aanbied. Sekere dele is baie teoreties. Sekere dele is meer prakties. 'n Mens kan miskien later 'n onderskeid tref maar jy sou dit by al die skole kon aanbied dink ek.

VRAAG: *Hoe moet klasse ingedeel word sodat hulle hanteerbaar is vir die implementering van TO?*

Antwoord: Jy het baie moontlikhede in Tegnologie - ek dink dit is in elk geval onrealisties om te verwag dat 'n klas van veertig leerlinge die praktiese deel ook gaan doen, ek dink dit is net nie moontlik nie – die tyd is net nie beskikbaar nie en dan gaan dit ook oor beheer van groepe wat 'n groot probleem is. Ek sou sê die ideale Tegnologie klas is vyftien en jy kan die wêreld versit daarmee.

VRAAG: *Deel u leerlinge in groepe om te werk?*

Antwoord: Ek deel hulle in groepe maar ek het dit op 'n stadium gelos as gevolg van die dissiplinêre probleme wat dit bring en dit is maklik om te sê 'n groep moet sinvol besig wees, jy weet die eerste minuut is hulle sinvol besig en van dan af is dit net 'n dissiplnêre probleem en niks verder nie.

VRAAG: *Wat se probleme ondervind u steeds met TO?*

Antwoord: Op hierdie stadium hoofsaaklik die tipe inligting wat 'n mens moet doen, die tipe werk wat jy moet doen. Ek voel dit moet afgebaken wees dat jy presies weet wat om te doen. Daar moet meer inligting beskikbaar wees naamlik bruikbare inligting. Dit is maklik om vir die onderwyser 'n klomp teorie en te sê jy moet weet waar jy is en jy moet weet waarheen jy oppad is – dit help my nie in die klas nie. Vir my om die inligting self voor te berei, ek is nog betrokke by ander vakke ook by die skool ek het nie die tyd om werklik die goed te gaan voor te berei en uit te dink en saam te stel – noem dit nou maar in ou terme lesplanne om hierdie goed aan te bied nie.

Dit is werklik 'n probleem.

Interview Respondent 2: Technology teacher

VRAAG: *Wat is u hooftaak by die skool?*

Antwoord: Om skool te gee. Vakgerig is dit vir Tegniese Tekene en Tegnologie

VRAAG: *Wat behels Tegnologie Onderwys?*

Antwoord: Dit is om die kinders te ly om tegnologiebewus te raak, dit te gebruik maar nog meer om iets vir hulself te kan maak; om enterpreneurskap te bevorder.

VRAAG: *Gebruik u 'n voorgeskrewe syllabus of het u u eie syllabus ontwikkel?*

Antwoord: Voorgeskrewe syllabus en ons hou nogal redelik by dit.

VRAAG: *Was daar ander onderwysers wat u gehelp het om TO by die skool te implementeer?*

Antwoord: Eers was ons alleen; het gesukkel om bronne te verkry, maar naderhand was ons so 3 tot 4 skole wat saam begin werk het. Ons het ons eie ding gedoen en was net klaar gewees toe hoor ons dat die goed verander.

VRAAG: *Is TO 'n vak op sy eie?*

Antwoord: Ja, dit is 'n vak op sy eie, maar hy is veronderstel om te intregeer met ander vakke daaronder.

VRAAG: *Is ander onderwysers ontvanklik vir TO?*

Antwoord: Ja, daar is nogal 'n negatiwiteit rondom tegnologie. Ek dink dit is omdat dit 'n vreemde vak is; baie keer is die ouens wat dit aanbied nie regtig geskool om die vak aan te bide nie; dit maak dat die ouens baie negatief is; dit is 'n rigting wat hulle nie ken nie, so dit is heeltemal iets nuut wat hulle van die grond af moet begin.

VRAAG: *Wat was die struikelblokke met die implementering van TO by u skool?*

Antwoord: Daar was nie duidelike riglyne van wat gedoen moes word nie. Ons kry nou nog die probleem van sekere goed wat in graad 7 gedoen is, dan kom ons in graad 8 en word dieselfde goed weer gedoen – die kinders raak dan verveeld. As ons vooraf gegaan het en hierdie riglyne vasstel het dan het ons nie daardie probleem gehad nie.

VRAAG: *Wat se vlak van opvoeding of kwalifikasie moet onderwysers hê om TO te implementeer?*

Antwoord: Dit sal goed wees as 'n persoon kan spesialiseer in die rigting; al is dit ook nou net in 'n diploma-kursus, soos wat in enige ander vak

gespesialiseer is. Ek dink dit is 'n noodsaaklikheid want dan wil jy dit graag doen – dit is die hoofgedagte.

