

AN EXPLORATION INTO GRADE SEVEN TEACHER  
ASSESSMENT PRACTICES IN  
TECHNOLOGY EDUCATION WITHIN THE  
PINETOWN DISTRICT

by

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A thesis submitted in fulfilment of the academic requirements (100%) for the  
degree of Magister Educationis (Technology Education) in the  
School of Science, Mathematics, Computer and Technology Education,  
University of KwaZulu-Natal

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March 2013

## **DEDICATION**

To my husband SWATHI for your tolerance, love and incredible support,

My dearest parents KRISH and RANI AKKIAH, for your encouragement, love and  
motivation,

and

Last but not least, my darling children AARIYA and AVINDRA - you are my inspiration and seeing the world through your innocent eyes has been an incredible journey thus far. Always remember, you can achieve the greatness that you were born to accomplish.

## DECLARATION

I, Narishnee Naidoo, declare that this study entitled: An exploration into Grade Seven teacher assessment practices in Technology Education within the Pinetown District represents the original work of the author and has not been submitted in any form to another university. Where use has been made of other scholars' work, this has been duly acknowledged in the text.

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## ACKNOWLEDGEMENTS

My heartfelt thanks and appreciation go to Dr. Martin Combrinck and Mr. Mervyn Moodley who supervised this research. It is through their unflinching support, guidance, encouragement, patience and invaluable advice from inception to the final preparation that this dream has become a reality.

My gratitude goes to the Principals of the school for allowing me the opportunity to conduct research at their schools.

To all the participants who willingly participated in this research, my profound gratitude; if it was not for your assistance this study would not have been possible.

My brother, Puvendra, for his support, assistance and motivation in the form of competition as to who was going to finish their masters first.

To my mother-in-law, Kamala, for all your encouragement and assistance in helping with the children so that I could pursue my dreams.

Sister-in-law Sharon and dear friend Deevashni for pitching in to care for my little darlings during the holidays and weekends when I needed some peace and quiet at home to get work done.

Dr. Busi Alant for providing me with a solid foundation and constantly encouraging me to push my boundaries and pursue my dreams.

Marion Sherwood and Bongeka Mabaso, my partners in crime, thank you for your assistance and companionship. We started this journey together.

My dearest friend Claudette, if it was not for your encouragement, constant motivation and shoulder to cry on when times got difficult, I would have abandoned my studies a long time ago.

My BWSPS family Jill Young, Kalay Thaver, Zaki Khan and Brandon Hobbs, who assisted and covered for me when I had to leave school to conduct research.

Mr. Paillard, for granting me the opportunity to conduct my research during school hours.

Last but not least, Leverne Gething my editor, for spending all those long tiresome hours editing my work, and having my best interest at heart. Thank you.

## ABSTRACT

As the political milieu in South Africa changed in 1990, a new curriculum framework guided by the principles of Outcomes Based Education (OBE) emerged. The paradigm shift from a traditional to an OBE curriculum was difficult for many teachers, especially the shift away from the traditional paper and pencil methods of assessment to using formative assessments methods.

The issues of assessment are further compounded in Technology Education because of its unique methodology. Within the South African context, Technology Education must include conceptual knowledge of technology products as well as procedural knowledge on the designing and manufacturing of such products. Technology Education is thus concerned with developing learners' capability. As a result, assessment in Technology becomes complex because we are looking for more than just a display of knowledge, understanding and manual skills.

It is against this backdrop that this study aims to explore Grade 7 teacher assessment practices in Technology Education within the Pinetown District and to gain a better understanding of what teachers assess in Technology Education. This was done by examining how they carried out their assessments and by exploring the reasons for such practices.

The research questions addressed in this study were: What are Grade 7 teachers assessing in Technology Education? ; How do Grade 7 teachers carry out these assessments? ; Why are Grade 7 teachers employing particular assessment strategies?

Middleton's revised concept of problem space, as well as the influence of social constructive influence on learning and assessment that forms the theoretical framework of this study. Guided by the interpretive paradigm, this research was qualitative in nature and a case study approach was used to explore it aims. The case study approach allowed the researcher an opportunity to study the participants' common and unique features in depth within a limited time scale. Participants for this study were selected by purposive sampling by virtue of their professional experience in teaching Grade 7 Technology Education within the senior phase. Data collection methods used to obtain data relevant to the research questions were

observation of Technology lessons, document analysis of learners' books and educators' portfolios, as well as semi-structured interviews.

It has emerged from the findings that although Technology Education has gained momentum over the years in South Africa. Greater attention needs to be paid towards assessment of the learning area because no proper guidelines regarding assessments have been provided for teachers. Teachers are assessing aspects of Technology Education that they feel are relevant and which they are comfortable with. Greater emphasis is placed on completed tangible products rather than the designing and the learning process that the learner engages in. Emphasis is placed on assessment for attainment of marks and not for life-long learning. Lack of pedagogical knowledge in the field of Technology Education and limited knowledge of appropriate assessment strategies in Technology Education have also emerged as major contributing factors for Grade 7 teachers for assessing Technology Education in the manner that they are.

It is recommended that appropriate and adequate professional development workshops be held for teachers of Technology Education so that these short coming are addressed. Subject advisors need to play a more active role in the development of Technology Educations and meet on a regular basis with the teachers to keep abreast of new trends and to tackle challenges. This is necessary so that Technology Education in South Africa can reach its true potential in developing enterprising, creative problem solvers as envisaged in the constitution.

## **LIST OF APPENDICES**

APPENDIX A: Letters from Department of Education to conduct research

APPENDIX B: Ethical Clearance Certificate

APPENDIX C: Principal's Consent

APPENDIX D: Participant's Consent

APPENDIX E: Interview Schedule

APPENDIX F: Document Analysis Schedule

## LIST OF FIGURES

Figure 1	.....	End products in traditional assessment system
Figure 2	.....	End products in an OBE education system
Figure 3	.....	Splitting of the expressive and conceptual knowledge in traditional testing
Figure 4	.....	The interaction of mind and hand
Figure 5	.....	Problem solving activity seen as a linear sequence
Figure 6	.....	Design loop
Figure 7	.....	Model of problem space
Figure 8	.....	Revised concept of problem space
Figure 9	.....	Structure of the human activity system
Figure 10	.....	Assessment model of conceptual and procedural understanding

## LIST OF TABLES

Table 1: Bloom's taxonomy of learning domains.....	p. 28
Table 2: Number of formal recorded assessment tasks Grades 7-9.....	p. 79
Table 3: Summary of participants' formal training and specialisation .....	p. 97
Table 4: Time allocated for the Senior Phase Grade 7 curriculum, 2005.....	p. 104

## LIST OF ABBREVIATIONS

APU	-	Assessment of Performance Unit
CAPS	-	Curriculum and Assessment Policy Statement
C2005	-	Curriculum 2005
CUMSA	-	Curriculum Model for Education in South Africa
DoE	-	Department of Education
ERS	-	Education Renewal Strategy
GET	-	General Education and Training Band
HEDCOM	-	Heads of Education Committee
LO	-	Learning Outcomes
NCS	-	National Curriculum Statement
NTT	-	National Task Team
OBE	-	Outcomes Based Education
RNCS	-	The Revised National Curriculum Statement
SKAVs	-	Skills, Knowledge, Attitude, Values
UK	-	United Kingdom

## TABLE OF CONTENTS

### Chapter One: Background and Educational Context

1.1. Introduction.....	1
1.2. Background and educational context.....	2
1.2.1. Inclusion of Technology Education in other parts of the world.....	3
1.2.2. Inclusion of Technology Education within the South African curriculum.....	4
1.2.2.1. A brief historical account of education before 1994.....	4
1.2.2.2. Post Apartheid review of education: Introduction of C2005.....	6
1.3. Rationale.....	10
1.4. Purpose of the study.....	11
1.5. Critical questions.....	12
1.6. Significance of the study.....	12
1.7. Methodology.....	12
1.8. Conclusion.....	13
1.9. Overview of chapter.....	13

### Chapter Two: Literature review and theoretical framework

2.1. Introduction.....	14
2.2. Transition from traditional assessment system to current assessment trends.....	14
2.2.1 General overview of assessment practices.....	19
2.3. Assessment practices within the NCS.....	26
2.3.1. NCS assessment guidelines for Technology Education.....	31
2.4. Approach to teaching Technology Education.....	33
2.4.1. Approach to teaching Technology Education in South Africa.....	35
2.5. Challenges Technology Education teachers face with regard to assessment practices	38
2.6. Theoretical framework.....	47
2.6.1. Newell and Simon's model of problem space.....	49
2.6.2. Revised concept of problem space and the influences of social constructivism	50
2.6.3. Constructivist approach.....	52
2.7. Conclusion.....	56

### **Chapter Three: Research design and methodology**

3.1. Introduction.....	57
3.2. Nature of inquiry in research.....	57
3.2.1. Locating this study within the interpretative paradigm.....	58
3.3. Approach to inquiry.....	58
3.4. Methodology.....	59
3.5. Sample.....	61
3.6. Data collection methods.....	62
3.6.1. Observation.....	64
3.6.2. Document analysis.....	66
3.6.3. Interviews.....	66
3.7. Data analysis.....	68
3.8. Validity in research.....	70
3.9. Design limitations.....	71
3.10. Ethical issues.....	72
3.11. Conclusion.....	73

### **Chapter Four: Analysis and discussion of data**

4.1. Introduction.....	74
4.2. Brief description of the participants.....	74
4.2.1. Mr. Jasper at Willow Primary School.....	74
4.2.2. Miss Shanti at Wisteria Primary School.....	75
4.2.3. Mr. Mario at Azalea Primary School.....	76
4.2.4. Mr. Yadav at Hycentia Primary School.....	76
4.3. Discussion of results.....	77
4.3.1. What are Grade 7 teachers assessing in Technology Education? .....	78
4.3.2. How do Grade 7 teachers carry out these assessment?.....	84
4.3.3. Why are Grade 7 teachers employing particular assessment strategies?.....	95
4.4. Conclusion.....	105

**Chapter Five: Recommendations and Conclusion**

5.1. Introduction..... 106

5.2. Findings and recommendations..... 106

5.2.1. What are Grade 7 teachers assessing in Technology Education? ..... 107

5.2.2. How do Grade 7 teachers carry out these assessment?..... 116

5.2.3. Why are Grade 7 teachers employing particular assessment strategies?..... 120

5.3. Limitations..... 124

5.4 Further research..... 125

5.5. Conclusion..... 126

**REFERENCES**

## CHAPTER ONE

### BACKGROUND AND EDUCATIONAL CONTEXT

#### 1.1. Introduction

The inclusion of Technology Education<sup>1</sup> within the curriculum of various countries became a common feature globally as technology literacy developed into a universal goal (Rasinen, 2003). However, when compared to other learning areas<sup>2</sup> in various curricula, Technology Education has posed many challenges to teachers. The reason for this, as cited by Ankiewicz, De Swart & De Vries (2006) in Rauscher (2010, p.2), is that Technology Education is a relatively new area internationally as compared to other learning areas, and is yet to develop into a well-established culture of classroom practice. To qualify this, McLaren and Dakers (2005) state that there is evidence to suggest that Technology Education is not making as significant an impact as it should in creating independent, creative problem solvers in classrooms around the world. Limited knowledge of subject matter and assessment practices have been cited by various Technology Education stakeholders as reasons for the gap that exists between policy and practice.

Technology Education became part of South Africa's educational curriculum landscape with the emergence of a new political dispensation in 1990. As the political milieu changed, a change in the education system became eminent. A new curriculum framework, Curriculum 2005 (C2005), guided by the principles of Outcomes Based Education (OBE), emerged. Eight compulsory learning areas were now part of the educational landscape, with Technology Education being one of them. All eight learning areas required new planning and preparation strategies. This burden fell heavily on the teachers' shoulders. Not only were they to learn new terminology and jargon, they were also expected to understand and implement a new curriculum into workable classroom activities. This placed undue stress on educators (Stevens, 2004; Van Niekerk, Ankiewicz & De Swardt, 2005).

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<sup>1</sup> Different countries use different terms to describe Technology Education, such as Technics, Design and Technology and Technological Education. For this study these terms were considered synonymous.

<sup>2</sup> Refers to the eight fields of knowledge in the Revised National Curriculum Statement: Languages, Mathematics, Natural Science, Technology, Art & Culture, Economic Sciences, Social Sciences and Life Orientation.

Changes within the South African education system were accompanied by many challenges. Teachers were expected to teach the new learning areas and apply OBE principles and strategies to all decisions regarding planning, methods of instruction and assessment. These changes in education placed enormous pressure on many teachers, more especially in the shift away from the traditional methods of assessment (Van Niekerk et al., 2005; Vandeyar & Killen, 2003).

Intensive teacher training programmes were launched by the Department of Education (DoE) to address the challenges of the new curriculum (Stevens, 2004). The paradigm shift from a traditional to an OBE curriculum was difficult for many teachers. This was so because prior to C2005, teachers mainly made use of paper and pencil assessments to test learners' textbook-based knowledge. Learners were then compared and promoted based on these results. It was quite difficult for many teachers to make the transition from the traditional way of awarding marks to using formative assessments of learners. They were also not familiar with the promotion of learners being determined by achievement of stated outcomes, as stated in the new policy. The problem was further compounded by the fact that Technology Education was an unfamiliar learning area with a unique methodology, which made assessment more demanding and challenging. Due to inadequate professional development by the DoE in Technology Education, many teachers were not adequately prepared to teach and assess the learning area (Van Niekerk et al., 2005; DoE, 2002).

It is against this backdrop that this study aimed to explore Grade 7 teacher assessment practices in Technology Education within the Pinetown District and to gain a better understanding of what teachers assess in Technology Education. This was done by examining how educators carry out their assessments and by exploring the reasons for such practices.

## **1.2. Background and educational context**

Human beings tend to generate needs as part of their daily lives, and provide solutions to problems that arise from needs and wants. Exposure to Technology Education is crucial in this context, for it concerns itself with solving practical social problems by using a variety of skills. As a result various communities would be able to have a decent quality of life through the application of Technology Education (Chapman, 2002; Makgato, 2003; DoE, 2002).

Technology Education assists learners in their endeavour to meet the challenges of a changing technological society by developing technological literacy (Ankiewicz, 1995; Chapman, 2002). It also enables learners to become critical users of technology as it exposes them to learning about the positive and negative impacts of technology whilst constantly reflecting on social, political and environmental issues (Chapman, 2002; Makgato, 2003).

It is for these reasons that Technology Education has the potential to develop and enhance a variety of skills and problem-solving abilities, as it is a learning area that has its own value and knowledge base which is enjoying international recognition. In Bensen's words, as cited in Ankiewicz (1995, p.248): "A relevant school curriculum therefore necessitates the inclusion of technology education." Technology Education has gained momentum throughout the world over the past decades (McLaren & Dakers, 2005; Mawson, 2003).

### **1.2.1. Inclusion of Technology Education in curricula in other countries**

Various curriculum documents began to emerge between 1994 and 2000 as Technology Education gained momentum in countries like Sweden, Australia, France, The Netherlands, the United Kingdom and United States of America. The curriculum documents of Sweden and Australia are the oldest, dating back to 1994. An analysis of the Technology Education curriculum of the six countries mentioned carried out by Rasinen (2003) clearly illustrates that the format and approach to Technology Education differ from one country to another, to suit the needs of the country concerned. There is, however, a shared rationale for the inclusion of Technology Education into various curricula including South Africa's:

- the need to prepare learners to live in a rapidly changing technological world;
- the seeming universal emphasis on learning to plan and produce solutions to technological problems;
- to become discriminating and informed users of technology;
- to become creative and innovative thinker; and
- to consider social, aesthetic and environmental issues when developing solutions (Rasinen, 2003; DoE, 2002).

### **1.2.2. Inclusion of Technology Education within the South African curriculum**

The recognition of Technology Education as an official subject in the school curriculum by the South African Government in 1997 marked a new beginning in the teaching and learning of Technology Education (Chapman, 2002). Various developments arose during the period of 1997-2007 that inevitably impacted on and subsequently shaped Technology Education in South Africa.

Education in South Africa underwent numerous changes over the past decades, and these changes were often accompanied by challenges. It is not the intent of this study to go into great historical detail regarding the evolution of the South African education system and the reasons for inclusion of Technology Education in the curriculum. A brief outline is, however, necessary so that the study can be located in the correct educational context, as espoused by Ankiewicz (1995, p. 245): “If a person wants to engage in any meaningful discussion on Education in South Africa, it has to be done against the background of the historical and political developments in the country.”

#### **1.2.2.1. A brief historical account of education before 1994**

Prior to 1994 education in South Africa was organised along racial lines. This inevitably led to the lack of provisions and resources for many ‘Black’ schools in rural areas. As a result, learners who wanted to choose practical subjects like Science, Home Economics and Woodwork, which were considered forerunners of Technology Education, were at a disadvantage (Stevens, 2004). This led to a disparity in the quality of education across racial lines (Makgato, 2003). This inevitably impacted negatively on the skills acquisition and job opportunities for the disadvantaged communities (Makgato, 2003; Stevens, 2004).

Resistance to social inequalities, the Soweto uprising of 1976 and widespread unrest that surrounded black education gave rise to debates and proposals for an alternative education system (Ankiewicz, 1995; Chapman, 2002; Stevens, 2004). The De Lange Commission was tasked by the government in 1980 to carry out a study on the state of education in South Africa following the 1976 crisis. The Commission recommended a shift towards vocational and technical education, and emphasised the disparity that exists between schooling and the demands of the work situation, that needed to be attended to. These recommendations were,

however, rejected by the Nationalist Government, which was still deeply entrenched in Apartheid ideology (Makgato, 2003). This highlights the extent to which the then government lacked understanding of real issues that were to be addressed. This lack of understanding had far-reaching consequences, which the present government is continually attempting to rectify and address in present-day education (Makgato, 2003).

Furthermore, pressures from global markets began to take their toll on South Africa and were gaining momentum over the race-based ideology of Apartheid (Stevens, 2004). This is the reason the period of 1990-1994 was marked by tremendous efforts to bring about educational changes. It is these social, political and economic pressures that brought about a review of the school curriculum.

The Walters Report of 1990 recommended that there should be significant change to the curriculum, with specific recommendations relating to a total overhaul of subjects. Subjects like Handwork, Needlework and Basic Techniques were re-curriculised into Design and Technology, with special attention given to the needs of South African society (Stevens, 2004) – a Technology Education curriculum aimed at developing the full potential of every learner, so that they could become effective citizens in a democratic South Africa. This curriculum was aimed at developing skills so that learners learned to generate creative and innovative ideas, and in doing gained competencies and the confidence to contribute to South Africa's social and economic development. This would allow them to meet the challenges of a changing technological society (DoE, 2002, p. 20).

The Education Renewal Strategy (ERS) of 1991 put forward similar suggestions, recommending that subjects such as Technology Education, Economic and Management Sciences and Art Education be included in the curriculum. These subjects were to be compulsory in the general formative curriculum from Grade 1 to Grade 9. The rationale for the inclusion of these subjects, in Steven's (2004, p.4) words, was: "These subjects would provide an education relevant to the needs of the learner and society as well as contributing to the personpower requirement of country". It is within this context that a discussion document regarding a curriculum plan for pre-tertiary education was released in November 1991. This became a Curriculum Model for Education in South Africa (CUMSA), and was the first step towards developing a curriculum that would address the needs of the South African population (Ankiewicz, 1995; Stevens, 2004).

It is in the CUMSA document that provisions for Technology Education in the curriculum were proposed. The CUMSA document defined Technology Education as follows:

Technology involves humankind's purposeful mastering and creative use of knowledge and skills with regard to products, processes and approaches so as to control his environment. Technology comprises, *inter alia*, the utilization of artifacts and processes by means of which labour productivity is increased (Stevens, 2004, p. 2).

It is worth noting that around this historical period the introduction of Technology Education was gaining momentum, and there were pilot programmes in operation. It is only after the democratic elections in 1994 and establishment of a non-racial education system that such projects gained legitimacy (Stevens, 2004).

#### **1.2.2.2 Post-Apartheid review of education: Introduction of C2005**

A National Task Team was appointed early in 1994 to 'spearhead' the introduction of Technology Education in schools. This project was called Technology 2005 (T2005). The team's responsibility was to develop a national curriculum and to trial it in all nine provinces. To this end pilot programmes were established and training programmes were introduced (Stevens, 2004).

With the ushering in of a new political dispensation in 1990, there was the opportunity to redress various issues. These included healing the racial divisions of the past, improvement of the quality of life for all citizens, and laying the foundations for a democratic and open society where democratic values and social justice are central. Education and the curriculum proved to be a perfect vehicle in the process of realising these goals (DoE, 2002; Chapman, 2002).

The proposals that were made by the ERS and CUMSA were strongly rooted in the new democratic system and became known as Curriculum 2005 (C2005). The main feature of C2005 was the implementation of eight compulsory learning areas, with Technology Education being one of them. The guiding principle for curriculum reform was that education and training needed to develop the full potential of every learner as an effective citizen in a

democratic South Africa. One of the principles that informed the new educational system was OBE (Chapman, 2002).

OBE aims to ensure that all learners achieve their maximum potential. If this is the case, it is believed that learners will be actively involved in their learning through discovery, problem solving and working in small groups, all of which develop social and co-operative skills so that they can effectively take their place in society (DoE, 2002).

According to Chapman (2002), Technology Education as a learning area has the capacity to change the way learners think and behave in everyday life. It furthermore has potential to stimulate learners intellectually so that they can become productive and critical leaders of the future. The fundamental belief was that if South Africa as a nation is to become a force to be reckoned with in the global arena and in the uses of Technology, then the inclusion of Technology Education is a necessary prerequisite (Chapman, 2002).

Large-scale capacity building for C2005 was necessary as teachers were not trained in OBE or in the new learning areas that were introduced. Unrealistic time frames for implementation of C2005 compounded the problems and the filtering of information regarding policy was inadequate; as a consequence the implementation of C2005 was rushed (Stevens, 2004).

This haphazard action around the implementation of C2005 caused immense strain, stress and uncertainty among teachers, as all eight learning areas required new planning and preparation strategies. The burden fell heavily on the teachers' shoulders: not only were they to learn new terminology and jargon, they were also expected to understand and implement a new curriculum into workable classroom activities. Technology Education thus lost its novelty amidst the implementation of C2005 (Stevens, 2004).

The above discussion shows that there were identifiable problems with C2005 (Chapman, 2002; Ziqubu, 2006). In the light of the various problems resulting from the implementation process, the National Minister of Education at that time, Professor Kader Asmal, called for a review of the curriculum in late 1999. The Chisholm Commission, chaired by Professor Chisholm, was established to review C2005. In light of all that had gone on it was not surprising that in May 2000, when the report was presented to the Minister, the

recommendation that was made that Technology Education was to be integrated with the Natural Science learning area in order to reduce the number of learning areas in the curriculum (Chapman, 2002; Stevens, 2004; Ziqubu, 2006).

This recommendation was not accepted by the Heads of Education Committee (HEDCOM), however, because they felt that there was a need to have an educational system that is on par with education in other countries (Chapman, 2002; Stevens, 2004; Ziqubu, 2006).

After the review of C2005 and the decision by HEDCOM to retain Technology Education, Professor Kader Asmal subsequently appointed another task team in 2001 to refine and reword the entire curriculum and turn it into a simpler and more user-friendly document. This was due to the fact that the majority of South African teachers discovered that it was challenging to make sense of the curriculum (Chapman, 2002; Stevens, 2004; Ziqubu, 2006).

The draft Revised National Curriculum Statement (RNCS) was generated in 2001. The seven specific outcomes of Technology Education were reduced to three by combining some of the original learning outcomes. The format remained the same, but was presented in a way that was easier to understand. It gave a detailed description of the learning programmes, and it was hoped that the guidelines would provide support mechanisms to Technology teachers. The RNCS was eventually adopted as the National Curriculum Statement (NCS) in 2005 (Chapman, 2002).

However, apart from the Technology Education curriculum document being more user-friendly, the actual implementation of the learning area in the classroom was still problematic (Rietsma & Mentz, 2006). “The strongest area of resistance to change was centered on issues of assessment and reporting of learning”, according to Vandeyar and Killen (2003, p.120). Problems surrounding Technology Education were compounded by the fact that this learning area was new, and not many educators had enough experience to teach it.

Numerous complaints, comments and public concerns regarding implementation of the NCS were forwarded to the Minister of Basic Education. As a result, in 2009 this Minister, Mrs. Angie Motshekga, appointed a Ministerial Committee that was tasked with reviewing the implementation of the NCS. The committee conducted public hearings, interviews and communicated via electronic media with teachers to get to the crux of the problem. The

Curriculum Review Committee acknowledged that teachers were overburdened with curriculum and administrative duties and that there were varying interpretations of curriculum requirements across the country (Meredith, 2010; Mosuwe, 2011).

By 2010 the following recommendations were made by the Ministerial Committee:

- The existing NCS document had to be condensed and rationalised into a simple, single, coherent document for each learning area from Grade R to Grade 12.
- Regular external annual assessments in Mathematics, Home Language and English (First Additional Language) in Grades 3, 6 and 9.
- English needs to be introduced as a learning area parallel to Home Language, from Grade 1 for learners who will use English as a language of learning and teaching from Grade 4.
- Reduce the workload in the intermediate phase by reducing the learning areas to six.
- Teacher training needed to be strengthened and in-service training provided where it was needed most.
- Reassert the role of textbooks, by compiling a catalogue of textbooks for all learners for every subject, and these textbooks should be provided to all learners nationally.