VRAAG: *Hoe ontvanklik is leerlinge vir TO?*

Antwoord: Dit hang van klas tot klas af. Mens kan dit baie interressant maak; tegnologie is 'n baie interessante vak; mens kan daarvan iets maak en die ou wat voor die klas staan bepaal daardie ontvanklikheids metode. In my eie klas is die kinders redelik ontvanklik – hulle geniet dit, maar dan moet jy sorg dra dat dit interressant aangebied word.

VRAAG: *Hoe betrokke is ouers by TO programme by u skool?*

Antwoord: Wat die take aanbetref, raak die ouers betrokke. Hulle sien wat die kinders doen - jy hoor maar baie keer pa het gehelp of ma het gehelp, maar andersins nie veel nie.

VRAAG: Dink u 'n skool moet eers toegerus wees en die nodige hulpmiddele hê voordat TO geimplementeer kan word?

Antwoord: Dit sal lekker wees as mens 'n laboratorium het, ja. Waar al hierdie toerusting beskikbaar is. Baie keer is dit moeilik om die goed aan te bied as mens van swerf-roosters gebruik maak – dit is tegnologie en jy het 'n vaste klaskamer of laboratorium nodig om die ding te doen.

VRAAG: *Hoe moet klasse ingedeel word sodat hulle hanteerbaar is vir die implementering van TO?*

Antwoord: Die grootte van klas speel 'n groot rol. Hoe grootter die klas hoe moeiliker raak dit om dit aan te bied want dit is prakties – dit is maar kinders wat speel – dus, hoe kleiner die klas, hoe meer suksesvol, dink ek, sal tegnologie wees.

VRAAG: *Deel u leerlinge in groepe om te werk?*

Antwoord: Ja, hulle werk in groepe – gewoonlik groepies van 6 tot 8.

VRAAG: *Wat se probleme ondervind u steeds met TO?*

Antwoord: Op hierdie stadium, soos ek in die begin gesê het: vaste riglyne en ek meen daar behoort 'n beter sisteem ontwikkel te word tussen skole.

VRAAG: *Wat dink u van die CTA's?*

Antwoord: Daar is verskillende gevoelens. Op hierdie stadium moet hulle gaan kyk na die CTA en die inhoud daarvan – sekere klasse mors jy jou tyd en met ander gaan dit goed. Wat my wel opgeval het is dat daar nog baie foute binne die CTA lê. Taalgebruik was vanjaar weereens 'n probleem gewees; die taalgebruik was ver te hoog gewees vir die graad van kinders; hierdie goed word nie regtig in ag geneem nie – ek kry baie keer die idée die ouens gryp maar net dit wat hulle kry en skep 'n ding – en maak daarvan iets en dit word nie deurdag nie.

VRAAG: *Sou u sê dit is te veel soos 'n begripstoets?*

Antwoord: Nee, nie regtig nie. Daar was 'n stukkie maar ek het nie 'n probleem daarmee gehad nie; ek dink tog hulle kom uit by wat hulle wou bereik het.

Interview Respondent 3: Technology teacher

VRAAG: *Meneer, wat is u hooftaak by die skool?*

Antwoord: My hoofverantwoordelikheid is die onderrig van Tegniese Tekene, Graad 10, 11 en 12 – Hoër graad en Standaard graad.

VRAAG: *Is u betrokke by TO ook?*

Antwoord: Ek is huidiglik ook verantwoordelik vir Graad 9 Tegnologie onderrig.

VRAAG: *Wat behels TO?*

Antwoord: Op hierdie stadium sou ek sê dat die onderrig van TO, is meer gerig om mense insig te gee op die meganiese wêreld, die strukturele wêreld; probeer 'n groot deel van die wêreld van tegnologie te omskryf.

VRAAG: *Gebruik u 'n voorgeskrewe syllabus of het u u eie syllabus ontwikkel?*

Antwoord: Ons gebruik op hierdie stadium nog die selfontwikkelde syllabus.

VRAAG: *Was daar ander onderwysers wat u gehelp het om TO by die skool te implementer?*

Antwoord: Innisieel nie, maar ons is huidiglik 'n paar skole en onderwysers wat saamwerk om mekaar by te staan.

VRAAG: *Is TO 'n vak op sy eie?*

Antwoord: Ja, hy funksioneer as 'n vak op sy eie.

VRAAG: *Is ander onderwysers ontvanklik vir TO?*

Antwoord: Nee, ek dink daar is nog steeds die stigma aan die wêreld van tegnologie wat baie mense 'n tegniese-stigma aan koppel. Ek dink daarom wil almal nie daarmee te doen hê of dit aanvaar nie.

VRAAG: *Wat was die struikelblokke met die implementering van TO by u skool?*

Antwoord: Eerstens 'n gebrek aan sillabus - die spesifieke vakinhoud wat gedoen moes word; niemand was spesifiek seker oor wat van ons verwag word of wat gedoen moes word nie. So, die implementering daarvan was baie moeilik ten opsigte van wat ons regtig moes doen.