The Minister immediately began implementing the recommendations of the committee. To relieve teachers of some of the administrative pressures, the number of projects for learners was reduced and portfolio assessment files for each learner were done away with (Meredith, 2010; Mosuwe, 2011).

Further changes based on the recommendations of the Ministerial Committee were set in motion by the end of 2010, most significant being refining and repackaging of the NCS into a single coherent curriculum document for each learning area, so that it is more assessable. This document was referred to as the National Curriculum and Assessment Policy Statement (CAPS), which is due to be implemented by 2012 in the foundation phase and Grade 10, by 2013 in the intermediate phase, senior phase and Grade 11, and by 2014 in Grade 12 (Meredith, 2010; Mosuwe, 2011).

The plans for developing a more comprehensive and structured curriculum and assessment policy for each learning area per grade for teachers to follow nationally were set in motion.

Workbooks and other teaching resources are in the process of being developed to assist with the transition. The reduction of the number of learning areas in the intermediate phase from eight to six means that Technology Education is to be combined with Natural Science within the intermediate phase. However, it would be taught as a learning area on its own in the senior phase (Meredith, 2010; Mosuwe 2011).

Development of the CAPS document sees a refined and repackaged NCS, making it more assessable for teachers. Being mindful of the fact that teacher orientation and the development of teaching support material is required, the implementation timelines have been structured in phases, as mentioned previously (Meredith, 2010; Mosuwe 2011).

### **1.3. Rationale**

Although, according to McLaren and Dakers (2005), Technology Education throughout the world has gained momentum over the decades, it is not making as significant an impact in classrooms around the world as it should. This is apart from the fact that the unique nature of Technology Education as a new learning area was posing a wide range of problems for many teachers worldwide (Mawson, 2003). Various Technology Education stakeholders have cited limited knowledge of the subject matter and assessment strategies as reasons for the gap that exists between policy and practice (McLaren & Dakers, 2005).

With the emergence of C2005 and the NCS, many teachers found it challenging to implement OBE principles in Technology Education, because they had no knowledge and training in content and methodology. Insufficient and inadequate training at DoE workshops further compounded the issue. No proper direction was given to Technology Education, and furthermore no specific training was given regarding assessment (Rietsma & Mentz, 2006).

This proved detrimental. For example, I, as a teacher of Technology Education, found myself experiencing challenges in developing learning work schedules<sup>3</sup> in Technology Education as well as in assessing learners' work. Policy documents and assessment guidelines which were supposed to assist educators were of little help as they were very generic and allowed for varied interpretations, which added to the confusion. Vandeyar and Killen (2003, p.133)

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<sup>3</sup>A year-long programme that shows how teaching, learning and assessment will be sequenced and paced in a specific grade.

qualify this by stating that the “National Curriculum Statement falls short of providing information and explicit guidelines that would help teachers to focus specifically on the fundamental principles of high quality assessment practices.”

My dilemma eased once I enrolled at the University of Kwazulu-Natal to complete my Advanced Certificate in Education in the field of Technology Education. I gained knowledge and insight in my field of study which directly impacted on my teaching and assessment practices. However, the gap that existed between theory and practice was still too large to bridge. It is from this experience that I rationalise this study.

Literature consulted further qualifies my rationale for this study, as it seems that the issues around assessment practices in Technology Education are proving to be problematic both locally and internationally. This is validated by Malcolm Welch (2001) of Queen’s University, Canada, who states that issues around assessment in Technology Education are unresolved and continuously being debated, and that there is a definite need for research to be conducted in classrooms to identify teacher assessment practices. Issues surrounding assessment practices are further highlighted by Susan McLaren of the University of Strathclyde and John Dakers of the University of Glasgow (2005), both in Scotland, by stating that the major inhibiting factor for Technology Education not reaching its ultimate potential in many countries (namely Scotland, England, New Zealand, South Australia and Sweden) is assessment practice.

Within the South African scenario Technology Education is a new learning area which is without a prior curriculum design to follow or historical data to assist curriculum developers or teachers in the field. In light of this, success around assessment practices seems a difficult outcome (Chapman, 2002). This indicates that a gap exists and that there is a need for research to be conducted in classrooms so that teacher assessment practices in Technology Education within the South African context can be explored further.

#### **1.4. Purpose of the study**

The aim of the study is to explore Grade 7 teachers’ assessment practices in Technology Education and to gain a better understanding of what teachers assess in Technology Education. This will be done by examining how they carry out their assessments and by exploring the reasons for such practices.

## **1.5. Critical questions**

The research questions are as follows:

1. What are Grade 7 teachers assessing in Technology Education?
2. How do Grade 7 teachers carry out these assessments?
3. Why are Grade 7 teachers employing particular assessment strategies?

## **1.6. Significance of the study**

This research thus allows me the perfect opportunity to explore issues that are proving to be problematic for teachers with regard to assessment practices in Technology Education within the South African context. It is hoped that a better understanding of teacher assessment practices in Technology Education will be gained, so that the gap between theory and practice is bridged. The intention is to build on the foundation of existing research that has been carried out in the field of Technology Education, and that this research would be of benefit to various national and international stakeholders involved in Technology Education.

## **1.7. Methodology**

Guided by the interpretive paradigm this research is qualitative, as the aim is to provide an in-depth understanding of Grade 7 teachers' assessment practices and the reasoning behind employing them in Technology Education (Burton & Bartlett, 2005; Cohen, Manion & Morrison, 2004). The case study approach has been opted for, as it allows the researcher an opportunity to study the participants' common and unique features in depth within a limited time scale (Bell, 1993; Denscombe, 2003; Cohen et al., 2004). The four participants selected for this study were chosen by virtue of their professional experience in teaching Grade 7 Technology Education within the senior phase<sup>4</sup>, as well as their accessibility within the Pinetown District. The data collection methods selected for the research are observation of Technology lessons, document analysis of learners' books and educators' portfolios, as well as semi-structured interviews. A more detailed description of these aspects is provided in chapter three.

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<sup>4</sup> Refers to the grouping of Grade 7 into a phase.

## **1.8. Conclusion**

The central purpose for the introduction of C2005 and hence Technology Education was to redress the past imbalances in education due to the apartheid regime. These imbalances had far-reaching consequences, and the effects are still influencing developments in the present educational systems. Furthermore, the controversy surrounding assessment practices is an international phenomenon which needs to be addressed.

## **1.9. Overview of chapters**

The primary purpose of chapter one of this study was to provide the background to the study and to develop an understanding of the educational context. Chapter two is divided into two parts: part one reviews the literature that has been consulted regarding the unique nature of Technology Education, and the impact on assessment and challenges experienced by Technology Education teachers worldwide, while part two outlines the theoretical framework of the study. Chapter three focuses on design and methodology, and chapter four presents the data that were obtained from the participants via semi-structured interviews, lesson observations and data analysis. Chapter five presents the conclusions and recommendations.

## **CHAPTER TWO**

### **LITERATURE REVIEW AND THEORETICAL FRAMEWORK**

#### **2.1. Introduction**

It is evident from Chapter One that in an effort to revitalise the South African education system, significant changes have been made in the last 15 years. In aiming to meet both political and educational objectives, the new OBE approach to teaching and learning had major implications for general school-based education. It brought about radical changes to an old traditional education system and posed new and unfamiliar challenges for teachers. Among these challenges was greater teacher involvement in assessment practices (Le Grange & Reddy, 1998).

In the light of the above and in order to gain greater insight into and understanding of Technology Education assessment practices, it is essential for this study that we understand what these changes were and how they impacted on teacher assessment practices. As this chapter unfolds the following aspects will be addressed: the transition from traditional assessment to alternative assessment; assessment practices within the NCS with a specific focus on Technology Education; the unique nature of Technology Education and its impact on assessment practices internationally; challenges facing teachers in assessing Technology Education; and finally the theoretical framework used in this study.

#### **2.2. Transition from traditional assessment system to current assessment trends**

Assessments are a communicative device used in the world of education and wider society, which ranges from informal exchanges to extremely formal monitoring (Broadfoot & Black, 2004, p. 9). Assessment entails gathering, organising and making decisions about a learner's performance. It is one of the most important and significant components of teaching and learning and forms an integral part of the curriculum, and should be included at all levels of planning (DoE, 2007; Le Grange & Reddy, 1998). It informs decision making and plays an important role in ascertaining the extent to which a learner has progressed. Assessments also aid the teacher in evaluating the effectiveness of his or her teaching and guide future practices (DoE, 2007; Kimbell, 1999; Van der Horst & McDonald, 2005; Le Grange & Reddy, 1998).

There are several types of assessments; however, for the purpose of this research the following types of assessments will be explained: summative, formative, norm reference and criterion reference.

Summative assessments refer to those which take place at the end of a learning experience, or assessment of learning. Usually it is the final measure of what was learnt, in the form of a single test or examination at the end of an academic year. The main objective of summative assessment is to determine how much the learner knows or can recall. If the result indicates that the learner has sufficient knowledge and has passed the test, they advance to the next grade. If the learner fails the test, then he or she has to repeat the grade. This type of assessment focuses on the end result and does not measure the actual learning process of the learner (Le Grange & Reddy, 1998; Van der Horst & McDonald, 2005; Cohen et al., 2004).

Cohen et al. (2004) bring to our attention that summative assessment is concerned mainly with certification that is awarding marks for public recognition of achievement. Summative assessment is aligned with norm reference assessments, as each learner's individual performance is compared with the performance of the other learners. Norm reference assessments enable a teacher to place learners in rank order, which could result in negative labeling if a learner performs badly. This form of assessment reflects little of the learner's ability and competence, and may be useful to justify selection (Le Grange & Reddy, 1998; Van der Horst & McDonald, 2005; Cohen et al., 2004; Taras, 2005).

Cohen et al. (2004, p. 330) eloquently state that "Formative assessment and summative assessment appear to lie in tension with each other even though they may overlap to a certain degree". Summative assessment is the opposite of formative assessment, which is assessment for learning. Formative assessment is conducted throughout the learning process and involves continuous monitoring of the learning process over a period of time. There is regular feedback between teacher and learner of the current learning performance. This immediate feedback is used to influence, inform and develop the learning process as learners are immediately made aware of the gap that exists between the desired goals and the actual goals achieved (Le Grange & Reddy, 1998; Van der Horst & McDonald, 2005; Cohen et al., 2004; Taras, 2005).

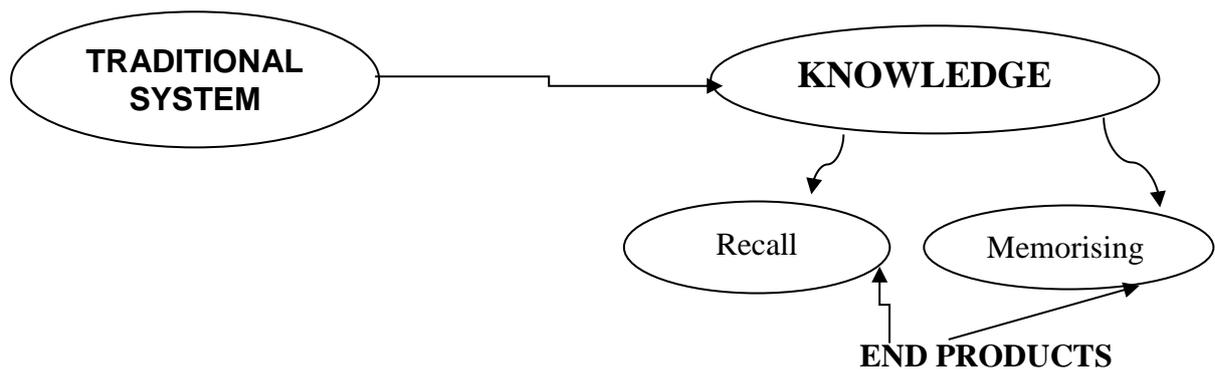
Criterion reference assessment was the brainchild of Glaser in the 1960s. Criterion reference assessments are when specific criteria are set out and learners are assessed according to the extent to which they have met the criteria. The criteria are predetermined and no comparison is made to other learners' achievements. A good example would be a Grade 11 learner who does Typing as a subject and has to meet the requirement of typing 25 words per minute to pass the subject. Siphon and his parents are aware of the requirement, and at the mid-year parent-teacher interview Siphon's parents are told that he is only typing 22 words per minute, and as a result has not met the requirement for passing. The focus is on individual performance of a learner and the quality of that performance, irrespective of what the other learners have achieved. Criterion reference assessments provide the teacher, learner and parents with more information regarding learner competence in a learning area (Le Grange & Reddy, 1998; Van der Horst & McDonald, 2005).

According to Le Grange and Reddy (1998, p. 3), "the way in which the learning and teaching process is understood influences the kind of assessment practices that are used." To elaborate further, the traditional curriculum is normally based on the understanding that a learner must memorise or know a certain body of knowledge in a particular grade. Teaching practices employed are based on developing the learners' memory, and as a result the skill of recalling memorised facts is what is assessed. The learner is promoted at the end of the year, as judged by what the learner knows. Within the traditional educational system the end product is assessed, and that is mainly based on the recollection of information. As a result the pen and paper assessment practices employed in a traditional system reflect this understanding (Le Grange & Reddy, 1998). Van der Horst and McDonald (2005) go on to state that traditional tests do not provide learners with opportunities to reveal their true character, or to showcase their attitudes, values, skills and knowledge.

The NCS which is underpinned by OBE principles is based on an understanding, according to Le Grange and Reddy (1998, p. 6), "that knowledge is not transferred intact from teacher to learner." The learner uses the newly found knowledge together with personal experience and prior knowledge and develops their own concept in their mind, and that is when learning takes place. Learners' attitudes, knowledge, skills and values are important, and the process of learning is more important than merely recalling and memorising facts, as illustrated in Figure 1. There is therefore a need to use alternative methods of assessment. Masters and Foster, cited in Van Rensburg (1998, p. 84), qualify this by stating that "The focus of

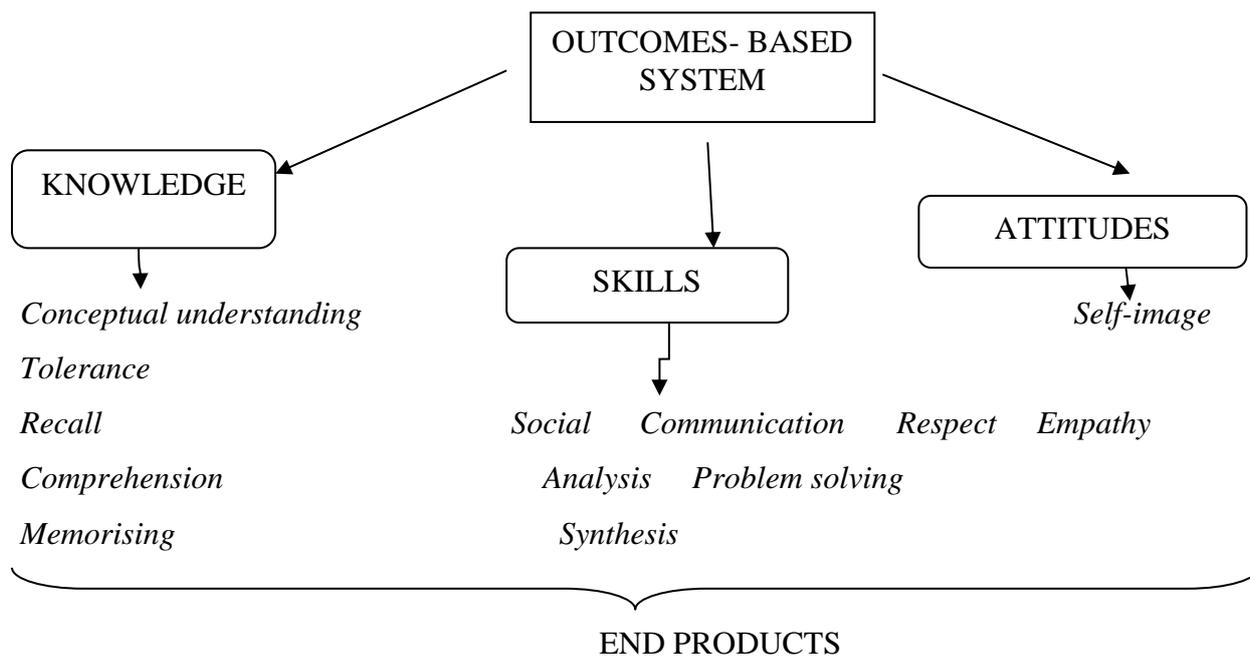
assessment is shifted from the notions of ‘passing’ and ‘failing’ to the concept of ongoing growth.” Continuous assessments help shape and develop the learner through the learning process, with different forms of assessment being required (Le Grange & Reddy, 1998; Van der Horst & McDonald, 2005).

When comparing the end products in a traditional system, namely recall and memorising (as shown in Figure 1), with the end products in an OBE system – the development of knowledge, skills and attitudes (as shown in Figure 2) – it is easy to see why teachers expressed concern about the implementation of OBE and the challenges that they had to face with the new, unfamiliar concept of continuous assessment. There are many different methods of uncovering and describing learners’ understanding. According to Le Grange and Reddy (1998), traditional methods of assessment such as tests and examinations fall short of assessing learners’ knowledge, skills and values.



**Figure 1: End products in traditional assessment system (source: Le Grange & Reddy, 1998, p. 7)**

The move towards OBE, as shown in Figure 2, has steered us away from traditional assessment techniques towards finding new, alternative assessment strategies which focus on holistic development of the child (Le Grange & Reddy, 1998).



**Figure 2: End products in an OBE system (source: Le Grange & Reddy, 1998, p. 7)**

The basic principle of OBE is that all decisions pertaining to planning, teaching and assessment in OBE are determined by four factors, namely:

- The outcomes educators need to achieve;
- The content educators use to help achieve these outcomes;
- The process the teacher uses to assist the learners in achieving the outcomes; and
- Assessment of learners.

As a result, before any assessment is carried out teachers need to identify the outcomes and the assessment standards that need to be assessed, because outcomes cannot be achieved in a vacuum. Assessment gives value to an OBE system. Learners' achievements are determined by the assessment of predetermined learning outcomes (LOs) as well as the learning process. If learners have not achieved specific outcomes, the teacher has to adjust the teaching method or learning experience to help the learners achieve the outcome. This means that a range of teaching methods and learning experiences need to be incorporated in order to achieve specific outcomes. Since learning experiences are important in achieving these outcomes, assessment must be continuous and throughout the whole learning process, so that the teacher can monitor and nurture the learners' development (Le Grange & Reddy, 1998; DoE, 2004).

McGown, as cited in Van der Horst and McDonald (2005, p. 169), is in agreement with Le Grange and Reddy (1998) as he goes on to say that in order for learning to improve, assessment techniques that are employed by teachers should present a multidimensional overview of the learners' capability. These assessment techniques should respect and highlight the learners' diversity as well as suggest actions that can be taken by the teacher to improve the educational development of the learners (Le Grange & Reddy, 1998).

### **2.2.1. General overview of assessment practices**

The current thinking around assessment and education has created a climate where assessment is more than just the attainment of marks. Educational and assessment goals have expanded into providing a competitive edge for learners, encouraging them to stay in the formal education system for longer, motivating them for life-long learning (Broadfoot & Black, 2004). Susan McLaren (2007), a Senior Lecturer at the University of Strathclyde in Glasgow, qualifies this by stating that assessment presently is seen as a tool that creates an atmosphere for life-long learning which encourages learners to reflect on their own learning and to make value judgements of their strengths and weaknesses.

The current trend world-wide regarding new assessment strategies is that of “authentic assessment”, “alternative assessment” or “performance assessment”, all of which are synonymous with formative assessment (explained earlier in the chapter). Authentic assessment, according to Cohen et al. (2004), has been termed “the true path to educational reform”, since the focus is on the measurement of performance and higher-order thinking skills in real-life situations. According to Cohen et al. (2004) authentic assessment links assessment to the real world and what people actually do, and at the end stakeholders that are involved are aware of the capability of the learners and what they are able to do in the real world. The thinking behind this form of assessment is to assess not only the correct response or finished product, but also the thought processes involved in arriving at a solution. What this means is that assessment is comprehensive and holistic, so when a learner arrives at a solution he or she actively engages in reflection on the learning process (Cohen et al., 2004). Reflection, critical thinking and taking ownership of one's learning is emphasised (Languages other than English Center for Educator Development, n.d.). As Van der Horst and McDonald (2005, p.168) go on to emphasise, “authentic assessments require learners to

demonstrate complex tasks rather than individual skills practiced in isolation”. McLaren (2007) is in agreement with Cohen et al. (2004) and Van der Horst and McDonald (2005) by adopting a progressive view of assessment and recognising that there are different purposes for assessments.

The different purposes of assessment as identified by McLaren (2007) are referred to as assessment of learning, assessment for learning and assessment as learning

**Assessment of learning** is assessment that is more formal and is generally conducted at the end of a section or learning unit. This form of assessment is carried out by the teacher and is sporadic. It is summative and compares learners’ achievements with standards and goals. The final scores that are attained are used to rank learners. Assessment tasks are drawn from the content studied and most often any feedback that is given to learners is delayed. The information gained from these assessments can be shared with parents and learner (Le Grange & Reddy, 1998; Van der Horst & McDonald, 2005; McLaren, 2007; McMillan, 2011). McMillan (2011) further goes on to state that assessment of learning is a superficial form of assessing and can decrease learner motivation.

**Assessment for learning** is a learner-centred and interactive process whereby the teacher and learner share in the learning experience. Learners are aware from the beginning of the unit what they are expected to achieve (Le Grange & Reddy, 1998; Van der Horst & McDonald, 2005). In McMillan’s (2011, p. 17) words: “It describes needs for future learning”. The assessments that are carried out are based on a variety of tasks, for example teacher observations, portfolios, practical work or oral presentations, and conducted during the unit that is being taught and ongoing. These assessments can be formal or informal and the agents for assessment can be the teacher, the learner or peers. There is in-depth testing and the learner is given regular, immediate and ongoing feedback. This feedback outlines the learner’s strengths and weaknesses. Once the teacher analyses the learners’ understanding and responses, the instructional methodologies are adjusted or modified accordingly to assist the learner and to keep them on track to achieve specific goals. Assessment is formative and suggests corrective instruction (Le Grange & Reddy, 1998; Van der Horst & McDonald, 2005; McLaren, 2007; McMillan, 2011).

**Assessment as learning** is when teachers and learners reflect on the learning experience through dialogue, peer and self-assessment. This type of assessment engages learners in the process of learning and fosters self-monitoring of learning. It provides learners with information on their achievements so that they can make necessary decisions on how to improve or maintain their progress, which involves goal setting, monitoring of progress and reflection on results achieved (Le Grange & Reddy, 1998; Van der Horst & McDonald, 2005; McLaren, 2007; McMillan, 2011). This type of assessment creates a climate of learning how to learn on a continuous basis, and the learner takes ownership of his or her learning. It is a good motivating tool for learners as it is conducted during the unit that is being taught and the feedback is immediate (McLaren, 2007; McMillan, 2011).

It is evident that assessments are carried out for a range of different purposes, some of which may include motivation, creating and improving teaching and learning opportunities, provision of feedback, to grading and as a mechanism of quality assurance (Cohen et al., 2004). Assessment is thus a powerful tool for all stakeholders in order to improve teaching, learning and achievement. The quality of assessment practices should therefore not be compromised (Rust, 2002; Cohen et al., 2004).

Assessment for learning is an essential element of current educational trends. Without valid and reliable assessment procedures it is difficult for teachers to ascertain whether or not the LOs for that particular unit have been met or not. Assessment forms an integral part of planning and preparation and is not something that a teacher considers at the end of the unit of work or a lesson. Current trends in assessment are mainly formative assessment, and as a result the entire learning process helps to shape and mould the learner (Killen, 2007; Van der Horst & McDonald, 2005; McMillan, 2011).

Van der Horst and McDonald (2005), state that it is vital when employing certain assessment practices that there is a clear indication of the content that is going to be taught. This subsequently affects the assessment practices that are employed, whether they are flexible and whether they are designed to match the LOs to be attained. The more realistic the assessment practice is, the clearer the picture of what learners' achievements will be. A teacher must know in advance exactly what it is that they want the learners to learn and why they want them to learn. Having a clearly defined purpose also enables the learners to know exactly what is expected of them, so that they are able to work towards these goals.

Moreover, what is taught must link directly with what is assessed (Van der Horst & McDonald, 2005).

Meaningful assessment practices within the authentic assessment framework rely on a good relationship between teacher and learner, and as a result both parties should be involved in the assessment process. The teacher is no longer the only one able to evaluate learners' work. Opportunities for learners to engage in self- and peer assessment often arise within the authentic assessment framework. Peer assessment is where learners appraise other learners' work, which can be done individually or in groups. Guidelines should always be provided by the teacher so that learners are made aware of what is important and to avoid unnecessary criticism or problems among learners. Self-assessment is when learners are given the opportunity to appraise or assess their academic skill or performance. It encourages ownership of learning and serves as a good motivating tool throughout the learner's scholastic career (Van der Horst & McDonald, 2005; Van Rensburg, 1998).