VRAAG: Wat se vlak van opvoeding of kwalifikasie moet onderwysers hê om TO te implementeer?

Antwoord: Ek sou sê dit is nie heeltemal in die lyn van 'n BA-graad nie, maar daar sal beslis moet 'n deel aan tersiêre opleiding geskenk

moet word vir mense wat tegnologie wil gaan doen. Dit kan, as dit reg geimplimenteer word, 'n spesialis-studierigting word.

VRAAG: *Hoe ontvanklik is leerlinge vir TO?*

Antwoord: Nie op hierdie stadium so baie nie. Ek vind veral by die dogters, weereens die stigma wat aan die vak gekoppel is – hulle kom met negatiewe gesindheid na die klas toe – dit is moeilik om hulle koppe te swaai om hulle net te kry dat hulle belangstel – soos bv. ratte, hulle kan nie altyd sien die nut daarvan nie, maar oor 'n wye vlak, as mens genoeg van verskillende goed inbring, dan begin die belangstelling tog bietjie aangewakker te word.

VRAAG: *Hoe betrokke is ouers by TO programme by u skool?*

Antwoord: Op hierdie stadium baie min.

VRAAG: *Dink u 'n skool moet eers toegerus wees en die nodige hulpmiddele hê voordat TO geimplementeer kan word?*

Antwoord: Vir sekere dele van tegnologie, ja – maar daar is baie fasette van tegnologie wat waarskynlik nie spesifieke locale nodig het nie; maar mens sal 'n gebrek aan die vak doen as mens dit nie het nie.

VRAAG: *Hoe moet klasse ingedeel word sodat hulle hanteerbaar is vir die implementering van TO?*

Antwoord: Heelwat kleiner t.o.v. die component van groepwerk en om baie aandag te gee, sal klasse baie kleiner moet wees. Maksimum 'n klas van 20 of self eintlik minder as dit.

VRAAG: *Deel u leerlinge in groepe om te werk?*

Antwoord: Baie selde. Aangesien die groepwerk-situasie aanleiding gee tot baie moeilike klas dissipline-situasies – sekere leerlinge "ry" op dit wat ander leerlinge doen – sommige leerlinge sal bereid wees om alles te doen sodat hulle die punt kan kry.

VRAAG: *Wat se probleme ondervind u steeds met TO?*

Antwoord: Baie min leiding van die Departement af. 'n Groot verwarring t.o.v. IVO-self wat daar verwag word en dit word vir ons baie moeilik gemaak t.o.v. wat behoort baie belangrik te wees en wat nie in dit wat aangebied word in die vak.

VRAAG: *Wat dink u van die CTA's?*

Antwoord: Vanjaar se CTA is vir my van 'n baie beter standaard as wat die vorige een was; dit is heel goed uitgelê. My probleem in die CTA lê in die gewigsfaktor wat dit uiteindelik in die totale punt tel

- maar ‘n skrale 25. Dit maak dit moeilik om die kinders te motiveer om baie aandag en insette daarin te gee.

VRAAG: *Sou u sê dit is te veel soos ‘n begripstoets?*

Antwoord: Ek het nou nog nie die huidige afdeling B gesien nie, maar laasjaar verseker – dit is 2 van die 3 vrae wat begripstoetse wat nie tegnologies verantwoordbaar kan wees nie.

Interview Respondent 5: Technology teacher/HOD

VRAAG: *Meneer, wat is u hooftaak by die skool?*

Antwoord: Departementshoof, Tegniese afdeling

VRAAG: *Wat behels TO?*

Antwoord: Is maar basies dat ons die kind onderrig gee in tegnologie-en waar dit inskakel in die tegnologie in die sameleweing, gebruik word om 'n breë kennis te kan gee van elke dag se gebruik van apparate sodat hy kan sien waar kom tegnologie vandaan en hoe word dit geimplimenteer.

VRAAG: *Gebruik u 'n voorgeskrewe sillabus of het u u eie sillabus ontwikkel?*

Antwoord: Ons skool saam met Fichardtpark, Sand du Plessis en Jim Fouche, het saam ons eie sillabus geskrywe. Vir Graad 9 bestaan daar nie 'n tegnologie-sillabus nie – daar bestaan nie eers RS vir hierdie jaar nie – tot en met verlede jaar Junie die eerste keer ons RS ontmoet – hierdie jaar gaan dit skitterend – ons het 'n werksgroep gevorm en ons is op pad.

VRAAG: *Was daar ander onderwysers wat u gehelp het om TO by die skool te implementeer?*

Antwoord: Ons het maar almal saam hier vir opleiding gegaan – ons het mekaar geleer – daar is nie een spesifieke ou wat meer as die ander geweet het nie. Wat ons almal weet, het ons almal saam geleer.

VRAAG: *Is TO 'n vak op sy eie?*

Antwoord: Ja, die vak is heeltemal op sy eie.

VRAAG: *Is ander onderwysers ontvanklik vir TO?*

Antwoord: Ja, alle onderwysers, en dit sluit myself in, is nie so baie ontvanklik nie. Nuwe ouens is bietjie meer ontvanklik – ons vind dat studente wat van Universiteit af kom baie maklik daarby aanpas, maar die ouer garde, omdat 'n mens weet waarheen is jy op-pad, is dit vir ons nog 'n moeilike konsep om by aan te pas.

VRAAG: *Wat was die struikelblokke met die implementering van TO by u skool?*

Antwoord: .....Spesifieke deel. Ons is 'n redelike ouer personeel; ons het baie moeilik aangepas daarby. Die opleiding wat ons gekry het in die begin – ons het almal 'n week gedurende die September-vakansie opleiding gekry – was power gewees (dit sal ek vir die Onderwys Departement ook sê) – die manier waarmee hulle dit vir ons aangebied het; die arrogansie waarmee dit aangebied is;

die ouens het daar uitgestap en het dit regtig nie reg ervaar nie. So, in die begin het 'n ou maar sy werk gedoen, daar was geen sillabus beskikbaar nie – as jy 'n onderwyser positief wil kry, gee vir hom 'n sillabus met "dit moet jy presies doen" – as jy hom wil negatief kry, sê vir hom "gaan stel jou eie sillabus op". As jy vir hom vra hoeveel werk moet gedoen word dan sê jy maar "berei jy vir my 'n ding voor" – so, ons het dit regtig negatief ervaar, veral as mens matriek-werk ook het en hulle verwag dat jy moet dieselfde of meer werk insit vir graad 9-werk as vir die matriek-kandidaat – ouens was redelik negatief.

VRAAG: *Wat se vlak van opvoeding of kwalifikasie moet onderwysers hê om TO te implementeer?*

Antwoord: Ek dink hulle sal presies dieselfde opleiding moet hê as die 4-jaar diploma of 'n graad – met definitief agtergrond van Tegniese tekene, Houtwerk, Naaldwerk, Kleding, ens. Sal 'n goeie tegniese opleiding moet hê, definitief, en as 'n ou bietjie kan raak aan die Wiskunde en Skeinat sal dit ook baie help.

VRAAG: *Hoe ontvanklik is leerlinge vir TO?*

Antwoord: Die leerlinge het dit nogal lekker ervaar – in die begin het ons nooit eers werklik in groepe gewerk nie, en hulle het dit lekker gevind om in klas in groepies saam te gesels (nie dat dit baie

effektief was nie) maar hulle het dit redelik goed ervaar. Aan die einde van die jaar wanneer hulle oorgegaan het na die volgende jaar, was dit vir ons bietjie moeilik want ons het nooit geweet watter kind weet presies wat nie – daar was geen eenvormige sillabus nie. Dan het die kinders dit negatief ervaar, want hulle kom van 'n ander skool af en sê "meneer, ons het nie dit gedoen nie", - die kind voel sleg want hy sit ook omtrent 'n week of drie in die klas voordat hulle regtig begin om jou te antwoord. Die graad 9's het dit miskien slegter ervaar, want baie kom van ander skole af en nie een het presies dieselfde werk gedoen nie. Maar, toe hulle begin het was dit maar nuwigheid en vir hulle lekker want hulle het baie prakties gedoen en hulle het dit regtig lekker ervaar.

VRAAG: *Hoe betrokke is ouers by TO programme by u skool?*

Antwoord: Geen. Daar is geen betrokkenheid nie, behalwe (en dit het ons gestop) as jy vir 'n kind 'n taak gee om by die huis te gaan doen. Seker, ek skat so, gemiddeld 10% wat jy kan sien ouers het baie gehelp – andersins, verder glad nie betrokke nie.

VRAAG: *Dink u 'n skool moet eers toegerus wees en die nodige hulpmiddele hê vordat TO geimplementeer kan word?*

Antwoord: Ja, as ek dink aan die groep-stelsel – om 40 of meer kinders in die klas te hê is chaos – totale chaos. Ek sal graag 'n inspekteur of onderwys persoon van die Departement hier wil hê om vir my te kom wys hoe sit jy in 'n klas van 45 kinders en daar is nie spasie om tegnologie toe te pas nie – veral as jy verwag hulle moet dit by die skool doen, want dit werk nie om dit by die huis te gaan doen nie. So, as jy by die skool 'n projek moet doen, en jy het nie 'n tegnologie-lokaal nie – dit werk nie.