These assessment strategies are used to create an environment whereby learners can have a better understanding of the learning community of which they are part, and also to enable them to take responsibility for their own learning. Assessment practices in OBE allow for assessing complex performances and higher-order thinking skills in real-life contexts (Van Niekerk et al., 2005; Van der Horst & McDonald, 2005).

Authentic assessment, as mentioned previously, is also referred to as alternative assessment, and offers a variety of alternatives to traditional methods of assessment, including journals, diaries, portfolios, performance tasks, exhibitions, assignments, reports, discussions and interviews (Van der Horst & McDonald, 2005; McMillan, 2011). All of these assessment strategies cannot possibly be covered in this study, but a few will be discussed briefly to highlight assessment options available to teachers. Those that will be discussed in this study are projects, portfolios and practical work. One must bear in mind that although these strategies are discussed separately, they can be used in conjunction with or as part of other strategies.

Projects are long-term tasks which could involve individual or group work over a period of time. They may include a variety of different activities, like the collection and analysis of data and preparation of a written report. At times posters may be used to describe and discuss

findings and recommendations. When a project is set out as an assessment task it must be structured so that the process can be assessed and not just final product in the form of a manufactured product, display file or answer to a series of questions (Van der Horst & McDonald, 2005; Le Grange & Reddy, 1998).

Portfolios are a deliberate collection of various samples of learners' work which indicate their accomplishments. These samples are collected over a period of time and may include written assignments, charts, models, artwork and test scores. Assessment portfolios should include teachers' assessments as well as self-assessments. Learners may have different portfolios for each learning area or a combined portfolio for all the learning areas.

Gronlund and Waugh (2009) draw our attention to the fact that portfolios can serve a variety of purposes and not only be used as an assessment portfolio tool. Portfolios may also be used as an assessment strategy and are a useful tool for assessing a learner's skills, attitudes and academic development. For example, a sample of the learner's work is placed in the folder at the beginning of the year, and later on that year other samples are collected. When the selected samples are compared it enables the teacher to assess the learner's growth and development towards achieving specific outcomes. Portfolios enhance teaching and learning and offer a more viable alternative to traditional assessments (Van der Horst & McDonald, 2005; Le Grange & Reddy, 1998; Van Rensburg, 1998).

Portfolios may also serve a specific purpose for assessment, as dictated by the characteristics of the learning area. For example, Technology Education uses design portfolios for the development of ideas from inception of learners' thoughts to completion of the final prototype. In this case portfolios are a way of capturing the story that is unfolding; it promotes an ongoing process where learners demonstrate performance, evaluation, revision and production of quality work (McMillan, 2011; Welch & Barlex, 2004). Assessment in this scenario is continuous and integral for learning. Cohen et al. (2004), however, also draw our attention to the fact that the reliability of portfolios is sometimes suspect and teachers may question whether they are solely the learner's work. They also go to say that portfolios vary from one learner to another, and as a result pose challenges to teachers when assessing them comparatively and fairly. In the light of this teachers prefer using them for formative rather than summative assessment.

Practical work can be used in many learning areas. Through hands-on practical activity learners are able to demonstrate skills that they have developed over time. Practical tests examine the process of doing and not just the final product; as a result the teacher observes the various stages of the learning process (Cohen et al., 2004). Le Grange and Reddy (1998) further state that when learners engage in hands-on, practical, learner-centred activities, their commitment to learning increases.

Broadfoot and Black (2004, p.10) state that the assessment strategy adopted within the present educational system worldwide needs to encourage 'deep' rather than surface learning. It is clear that there are a variety of tools for assessment and these tools can be employed for a variety of purposes and have the potential for great educational value. However, some of these tools of assessment are not currently understood well or used effectively.

The paradigm shift in education practice demonstrates the need for change to take place in assessment. This means that assessment strategies and tools used in assessment need to be aligned with curriculum reform. Otherwise, as Van Rensburg (1998, p. 82) puts it, "The desired changes in education will be extremely difficult, if not impossible, to implement."

Kimbell (1997, p. 20) refers to "Assessment in schools as a 'high- stakes' activity. Because it plays a crucial role in determining learners' futures, it is time consuming for teachers and extremely expensive considering new learning and support materials need to be purchased." It is evident from research carried out by Dekker and Feijis (2005) that when curriculum change and assessment practices were revolutionised in countries such as the USA and The Netherlands. Teachers found it difficult to adapt their assessment practices to a process-orientated teaching and learning situation. This placed immense strain and stress on teachers. Similar to the South African situation, teachers from a traditional pen and pencil assessment background found it difficult to change their mind-set to a formative assessment system (Stevens, 2004).

A major contributing factor to this problem was the fact that teachers showed a limited understanding of formative assessment practices, and this resulted in teachers providing insufficient feedback to learners about their progress. According to Broadfoot and Black (2004), many of the teachers' practices with regard to formative assessment were narrowed down to 'rubric-driven instruction'. It was also found that although teachers were

implementing the newly reformed curriculum, they still resorted to traditional assessment techniques. Teachers continued to focus on assessment of basic skills and paid little or no attention to varying strategies used by learners to solve problems and come up with solutions. Emphasis was still on recall and memory rather than teaching and learning for understanding (Dekker & Feijis, 2005). Dekker and Feijis (2005) confirm Broadfoot and Black's (2004, p. 17) claim that challenges arise when there is a lack of adequate professional training to help teachers be consistent and rigorous in framing and selecting assessment strategies.

Research carried out by Dekker and Feijis (2005) reveals that significant changes occurred in teacher attitude and classroom practice towards formative assessment in the USA and The Netherlands as a result of appropriate professional development. Teachers who participated in these professional development workshops began implementing the various strategies learnt, which also impacted on learners' performance. Furthermore, continued teacher support was provided to the teachers who attended the workshops in the form of regular site visits and informal as well as formal meetings by facilitators for cascading of new vital information (Dekker & Feijis, 2005).

Compared to traditional methods of assessment, authentic assessment in real-life contexts provides a perfect vehicle to measure higher-order thinking. Real-life contexts allow learners to find solutions to problems in creative ways; they are able to link the classroom situation with the outside world and gain ownership of their learning. Dekker and Feijis (2005) state that learner textbooks do not always provide teachers with the best problem context; it is thus important for teachers to adapt the problem context posed in the textbook to that which learners can identify with and would enhance their learning. In this way assessment becomes meaningful and real to learners since they can identify with the context. An added advantage is that assessments now become an integrated part of the teaching and learning process and not just an add-on at the end of a section. During authentic assessment practices the learner is able to demonstrate complex tasks rather than individual skills, which impacts on formative assessment practices where assessments must be comprehensive and holistic (Van der Horst & McDonald; 2005, DoE, 2002; Dekker & Feijis, 2005).

### **2.3. Assessment practices within the NCS**

The driving force behind educational reform was to improve the standards of assessment in South Africa. With the introduction of C2005 and later the NCS, the transformation of assessment practices in South Africa evolved. Assessment practices that are encouraged in the NCS are underpinned by the principles of OBE. Assessment practices are thus deliberately planned processes of gathering information on learner performance against LOs. The level at which the learner is assessed is determined by the assessment standard that is outlined for each grade (DoE, 2007).

Assessment as defined by the NCS “is a process of making decisions about a learner’s performance. It involves gathering and organizing information in order to review what the learners have achieved” (DoE, 2007, p.1). Assessment informs decision making and aids teachers in establishing whether learners are performing in accordance with their true potential (Le Grange & Reddy, 1998).

The general purpose of assessments in terms of the NCS within the GET band is to:

- Develop learners’ knowledge, skill and values;
- Identify the needs of the child;
- Allow for teachers to reflect on their practice;
- Allow learners to identify their strengths and weaknesses;
- Revisit or revise sections that learners are having difficulty with;
- Provide information and data to relevant stakeholders; and
- Demonstrate the effectiveness of the curriculum or a teaching strategy (DoE, 2007, p.1).

According to Vandeyar and Killen (2003) and the DoE (2002), assessment strategies that teachers employ should reflect the foundation principles of OBE. This is because OBE principles form the foundation of the NCS, which aims to develop life-long learning and full potential of each learner within a democratic South Africa (DoE, 2002, p. 2).

Assessments should thus include the following:

- Assessment procedures should focus on the outcomes to be tested so that valid inferences can be drawn about learning;
- Assessment procedures should be reliable, whereby a conscious effort is made to minimise errors and to allow learners to demonstrate their understanding;
- Assessment practices should be fair and learners should not be disadvantaged due to irrelevant factors such as cultural background;
- Assessment should reflect the knowledge and skills that are important for learners to learn;
- Assessment should challenge learners to the limits of their understanding and their ability to apply them;
- Assessment tasks should be authentic and meaningful so that they support every learner's opportunity to learn, so that they can develop individually and maintain their individuality; and
- Assessments should be integrated with teaching and learning.

The rationale behind the inclusion of Technology Education as a learning area within the NCS was for learners to acquire skills so that they learn to generate creative and innovative ideas. In doing so, they gain competencies and confidence and are able to contribute to South Africa's social and economic development. Technology Education also helps the learner to develop intellectual and practical skills so that they can meet the challenges of a changing technological society (DoE, 2002, p. 20).

The NCS strives to ensure that all learners achieve their maximum potential. As a result education is learner-centred and activity-based. Learners are actively involved in their learning through discovery, problem solving and working in small groups, which develops social and co-operative skills. These outcomes are achieved in the Technology lesson, when learners work in groups to analyse information given to them so that practical solutions are created. Technology contributes to the intellectual and practical development of the learner, through its open-ended and problem-solving approach (DoE, 2002, p. 5).

In order for the NCS to achieve the critical outcomes outlined in the document, assessment tasks planned by teachers cannot only assess recall and memory. Provision needs to be made

for higher-order thinking activities. Instructional activities need to be developed to best achieve these outcomes set by the NCS, and using a taxonomy like Bloom’s assists a teacher in preparing assessment procedures that are aligned to meet the outcomes of the NCS and Technology Education (Gronlund & Waugh, 2009)

Bloom’s taxonomy consists of six levels of development of knowledge and intellectual skills which progress from simple to complex activity. Bloom’s taxonomy is extremely helpful when formulating specific learning tasks and assessments. There are six categories, starting from the simplest to the most complex, as illustrated in Table 1.

<b>CATEGORY</b>	<b>INTELLECTUAL DEVELOPMENT</b>
KNOWLEDGE	Recalls data or information
COMPREHENSION	Understands the meaning and interprets instructions
APPLICATION	Uses a new concept in a new situation, applies knowledge in novel ways, changes ideas
ANALYSIS	Breaks down concepts so that they may be understood, subdivides and classifies
SYNTHESIS	Builds a structure or designs an object, puts parts together to create new meaning or a new structure
EVALUATION	Makes judgements about ideas, structures or materials

**Table 1: Bloom’s taxonomy of learning domains (McMillan, 2011)**

When one reflects on the design process it is clear that Technology Education as a learning area encompasses Bloom’s taxonomy. Technology Education activities have the potential to allow learners to develop their intellect through the various categories, from the simplest to the most complex. Technology Education develops higher-order thinking.

The aim of assessing learners is to enhance individual growth and development as well as to monitor progress in learners. This can be achieved by using different types of assessments as recommended by the NCS document across all learning areas:

- **Baseline assessment** is usually done at the beginning of a phase, grade or learning experience to ascertain what the learner knows and the gaps that exist so that the teacher knows at what level to begin the next phase, grade or learning experience.
- **Formative assessment** is developmental and is used to inform teachers and learners of the progress that is being made so that necessary action can be taken to improve the quality of teaching and learning. Formative assessment is interactive: the teacher provides thought-provoking contexts to stimulate learners' thinking and discussion. In this form of assessment both learner and teacher are involved in a process of continual reflection, and learners are assessed during the course of instruction rather than at the end. Feedback that is provided to learners is essential as it helps learners to understand what they know as well as what they need to do to improve. Formative assessment also indicates the existence of gaps between the actual level of work being assessed and the required standard so that these gaps can be addressed by teacher and learner.
- **Summative assessment** presents an overall picture of learners' progress at a given time, for example at the end of the term, year or course of instruction. Often summative assessment tests memory and recall as well as the extent of learners' knowledge and at the end of the section. Feedback on successes and failures is minimal. The role of summative assessments has been reduced within the NCS.
- **Diagnostic assessment** is similar to formative assessment, but its application will always lead to remediation or some form of intervention programme. It indicates learners' weaknesses and strengths (DoE, 2007; Van der Horst & McDonald, 2005; Le Grange & Reddy, 1998; Overall & Sangste, 2006; Taras, 2005).