VRAAG: *Hoe moet klasse ingedeel word sodat hulle hanteerbaar is vir die implementering van TO?*

Antwoord: Ek sal 'n tegnologie-klas lekker aanbied as ek 25 kinders in 'n klas het. Dan kan dit in 'n gewone klas wees en kan ons al die goed in die klas self bêre, maar 'n mens kan groepies van 5 maak – dit is hanteerbaar, maar nie meer as dit nie.

VRAAG: *Deel u leerlinge in groepe om te werk?*

Antwoord: Ja, sowat 'n derde van my aktiwiteite is in groepe –die ander is individuele werk – of dus werk wat hulle kry om by die skool te kom doen, individueel.

VRAAG: *Wat se probleme ondervind u steeds met TO?*

Antwoord: Kyk, as ek 'n taak vir 'n kind gee om te doen en hy kom terug van die taak af dan het hy baie goeie kennis van die papier wat hy geskrywe het. Ek het al agtergekom – dan doen ek 'n paar steekproewe – dan sien ek die pragtige rekenaar-uitgedrukte taak, dan sê ek vir hom: "vertel net vir my so 5 dinge wat hy oor die taak verstaan – dan staan hy daar ..... Ek het met die ander onderwysers ook gepraat – die kinders doen vreeslik baie moeite - ..... in st. 9 presies dieselfde ervaring gehad, gaan daar by die internet in, doen 'n asemrowende taak met die mooiste buiteblad – dit lyk skitterend, maar aan die einde van die dag het dit geen waarde nie; sy het nie rerig geleer nie.

VRAAG: *Wat dink u van die CTA's?*

Antwoord: ... Verlede jaar het daar iets soos 60 foute op die eerste gedeelte, daar was woorde wat ek gesukkel het om te verstaan, daar was Engelse woorde wat sommer tussenin gedruk is, as 'n ou nie fisies staan en jy verduidelik die kind die begrip, wat is die vorm ... hulle kry miskien 'n "scenario" om te ontleed – as jy nie fisies daar staan en dit vir die kinders verduidelik nie, dan is dit totale chaos. Ons het in die samelewing verskillende kultuurgroepe hier – as daar nou 'n swart kind sit wie se huistaal nie Afrikaans is nie, dan verstaan hy nie daardie woorde nie.

Hulle verstaan partykeer nie eers die vraag nie, wat nog van die antwoord gee. Ek moet vir jou sê, hierdie jaar – ek weet nie hoe sal dit lyk nie, dit raak beter, maar dit is nog ver van wat 'n ou verwag. Ek dink 'n kind word baie benadeel daardeur en ek glo dit is dalk omdat daar kundiges sit wat nie rêrig onderwysers is wat dit opstel nie – ek dink dit is ouens wat nie in die praktyk saam met kinders werk nie, wat nie weet hoe praat hulle nie, maar definitief word die kind benadeel daardeur.

VRAAG: *Sou u sê dit is te veel soos 'n begripstoets?*

Antwoord: Definitief. Ons het verlede jaar toe ons ons werkstukke opgestel het, na ons RS toe gegaan en gevra: "Wat verwag u moet ons ons skema vanjaar saamsit" – toe sê sy, sy mag dit nie vir ons sê nie en sy kan dit ook nie vir ons sê nie. Toe sê ons vir haar: "Mevrou, maar aan die einde van die jaar kry ons 'n CTA" toe sê sy weet ook nie wat dit moet wees nie, sy is nie deel van dit ook nie. Sê nou hulle vra werk daar wat nie gedek is nie. Toe gee ons vir haar 4 kwartale se werk wat uiteengesit is, kyk net daarna, is dit wat jy verwag, toe sê sy sy kan net 'n aanbeveling maak dat dit reg is, maar sy kan glad nie vir ons voorskryf nie. So ons het 'n jaar se werk gedoen, en dit aan haar voorgelê, sy het daarna gekyk, toe sê sy dit is aanvaarbaar. Daar is nêrens 'n voorgeskrewe sillabus wat sê dit of dit – daar word gesê jy

moet byvoorbeeld nokke dek, maar dit is so wyd – dit is onaanvaarbaar en ek ervaar dit sleg want nêrens sien ek dat sy gaan voorberei het – sy kan glad nie gaan voorberei nie want sy kan ‘n hele werkstuk gaan voorberei, maar wie sê dit word saamgevat.

Interview Respondent 6: Technology teacher/HOD

QUESTION: *Sir, what is your main duty at this school?*

Answer: I'm the Departmental head for Technical and Technology.

QUESTION: *What is TE all about?*

Answer: It's the aspects of problem solving and teaching the child hand-skills and to broaden his knowledge of problem solving and all the different aspects of technology.

QUESTION: *Do you use a prescribed syllabus or have you developed your own?*

Answer: We did a prescribe that we received from our learning facilitator to do certain areas of technology.

QUESTION: *Are there other teachers who helped you to implement TE at this school?*

Answer: There are different teachers that do it.

QUESTION: *Is TE a subject on its own?*

Answer: It is a subject of its own.

QUESTION: *How are other teachers receptive to TE?*

Answer: In the beginning they weren't very receptive but at this stage they realized that we have to do it, and they are really helpful in this way now.

QUESTION: *What were the stumbling blocks for the implementation of TE at your school?*

Answer: We do not know what to do. Facilities at our school. We've got workshops; we use classrooms and workshops to do it.

QUESTION: *What level of education or qualification must teachers have in order to implement TE?*

Answer: I feel they must have a Technical/Technology certificate, trained in technology.

QUESTION: *How receptive are learners of TE?*

Answer: The broad majority of the children are very receptive towards technology; other children are limited because they don't have the facilities at home to do things that we ask.

QUESTION: *How involved are parents in technology programmes at your school?*

Answer: They aren't involved at all.

QUESTION: *What is your advice in respect of resources for schools, which do not have resources to implement TE. Should the schools wait to be resourced?*

Answer: I feel the school should try to resource itself; otherwise the department should resource the school of centre to teaching technology.

QUESTION: *How should classes be organized so that they are manageable in implementing TE (teacher-learner ratio)?*

Answer: I would say round-about 20-25 children in a group, then your can get more work done.

QUESTION: *Do you organize learners to work in groups?*

Answer: I use group work as well.

QUESTION: *What problems do you still experience with TE?*

Answer: I experience the problems of when certain outcomes have to be reached; you get certain children working and certain children that do not work. Then the children that are not working get the same marks as those who are working.

Interview Respondent 7: Technology teacher

QUESTION: *Sir, what is your main duty at this school?*

Answer: Technology.

QUESTION: *What is TE all about?*

Answer: You teach children to think for themselves and use their hands and studies together.

QUESTION: *Do you use a prescribed syllabus or have you developed your own?*

Answer: No, we don't have a prescribed syllabus – we got together with some people at Grey College ….to do the work on their own.

QUESTION: *Are there other teachers who helped you to implement TE at this school?*

Answer: Just one teacher. I have 8 classes.

QUESTION: *Is TE a subject on its own?*

Answer: It is a subject on its own, Yes.

QUESTION: *How are other teachers receptive to TE?*

Answer: Well, the meeting we've had at different places – as I could see, lots of people didn't have a technological background. The questions we asked, to me it was simple, but to them it was quite difficult, because I have a technical background.

QUESTION: *What were the stumbling blocks for the implementation of TE at your school?*

Answer: At our school it's the fact that our kids are from a bit of a back area. The parent can't always afford what is necessary. Even though our libraries that we have were developed for the school are stocked up with the books about the things that the kids need.

QUESTION: *What level of education or qualification must teachers have in order to implement TE?*

Answer: Technology has quite a wide field. The level of education is widespread because you go from dressmaking right down to mechanical work. So you can't actually specify teachers will have to learn a whole lot of different subjects to be able to implement technology.

QUESTION: *How receptive are learners of TE?*

Answer: The boys, they catch on very quickly, not all of them but there are some that struggle. Girls do struggle a bit.

QUESTION: *How involved are parents in technology programmes at your school?*

Answer: Not much.

QUESTION: *What is your advice in respect of resources for schools, which do not have resources to implement TE. Should the schools wait to be resourced?*

Answer: They should be resourced first – especially the under privileged children who can't afford it, they have to be resourced.

QUESTION: *How should classes be organized so that they are manageable in implementing TE (teacher-learner ratio)?*

Answer: First of all, the classes we have now are far too big. You can't get out to every child to do the work in that period. You do five periods with them in a seven-day cycle; so, there's not enough time.

QUESTION: *Do you organize learners to work in groups?*

Answer: Yes, I do.

QUESTION: *What problems do you still experience with TE?*

Answer: Languages – Some of the terms - sometimes the standard is to high for a child in grade 8 or 9.

QUESTION: *What do you think about the CTA's?*

Answer: CTA's should be more organized. The way the CTA's are written, the children don't understand the questions. The amount of teachers we have these days, you don't have the time to go to the classes and see what the problem is.

QUESTION: *Do you think it is too much like a comprehension test?*

Answer: It is.

Interview Respondent 8: Technology teacher

VRAAG: *Meneer, wat is u hooftaak by die skool?*

Antwoord: My hooftaak is Tegnologie-onderwyser, ek is departementshoof oor die Tegniese vakke

VRAAG: *Wat behels TO?*

Antwoord: My persoonlike mening is dat ons moet meer konsentreer op wat die woord sê "tegnologie" .... In die vakrigtings, die kinders bietjie meer agtergrond te gee van waaroor dit gaan.