Assessment in the NCS is also based on **continuous assessment**<sup>5</sup> and can be both formal and informal. Formal assessment provides teachers with a systematic way of evaluating how well learners are progressing in particular learning areas and in a specific grade. Formal assessment includes projects, oral presentations, practical demonstrations, tests and examinations which should be recorded.

Informal assessments or daily monitoring of learners' progress is done by observations, discussions, learner-teacher conferences and informal classroom interactions. The purpose of

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<sup>5</sup> Continuous assessment means an ongoing process that measures a learner's achievement during the course of a grade, providing information that is used to support learner's development.

this form of assessment is to gauge learners' immediate understanding and to improve teaching. Informal assessments need not be recorded but should provide feedback to learners (DoE, 2007).

The NCS for Grades R - 9 clearly states that the various forms of assessment carried out should be appropriate to the age, learning area and varying developmental levels. The tasks set should thus ensure that a variety of skills are assessed. In light of this teachers are required to use a variety of appropriate assessment strategies<sup>6</sup> that would adequately assess learner achievement and develop skills for life-long learning. These alternative assessment strategies allow for teachers to be sensitive to learners who have special educational needs and that experience barriers to learning (DoE, 2002).

Assessment methods that are employed by teachers need to incorporate various contextual factors that may influence learner performance (Gronlund & Waugh, 2009). Marks cannot just be awarded to learners; a more structured grading and reporting system needs to be in place because the comments, marks and grades that teachers award impact on learners' confidence and enthusiasm. Feedback and formative assessment are interdependent. They can occur formally when you are grading or marking a task given or informally in the form of comments as the lesson progresses. Ultimately teachers are required to provide feedback to learners on their performance so that learners can make judgements about their performance. The feedback that is provided must highlight the learners' strengths and weaknesses so that necessary adjustments can be made by the learners for attainment of educational goals (DoE, 2003; Gronlund & Waugh, 2009; Overall & Sangster, 2006).

Butler (1988), as cited in Overall and Sangster (2006, p. 127), explains that when a teacher merely awards a grade or mark on a piece of work it confirms the learner's belief whether he is good in the learning area or not. No other feedback is provided for the learner to identify their strong points and weaknesses in the learning area for improvement.

Awarding marks by providing a letter grade or a mark out of ten would have been acceptable in the past; however, current assessment trends require more information to be provided for the learner so that they can improve their work. Providing comments which are directly

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<sup>6</sup> Approaches taken to assess a learner's performance using a number of assessment forms appropriate to the task and the level of the learner's understanding.

related to marking criteria provides the learners with an opportunity to reflect on his/her performance and allows a greater opportunity for learning. Learners are able to ascertain their shortcomings relating to the task that has been assessed and when preparing for the next task are better informed as to how to answer a similar question and not to make similar mistakes in the future (Overall & Sangster, 2006). This is confirmed by Black and William (2005), that providing comments to learners gave learners and their parent's advice on aspects that were executed well and what needed more improvement, as well as providing guidance on how to make the improvements.

Gronlund and Waugh (2009, p. 29) state that "feedback of assessment results is an essential factor in any assessment programme." In order for feedback to be effective, it is essential that it:

- Follows immediately after an assessment task or during the assessment;
- Is comprehensive and easily understood by learners;
- Highlights the strengths of the learners' achievements and also the weaknesses so that shortcomings can be rectified;
- Provides remediation from the teacher; and
- Is positive and will help guide the learner and not discourage them.

This form of feedback allows for learners to actively participate in their learning process and work on their strengths and weaknesses immediately so that they can achieve their goals.

### **2.3.1. NCS assessment guidelines for Technology Education**

As part of a development process aimed at increasing the effective implementation of the NCS and the National Policy on Assessment for Schools in the General Education and Training Band (GET), the DoE developed authentic assessment systems congruent with OBE and the NCS (DoE, 2007).

For every learning area a specific assessment guideline document was published. The document relating to Technology Education provides guidelines for assessment within the intermediate and senior phase. However, it merely provides a general overview of assessment

practices, the purpose of assessment and examples of work schedules and assessment rubrics related to Technology Education. Guidelines pertaining to assessment for Technology Education spelt out in this document could apply to any learning area in the NCS. Specific and explicit guidelines are not provided on assessment or the implementation of assessment practices pertaining to Technology Education. The document clearly states that the teacher needs to decide what core knowledge will be assessed and how the teacher will carry out the assessment (DoE, 2007).

The role of assessment in Technology Education is the key to successful teaching and learning and development of the subject, according to the Center for the Study of Higher Education (2007). Assessment strategies employed by teachers often defines the character and quality of work carried out in the classroom. It is thus essential for teachers to have fundamental knowledge and understanding of Technology Education in order develop meaningful work schedules and employ appropriate assessment strategies (Center for the Study of Higher Education, n.d.; Middleton, 2005; Welch, 2001).

Issues around assessment practices within Technology Education are unresolved. A major reason for the issues that surround Technology Education assessment is its unique methodology and the different approaches to teaching the learning area. Mawson (2007), as cited by Rauscher (2010, p. 2), confirms this by stating that “Technology Education is in fact still a fairly new subject globally without a large research base and a well-established culture of classroom practice.” According to Van Niekerk et al. (2005, p. 2), “Technology has its own field of knowledge, skills and values with unique characteristics and links with the other learning areas.”

In order for us to gain more insight into issues regarding assessment in Technology Education, it is necessary for readers to have a clear idea of the nature of Technology Education and what sets it apart from other learning areas. The following addresses the challenges faced by Grade 7 Technology Education teachers with regard to assessment of the learning area.

## **2.4. Approach to teaching Technology Education**

After exploring the literature regarding the implementation of Technology Education curricula in countries such as England, Wales, Australia, New Zealand and Canada, many parallels were identified with the South African Curriculum. It is in light of this that the researcher has chosen to explore similarities with the abovementioned countries further.

The Design and Technology Curriculum introduced in England and Wales in 1990 played a crucial role in developing Technology Education curricula. It has also influenced teachers' classroom practices. By 1999 various curriculum documents began to narrow the focus of Technology Education as being a design and make process based on acquisition of skills and technological activities. The approach to Technology Education in countries like Australia, New Zealand and Canada illustrated a similar trend, and viewed Technology Education as being congruent with the design-make-appraise process. The USA, however, saw Technology as a problem-solving activity (Mawson, 2003).

Within the literature of Technology Education there is great debate about the relationship that exists between technological practice, technology process and problem solving. Johnsey (1995), as cited in Mawson (2003, p. 118), sees the design process as being the same as technological practice, which he defines as "the complete action from when a design and make context is explored through to making and evaluating a product which satisfies an identified need". Eggleston, cited in Mawson, (2003, p. 118), on the other hand, is of the belief that the design process is synonymous with problem solving, which begins with an idea and develops until the best possible solution is attained.

As Technology Education developed and became a compulsory element in many education systems, the dominant rationale of problem solving in Technology Education began to emerge (Williams, 2007). A range of models regarding the approach to Technology Education began to surface, each trying to capture the 'essence' of Technology. Ultimately design was seen as an underlying structure for Technology Education, and subsequently the design-make-appraise process in Technology evolved in many Technology Education curriculum statements (Mawson, 2003). It is this process that introduces the learner to the design and make world, and it is through this process that new ideas are born (Welch, 2001).

Owen-Jackson (2000), as cited in Crossfield, Daugherty and Merrill (2004, p.2), states that when teaching Technology Education it is extremely important for teachers to be aware of what is taught in the course and why it is part of the curriculum. McCracken (2000), as cited in Crossfield et al. (2004, p.2), also suggests that it is important that teachers have a good understanding of the design process and the nature of Technology Education, as both of these aspects are interdependent of each other. According to McCracken (2000), as cited in Crossfield et al. (2004, p. 3), “Technology would be incomplete without design, and design cannot be fully appreciated without an understanding of technology”.

Thus it would be in order to say that for teachers to teach Technology Education it is imperative that they understand how the design process works. The design process consists of five main steps: investigate, design, make, evaluate and communicate.

**Investigation:** Requires the learner to gain more information and insight regarding a particular situation or problem, evaluating existing products and performing practical tests to get a better understanding of materials and products. This is done so that learners can make informed choices.

**Designing:** Once clarity is gained regarding the problem and the specifications are considered, ideas are generated. Most often these are in the form of drawings. The initial idea is not necessarily the best. This part of the design process requires the learners to have an understanding of graphics, the use of two- and three-dimensional drawings, planning and modeling. The drawing should be in detail, including notes, instructions and dimensions.

**Making:** This is when the learner uses various materials and tools to develop the solution to the problem. This process involves numerous skills, building, measuring, mixing and modifying. When making the product the learners should follow the design that was generated in the previous stage; modifications are allowed.

**Evaluation:** This is when the learner looks at the solution and evaluates the course of action that he or she has taken in coming up with a solution. Changes and improvements can be suggested by teachers or peers, and the learner has the option to modify or not. Final evaluation of the manufactured product is carried out according to specifications by the teacher.

**Communication:** The presentation of the previous stages in either an oral, written or graphic format. This is basically a record of the process the learner embarked on from inception to the final, made product (DoE, 2002).

Models of how to use the design process have emerged and have been of great help to non-specialist teachers teaching Technology Education. Mawson (2003), however, warns us of the dangers of this when he acknowledges that models have been a great help and a guide to many non-specialist teachers, but have also become increasingly dangerous when the prescribed steps are completed in order, and turn the design and technology process into a series of products (Mawson, 2003, p. 120).

Mawson states that one of the reasons Technology Education teachers follow the design process is because many Technology Education teachers are non-specialist teachers and have very little understanding of how designing works. The design process models provide them with some structure which they could follow and organise into their classroom activities. These models also give the non-specialist teacher a sense of security and guidance on how to proceed (Mawson, 2003, p. 120).

#### **2.4.1. Approach to teaching Technology Education in South Africa**

The Technology Education policy document (DoE, 2002, p. 4) defines Technology Education as “The use of knowledge, skills and resources to meet the people’s needs and wants by developing practical solutions to problems, taking social and environmental factors into consideration.”

Within the South African context the problem-solving element and design-make-appraise approach to Technology Education are clearly evident. In order to develop practical solutions to technological problems learners are to follow the design or technological process, which involves investigation, designing, developing, evaluating and communicating ideas (DoE, 2007).

Technology Education within the South African context consists of three LOs. These are interrelated and based on the following categories:

- Technological processes and skills;
- Technological knowledge and understanding; and
- The interrelationships between technology, society and the environment.

Each of these LOs can be stated as follows:

LO1: Encompasses the technological processes (design process), which is referred to as the creative, interactive approach, and the associated skills are investigate, design, make, evaluate and communicate.

LO2: Technological knowledge and understanding, which outlines the three core-content areas that we need to focus on: processing, structures and systems and control.

LO3: Deals with technology, society and the environment. Learners become aware of values, beliefs and traditions and how these aspects shape people's perceptions and view of technology. Learners also learn to understand the link between technology, science and the environment (Pudi, 2007; DoE, 2002).

LO1 is seen as the "backbone" of Technology Education in the NCS. Since the aim of LO1 is to develop technological skills, it needs to be used as an integrating LO with LO2 and LO3, to structure learning programmes that would develop learners' skills, knowledge, values and attitudes in a holistic way (DoE, 2002).

Technology Education is about thinking and doing. A unique methodology relating to classroom practice was developed in England and Wales by the Nuffield Design and Technology Project. This approach to teaching Technology Education has been adopted and adapted to suit the South African context. The adoption of this pedagogy provides teachers with a clear framework to develop coherent units of work and combine procedural knowledge and conceptual knowledge effectively (Rauscher, 2010; Barlex, 2000; Banks, 2000).

Technology Education in South Africa is project-based. In order to develop coherent units of work around a problem-solving task the following operational approaches have been adopted

as classroom practice for Technology Education: capability tasks, resource tasks and case studies.

- **Capability tasks** involve the designing and making of a product. These tasks follow the technology process whereby the learners design, make and evaluate a product in response to a need or problem. These tasks are very often structured to reveal learners' understanding of conceptual knowledge gained during resource tasks.
- **Resources tasks** are shorter, practical tasks that are deliberately designed and structured to teach knowledge, skills and values. These focused tasks impart conceptual knowledge and in turn contribute to the quality of the capability task. They can also be referred to as focused tasks; they add authenticity to Technology Education and link learning in schools with the wider community.
- **Case studies** have been included in the approach to teach Technology Education. These are tasks that reflect on the designs and technologies of others currently living in our society or living at another time or in another place.

The relationship that exists between these tasks enables technology capability to develop progressively. Knowledge, skills and concepts grasped during resource tasks and case studies are used by the learners to develop and create a solution to the problem based on the context within (Rauscher, 2010; Barlex, 2000; Banks, 2000)

Technology Education practices within the South African context must include conceptual knowledge ("knowing that") of technology products as well as procedural knowledge ("knowing how") on the designing and manufacturing of such products. Although both forms of knowledge can be distinguished, they cannot be separated. Generally, in Technology lessons procedural knowledge is developed in a stage-oriented format called the design process. In comparison to conceptual knowledge, procedural knowledge cannot be taught. In the words of Ropohol, as cited in Van Niekerk et al. (2005, p. 2): "Technical know-how can be gained by practice only".

Technology Education is concerned with developing learners' capability. Technological capability, according to Welch and Barlex (2004), includes the processes that learners experience as well as the skill and understanding that they develop and employ. Since we are

aiming at assessing learner capability, assessment in Technology becomes complex because we are looking for more than just a display of knowledge, understanding and manual skills (Welch, 2001).

It is evident from the discussion above that since Technology Education is about problem solving, the designing and making of the product as well as the process that the learner engages in, teaching of Technology Education differs from the way other learning areas are taught (Pudi, 2007). Technology Education encompasses how learners design and make products by combining designing skills with knowledge, skill and understanding of the world with the idea of improving it (Pudi, 2007; Welch, 2001).

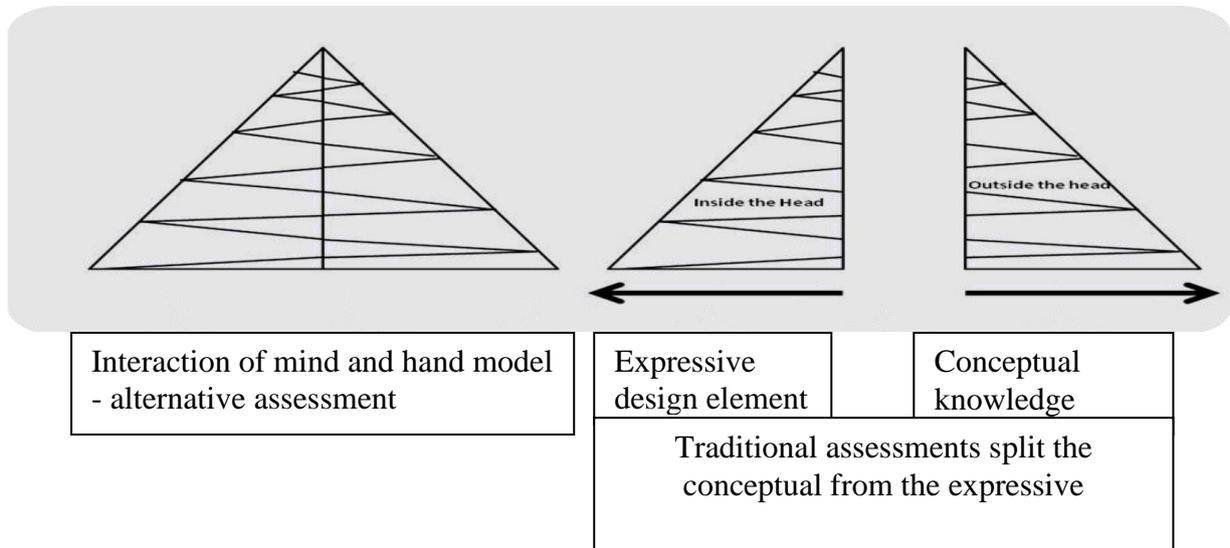
Thus it is essential for teachers to have a good fundamental knowledge of Technology. This knowledge will aid educators in deciding what to assess and how to go about assessing the design process. This is central to capturing the benefits of Technology Education and avoiding its pitfalls (Centre for the Study of Higher Education, n.d.; Middleton, 2005).

## **2.5. Challenges Technology Education teachers face with regard to assessment practices**

Assessment practices are a major contributory factor to Technology Education not reaching its ultimate potential in developing creative, enterprising and risk-taking individuals (McLaren & Dakers, 2005). This statement is qualified by Jones and Moreland (as cited in McLaren & Dakers, 2005, p. 5), when they looked at emerging assessment strategies and noted that existing subcultures in schools, assessment policies and teacher subject expertise impact greatly on assessment practices that teachers employ.

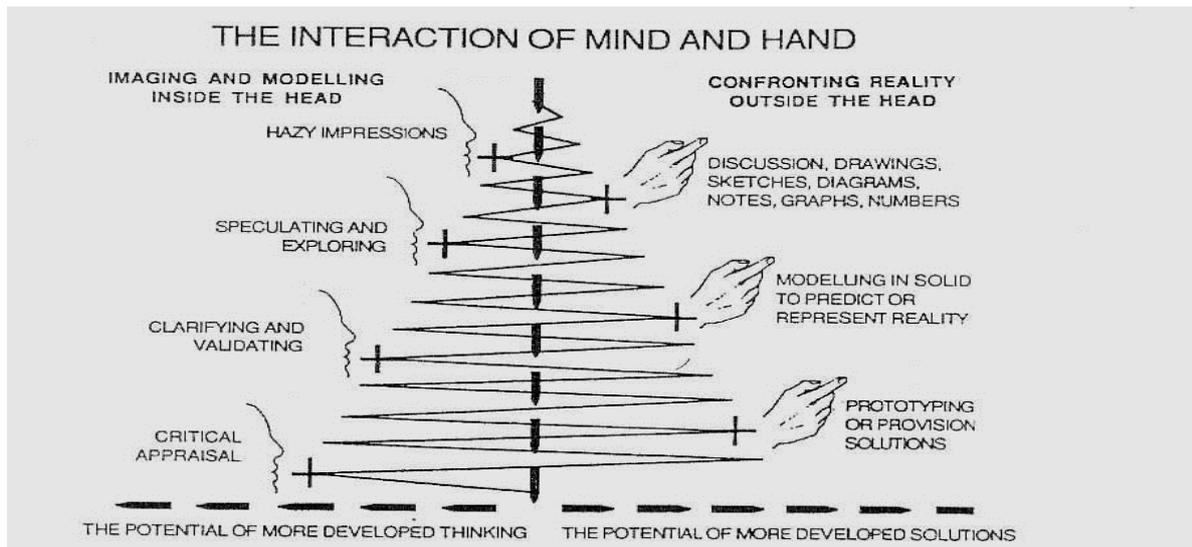
Traditional assessment practices used in Technology Education separate the conceptual and expressive aspects of designing, as illustrated in Figure 3. The conceptual knowledge is tested in the form of written tests and examinations, while the procedural knowledge is tested by graphic representations or modeling/making examinations. This approach to assessment is destructive to the essence of capability, since the focus in contemporary Technology Education curricula is not conceptual understanding for its own sake but rather learners' use and understanding of knowledge and skills when tackling a design and make task. Capability in Technology Education, according to the Assessment of Performance Unit

(APU) in the UK (1991, p. 22), “Involves the purposeful development of understanding and skill – not just their passive demonstration.” Traditional assessment practices in the form of isolated tests of knowledge and skills are therefore inappropriate (APU, 1991; McLaren, 2007).



**Figure 3. The splitting of expressive design and conceptual knowledge in traditional testing (source: APU, 1991, p. 22)**

In reply to using traditional assessments strategies to assess Technology Education, the APU has documented that the essence of Technology Education is the interaction of hand and mind (APU, 1991, p. 20). This interaction begins simply by developing solutions to a problem in the form of initial hazy impressions and ideas within the head; these ideas then progress into discussions, drawing and creating of prototypes outside of the head, as illustrated in Figure 4.



**Figure 4. The interaction of mind and hand (source: APU, 1991, p. 20)**

By using the interaction of mind and hand model (as described above) to teach Technology Education, it is evident that the process the learner goes through when coming up with a solution is more important than the manufactured end product. As a result the focus is now on the thinking, decision making and thought processes that go into making a product. This model impacts significantly on how Technology Education capability should be assessed.

Van Niekerk et al. (2005, p. 6) qualify this by stating that “Learners’ competence in Technology Education should be assessed in a meaningful and responsible manner requiring more than just the end product being assessed.” Moreland and Jones, as cited in Van Niekerk et al. (2005, p.6), are of a similar view. They state that the major problem regarding assessment practices in Technology Education is that the focus is not on the essential aspects of Technology Education. Teachers are striving to achieve the broad outcomes and inevitably paying more attention to the completed product, thus assessing only the learner’s final attempt.

With the introduction of the National Curriculum in 1988 in the UK, significant changes were brought about with regard to assessment procedures. Learners’ achievements had to be measured and reported at regular intervals based on criterion referencing (Tufnell, 2000).

In the field of Technology Education the National Curriculum in the UK was the first to formally adopt the criterion-referencing approach of assessment; prior to this, assessments in

Technology Education were based on completion of an end product. Learners were given a task and at the end the teacher awarded marks based on norm-referencing. This form of assessment was not suitable, especially with the introduction of a multi-level scale of achievement. The scales were based on specific criteria defining progress of learners. The assumption was that each learner would progress through the different levels if taught systematically. According to Tufnell (2000, pp. 105-106) “the adoption of the multi-level scale of achievement was an ambitious enterprise as learning is not always straight forward and teaching is rarely systematic.” The design process once again became the basic structure of assessment.

Kimbell (1997, p.163) echoes similar sentiments when he expresses that the criterion reference assessment scheme defines in advance the qualities of what is going to be assessed. This may be the desired outcomes; however, for Technology Education it is a serious drawback since it is not suitable for a capability task because there is an assumption underpinning the usage of criterion-based assessment – that the teacher knows the ‘correct’ and ‘only’ way to complete the capability task, and that this is the only acceptable solution. All evidence available presently contradicts the above statement. In their description of designing and making many academics have moved towards describing the process and not the product, and at the centre of the process is creativity (Kimbell, 1997, p.163).

To further compound the problem, National Curriculum assessment policy was aligned more towards subjects like Mathematics and Science where the knowledge component is crucial and not capability as in Technology Education. In the meantime, other countries were developing models of assessment that were more in keeping with Technology Education (Tufnell, 2000).

Thereafter a new national system of assessment was introduced in the UK, known as the National Vocational Qualifications (NVQs). The focus was now on what the individual could do. This form of assessment required the collection and evaluation of learners’ achievements against performance criteria essential for competence. According to Tufnell (2000, p. 107) this approach “provided support for the notion that assessments should be in accordance with the character of the subject.”

Technology Education differs greatly from a craft lesson and focuses on the problem-solving nature of the design world. In attempting to find a solution to the problem, learners will without a doubt come up with multiple solutions, and with greater freedom more varied products will be produced. This is in contrast to a craft lesson, according to Kimbell (1997), where the craft<sup>7</sup> teacher clearly specifies details of a product and provides the learner with step-by-step instructions on how to proceed in creating the end product. This process involves imitating the teacher. As a result, the method that a craft teacher would use to assess a learner's product is inappropriate in a design and make project, because in the latter task the end result is unpredictable. This may be so because the teacher is unaware of how each learner would interpret the problem and develop the solution, unlike in a craft lesson where the product is clearly defined from the start.

Kimbell (1997, p. 20) clearly states that the more we move towards the 'proper way' of following the design process, "we risk valuing the plodding and orthodox over the inspired and unexpected." Ultimately, using predetermined criteria of excellence in a Technology Education lesson sends out a message that all learners will complete a design and make task according to the teacher's plan. A teacher teaching Technology Education therefore cannot have predetermined criteria for an assessment when he cannot predict the final outcome (Kimbell, 1999, 1997). What the teacher can specify from the very outset is that there is a problem to be solved, and all design solutions must solve the problem at hand to a certain extent. This allows for learners use their own creativity, skills and knowledge learnt to develop a solution to the problem; this in turn enables the teacher to assess procedural knowledge (Kimbell, 1999; Van Niekerk et al., 2005).

The main challenges arise when only the final solution of a design and make task is being tested. What does the teacher assess and how does he or she carry out the assessment? What happens if the product fails to hold a specific load or breaks when it is being tested; is it that the design solution is bad according to the criteria developed by the teacher? Or could it not be a case of using inferior materials? Furthermore, the end product in a design and make task is a combination of design skills and workmanship; by assessing just the end product the teacher concentrates on the workmanship skills of the learner rather on than the design skill (Kimbell, 1999; McLaren & Dakers, 2005). According to Kimbell (1999, p.162) this "is a

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7. Traditional needlework, handwork or art lessons.

most unfair test of his design thinking skills”. When assessing a design and make task we have to take note of not just the final product but also the development of ideas that led to it (Kimbell, 1999).

Assessing just the end product also poses the problem for teachers of learners who merely ‘copy’ an idea from another child and come up with a working solution, without developing any of the skills associated with Technology Education (Kimbell, 1999). To avoid such a situation from arising, Kimbell (1999) once again advocates that the process involving the development of ideas leading up to the actual manufacturing of the product is essential.