VRAAG: *Gebruik u 'n voorgeskrewe sillabus of het u u eie sillabus ontwikkel?*

Antwoord: Ek het 'n sillabus ontwikkel, aantekeninge. .....Daar is niks van die Departement af nie; daar is wel voorskrifte maar niks op papier nie.

VRAAG: *Was daar ander onderwysers wat u gehelp het om TO by die skool te implementer?*

Antwoord: Nee, ek is tans al onderwyser wat dit aanbied en ek het beide grade by die skool.

VRAAG: *Is TO 'n vak op sy eie?*

Antwoord: Dit is 'n vak op sy eie.

VRAAG: *Is ander onderwysers ontvanklik vir TO?*

Antwoord: Dit is moeilik om dit te sê … hulle wil graag bietjie meer agtergrond hê oor die spesifieke rigting, as dit dan 'n tegniese vak sou wees.

VRAAG: *Wat was die struikelblokke met die implementering van TO by u skool?*

Antwoord: Om departementele beleide toe te pas en in te stel; van beide kante word verwag om tevrede te stel vir die hoeveelheid kinders wat ek mee werk en die hoeveelheid klasse wat ek moet hanteer

VRAAG: *Wat se vlak van opvoeding of kwalifikasie moet onderwysers hê om TO te implementer?*

Antwoord: Ek sou sê, hy moet darem ten minste Universiteits-opleiding hê waarvan tegnologie deel is van die 3 of 4 jaar kursus wat hy doen om bietjie agtergrond ook te kry. Ek weet nie of dit voldoende is om wel uit die nywerheid ….. aan die nywerheid te voorsien, maar meeste van ons gaan maar deur na Graad 12 toe.

VRAAG: *Hoe ontvanklik is leerlinge vir TO?*

Antwoord: ... Hulle weet nie wat leer hulle daarby nie; ons is baie groepgerig, so die individu kom nie veel tot sy reg daar nie.

VRAAG: *Hoe betrokke is ouers by TO programme by u skool?*

Antwoord: Baie min.

VRAAG: *Dink u 'n skool moet eers toegerus wees en die nodige hulpmiddele hê vordat TO geimplementeer kan word?*

Antwoord: Ek wil graag so sê, want op die stadium moet die onderwyser al die hulpmiddels self maak; jy moet self die voorbeelde doen; jy moet kinders vra om vir jou goed te doen – en baie kinders help ook maar by die huis – daar is nie die plek in die klas om alles in die klas-situasie te doen nie.

VRAAG: *Hoe moet klasse ingedeel word sodat hulle hanteerbaar is vir die implementering van TO?*

Antwoord: In my situasie – ek het 'n praktiese lokaal maar ek kan nie meer as 20 kinders op 'n slag hanteer nie – ons klasse is tot 35; dit is onmoontlik om praktiese ...

VRAAG: *Deel u leerlinge in groepe om te werk?*

Antwoord: In sekere komponente wel in groepe, maar ander komponente die individu.

VRAAG: *Wat se probleme ondervind u steeds met TO?*

Antwoord: Al die kinders in die klas is my grootste problem.

VRAAG: *Wat dink u van die GTA's?*

Antwoord: Is nie vir my volgens standard nie; daar is sekere dele wat wel goed is, maar daar is sekere vrae wat, volgens my, nie op standard is vir graad 9 nie.

VRAAG: *Sou u sê dit is te veel soos 'n begripstoets?*

Antwoord: Dit kom neer op begripstoets om die antwoorde uit te krap (te soek?) soos gevra word.

Interview Respondent 9: Deputy Principal

QUESTION: *Sir, what is your main duty at this school?*

Answer: I'm the vice-principal at the school and I'm mainly responsible one for teaching, secondly I'm responsible for curriculum development, thirdly I'm mainly responsible for a lot of administrative tasks at the school, that includes all duties. Generally I'm in charge of lot of the finance systems.

QUESTION: *What is TE all about?*

Answer: I see T.E. as that learning area that deals with everything that man created or planned to create to ease his life on earth – and TE is supposed to deal specifically with that.

QUESTION: *Do you use a prescribed syllabus or have you developed your own?*

Answer: No, we are supposed to use the curriculum statement of '96. So, in other words, we follow the policy of using the seven outcomes as stated in that policy with all the assessment criteria.

QUESTION: *Are there other teachers who helped you to implement TE at this school?*

Answer: Yes. There's a lot of them dealing with it and acting as class teachers in that learning area.

QUESTION: *Is TE a subject on its own?*

Answer: It's a learning area that deals with the seven outcomes as in the policy statement. So, it's a learning area definitely individually on its own, especially in the senior phase; it is combined with other learning areas.

QUESTION: *How are other teachers receptive to TE?*

Answer: We are a technical school and we've dealt with TE for a very long time for many decades, so, in other words, technology as a subject or a learning area was not that new to all the teachers, so they're quite familiar with a lot of the stuff. But I thing they still have a lot to learn. So, to them it wasn't that new.