In Technology Education it is clear that when following the design process, assessing the design product is not left solely to the teacher but is also a requirement of the learner. The learner needs to assess the design every step of the way, so that the product can be refined until the final solution is developed. According to Kimbell (1999) designing and self-assessment go hand in hand. Standards of excellence must be developed in learners so that they can be used to transform designs into high-quality products. The teacher is aware of the standards required in a particular project, and passes this information to the learner through continual observations (formative assessments) of the learner’s work. According to Kimbell (1999, p. 169) “the more rigorous and perceptive the teacher becomes as an assessor of his students work, the more the student is capable of benefitting from it.”

According to Kimbell (2002), criterion reference-based assessments have resulted in teachers becoming increasingly concerned with details and specifics – to the extent that their assessments have lost their authenticity. Criterion reference-based assessments have reduced assessments of Design and Technology in the UK to hundreds of tick boxes. Hundreds of boxes need to be ticked when single or multiple skills have been demonstrated (Kimbell, 2002). Atomising of assessment using short, clear discriminators for assessment, according to Kimbell (2002, p. 226) has huge limitations: “It is like picking up a piece of a jigsaw puzzle, it tells you very little of the whole picture and even less of the quality of the picture until all pieces are put together.”

These categorical assessments require the teachers to make yes/no judgements to allow for learners to be divided into two categories: those who can do certain tasks and those who cannot. At which point a teacher turns a yes into a no judgement or vice versa in a

Technology Education lesson is often problematic for them. With atomising of assessment, as the assessment gets more precise and specific, the discriminators begin to increase in volume. Another aspect that comes to the fore is that teachers have found that assessments based on criteria do not always align themselves to the actual capability of the child. Teachers are so busy assessing independent aspects that they ignore the interdependence of these aspects, which develops technological capability (Kimbell, 2002).

In the words of Kimbell (1997, p. 25): “It is a bit like judging the quality of an omelette. However good the eggs are – and the herbs, and the butter, and perhaps the cheese - the key question is how well are they blended to work together and enhance each other.” Thus to atomise assessment of technological capability individually is to seriously misjudge the interdependence of the fundamental aspects that make up technological capability.

An assessment strategy advocated by Kimbell is the move towards holism (Kimbell, 2002; APU, 1991). Holism is an assessment procedure that prioritises holistic assessment of the design process and not just the final product. This approach requires the teacher to make the first judgement based on the overall impression of the quality of the learner’s solution and then progress onto working with the details. Assessments must not start with the details and then work towards the whole (Kimbell, 2002; APU, 1991). This method of assessment is closely linked with formative and authentic assessment, as explained earlier in the literature review.

Holistic assessment captures the true nature of Technology Education. It enables learners to build continuity and coherence between ideas and actions over time; as a result, tasks that are set out by teachers are often complex, and a lot of time is required to develop these ideas into tangible products (Kimbell, 2002). The long-term nature of Technology Education poses challenges for learning, teaching and assessment since there is a curriculum to finish (Moreland, Cowie & Jones, 2007).

Welch (2001) draws our attention to the fact that many teachers are also unsure of what assessment strategies to use when assessing Technology Education. Does a teacher, just by looking at a product, or any aspect that the teacher thinks is important in Technology Education, know what is to be assessed? That is the fundamental question. According to

Welch (2001) most teachers will assess that which they think is important to them in Technology Education.

According to Welch (2001) an effective strategy to employ to capture the fundamental nature of Technology Education is to use a design portfolio; this captures the essence of a designer's world and will provide greater insight into the mind of the learner. The design portfolio allows teachers to see the progression of the learner's ideas from the initial rough sketches to the final product. The portfolio provides practical and intellectual evidence that will turn ideas into products that can be used and evaluated (Welch, 2001).

However, Welch (2001) warns us that the success of the design portfolio assessment strategy depends on the learner having ownership and control of his or her portfolio. Also, in order for the design portfolio to be an authentic assessment tool there is a need for a great deal of teacher-learner interaction. Middleton (2005) also suggests that the incorrect use of design portfolios – by creating a design portfolio as a separate task and not as a build-up of ideas and designs of a design task – could be destructive and detrimental to Technology Education. Middleton (2005) qualifies this by citing McCormick's (2003) observations, whereby neat, well-presented portfolios are drawn up after the final product has been produced.

Welch and Barlex (2004) also highlighted that in England the Office for Standards in Education noted that limited attainment in Design and Technology Education is due to the fact that too much time is spent on superficial work dealing with the compiling and presentation of portfolios, and as a result core aspects of designing and making activities are compromised. According to McCormick and Davidson, cited in Welch and Barlex (2004, p.2), the conversion of ideas and designs in a portfolio into a prototype has become a significant problem.

The approach to assessment is just as important as the assessment instrument that is used. Welch (2001) suggests that teachers use a holistic rubric, which is a brief description of degrees of achievement on which educators base their assessment of learners' work. Applying a rubric to a learner's work would ensure a quantitative analysis of the work, and as a result the educators will be able to make some inferences regarding learner competence (Welch, 2001).

According to Jones (2002), learners' and teachers' concept of Technology Education and the design process impacts on how technological practices are undertaken in the classroom. If a teacher has a strong craft background, his or her perceptions of what is important in Technology Education will be reflected in the teacher's classroom practice. For example, the teacher will place more emphasis on making rather than the process that is involved. McCormick and Davidson (1996, p. 230) are in agreement with Jones's view, as they state "Teachers of technology in schools in most countries in the world (where it exists in the curriculum) have a strong craft tradition and hence a strong concern for 'making' and for the product that results".

Manufacturing of a product forms an integral part of Technology Education and cannot be avoided. The problem arises when the making of the product becomes a form of tyranny (McCormick & Davidson, 1996) where the creative process of Technology Education turns into a ritualistic process and the 'design process' is merely transformed into tangible products that can be measured and assessed. Kimbell (1997, p. 21) explains this tyranny further:

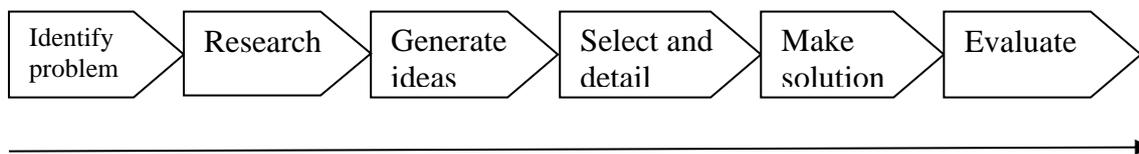
Investigation as an activity becomes an investigation folder and active design thinking becomes a folio of drawings. The evaluation report at the end of the exercise is the only direct evidence of evaluative activity and therefore becomes synonymous with it. The process has become a series of products.

Teachers that come from a craft background are also aware of the motivating role that manufacturing products plays in a classroom environment, and the joy of taking a completed project home to parents. As a result product completion becomes the focus and assessment is of the product. Creative and divergent thinking are difficult qualities to assess for a teacher; it is much simpler to assess a tangible product. As a result, Technology Education is reduced to a set of pre-specified products, and fundamental aspects like the design process and the problem-solving activity that were supposed to be fostered in Technology Education are forgotten (McCormick & Davidson, 1996; Kimbell, 1997).

## 2.6. Theoretical framework

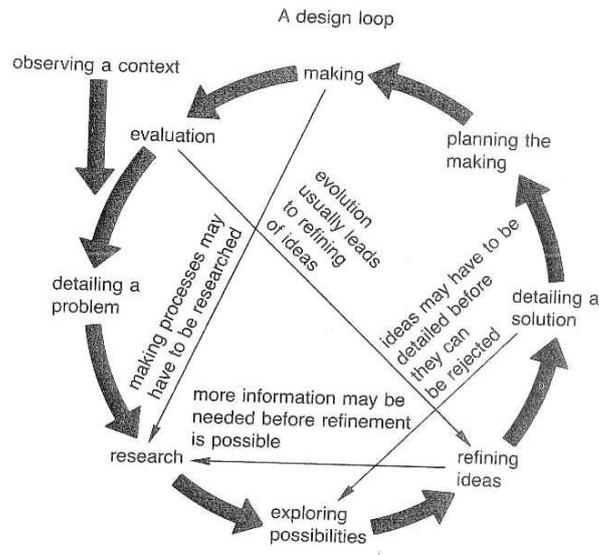
Technology Education as a learning area introduces a learner to the powerful world of design, where inspiration is taken from the made environment and new ideas are conceived. It is through creativity and problem solving that solutions are developed (Welch, 2001). As learners engage with a problem set within a context, they use skills and knowledge attained during previous Technology Education lessons to come up with solutions (Welch, 2001; Middleton, 2005). Problem solving has become a dominant rationale for learners engaging in design and make activities in various Technology Education curricula. This invariably influences teaching and learning (Williams, 2007).

Early approaches to teaching capability tasks were described as a simple problem-solving activity that commenced with a problem and progressed through a sequence of linear steps, (as represented in Figure 5) towards a solution, with the emphasis placed on the final product (APU, 1991).



**Figure 5. Problem solving activity seen as a linear sequence (source: APU, 1991, p. 19)**

As the approaches to teaching design and make tasks in Technology Education were refined, problem solving was seen as more than just a linear sequence of steps. The process of designing and making now involved recognising the nature of the problem, investigating possible solutions, and testing them by making and evaluating the end product. It is being seen as a flexible, interactive loop that includes a broad range of creative activity which allows for refinement of ideas and back and forth movement between the various stages of development, as illustrated in Figure 6 (APU, 1991; Fisher, 1990).



**Figure 6. Design loop (source: Fisher, 1990, p. 127)**

As problem solving becomes more complex, it allows for varying interpretations and a variety of solutions. This impacts directly on assessment practices in Technology Education, since there are now multiple solutions to a single problem. Middleton (2005) also states that often the solutions that learners develop are beyond the expectations of the teacher.

Within the South African context the situation is compounded, since the Technology Education curriculum provides details of the knowledge and content to be covered, as well as the suggested design process that is to be considered when coming up with a solution (Middleton, 2005; DoE, 2003; Pudi, 2008). This proves problematic for teachers as they are unsure of which aspect to focus on - the procedural knowledge or the conceptual knowledge of Technology Education.

In light of the above it is thus imperative that teachers have a good understanding of the nature of learning that occurs when learners engage in a design and problem-solving task (procedural knowledge) as well as during the resource tasks (conceptual knowledge), so that assessment strategies that are used capture the essence of Technology Education. This invariably impacts greatly on teachers' assessment practices in Technology Education.

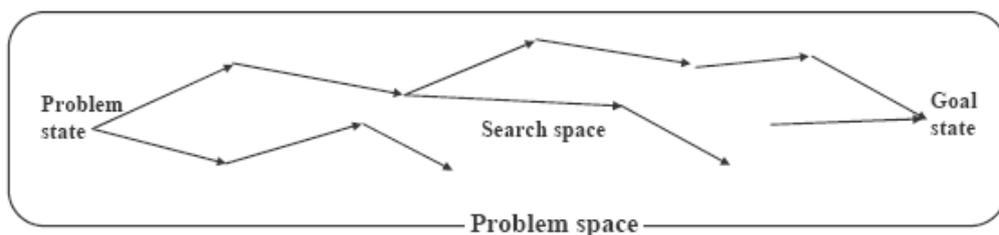
Since problem solving plays an important role in Technology Education, how a teacher understands and approaches this aspect and uses this knowledge to formulate assessment strategies is vital for Technology Education. Researchers have formulated various problem-

solving models. One of the first models of problem solving, which continues to impact present-day studies, was devised by Newell and Simon (as cited in Middleton, 2005). Newell and Simon’s model of problem space is briefly explained for greater insight into how humans solve problems.

Middleton adapted and revised Newell and Simon’s model to encompass the characteristics of Technology Education. This adapted model was referred to as Middleton’s revised concept of problem space, and allows for creative and more complex problem solving in the world of design. It is this model by Middleton as well as the social constructive influence on learning and assessment that have been used as the theoretical framework for this study.

### 2.6.1. Newell and Simon’s model of problem space

How humans think and solve problems has been the subject of research for many years, and from this have arisen many insights and representations of how human solve problems. One such model is Newell and Simon’s model of a problem space, as illustrated in Figure 7. This examines the nature of problems and how humans think and solve problems. According to Middleton (2005, p. 1) “Their model of problem space, can be used to characterise all problems humans encounter and attempt to solve.”



**Figure 7. Model of problem space (Newell & Simon, as cited in Middleton, 2005)**

Newell and Simon’s model was first developed in 1972, and despite its age, when dealing with problem-solving research it is still regarded as a starting-point (Middleton, 2005). According to this model, all problems occur within a problem space which consists of three parts: the