QUESTION: *What were the stumbling blocks for the implementation of TE at your school?*

Answer: I think the time frame that the department wanted to introduce it - was too short and too fast. Although we did a lot of preparation

for this learning area, I think a lot could still have been done in order to implement it to the best.

QUESTION: *What level of education or qualification must teachers have in order to implement TE?*

Answer: Definitely at least at the NQF level five to six – because, putting teachers in classes without the proper training, is really a negative thing to me.

QUESTION: *How receptive are learners of TE?*

Answer: I think, what I've experienced especially in 2002, is that learners are quite enthusiastic about technology and they are very open minded to it. So, it all depends on what initiative the teacher have in the classroom to make use of this opportunity, especially in terms of the enthusiastic ways that the learners may deal with it.

QUESTION: *How involved are parents in technology programmes at your school?*

Answer: With the school population coming from whole race groups or social groups, it depends; some learners you can clearly see that the parents are quite involved and that depends on the

work, but in terms of other learners, you clearly see that there's no involvement at all.

QUESTION: *What is your advice in respect of resources for schools, which do not have resources to implement TE. Should the schools wait to be resourced?*

Answer: I think it depends absolutely on the initiative of the teacher in class. He must go out and be enthusiastic about this and make a difference. What I mean by this is, he can go out there and look for sponsors and try to get hold of resources - he can not sit back and wait for the department to supply – that's impossible.

QUESTION: *How should classes be organized so that they are manageable in implementing TE (teacher-learner ratio)?*

Answer: It depends again on the role that a specific teacher plays in class - some teachers still try to stick and stay with the old type of formal classroom set-ups where the teacher is the focus point in class. With the modern educational systems that does not fit – in other words, what I mean by this, is that the teacher must accept that he's acting as a facilitator in classroom and that he must re-organize his class to fit this new set-up – in other words, you'll have to look at group work; you'll have to work with

learners in pairs. That kind of stuff means a new thinking on re-organization of classrooms.

QUESTION: *Do you organize learners to work in groups?*

Answer: Yes, definitely, from time to time.

QUESTION: *What problems do you still experience with TE?*

Answer: There is sometimes a lack of co-operation from the learners' side. They see clearly that OBE is a system that where you can be a "happy clappy" in classroom and it doesn't work that way. They must bring their side. I think the question of responsibility from the learners' side, is a very big issue.

QUESTION: *What do you think about the CTA's?*

Answer: It can be very good. My experience is that they were well organized. There were a lot of mistakes in – but I think that can be corrected in future. One thing that I can say here is that they must get away from that old situation of "apartheid" – we must work towards the future.

QUESTION: *Do you think it is too much like a comprehension test?*

Answer: No ways! It is not a comprehension test. The one one's that I've worked out with the learners was well organized, well planned.

But still the negative things that we didn't like, the old situation about "apartheid". We must get rid of that.

Interview Respondent 10: Deputy principal

QUESTION: *Sir/Madam, what is your main duty at this school?*

Answer: I'm the deputy principal.

QUESTION: *What is TE all about?*

Answer: TE is to combine science with engineering.

QUESTION: Do *you use a prescribed syllabus or have you developed your own?*

Answer: Prescribed.

QUESTION: *Are there other teachers who helped you to implement TE at this school?*

Answer: Yes

QUESTION: *Is TE a subject on its own?*

Answer: Not quite. You can combine it with natural science.

QUESTION: *How are other teachers receptive to TE?*

Answer: Very good.

QUESTION: *What were the stumbling blocks for the implementation of TE at your school?*

Answer: Facilities.

QUESTION: *What level of education or qualification must teachers have in order to implement TE?*

Answer: I think they must have a good background in technical subjects.

QUESTION: *How receptive are learners of TE?*

Answer: They are very lazy. They don't do their bit.

QUESTION: *How involved are parents in technology programmes at your school?*

Answer: In our school – not at all.

QUESTION: *What is your advice in respect of resources for schools, which do not have resources to implement TE. Should the schools wait to be resourced?*

Answer: Yes, they must have a well equipped library.

QUESTION: *How should classes be organized so that they are manageable in implementing TE (teacher-learner ratio)?*

Answer: They must not be too big. I think a maximum of 25 pupils.

QUESTION: *Do you organize learners to work in groups?*

Answer: Yes.

QUESTION: *What problems do you still experience with TE?*

Answer: Resources is not available; and also no equipment, especially for our kids with poor community and who do not have a lot of equipment and material at home.

QUESTION: *What do you think about the CTA's?*

Answer: I think it's too difficult – is based on read and understanding – too many comprehensive tests in the CTA.

QUESTION: *Do you think it is too much like a comprehension test?*

Answer: There you answer my last question, it was: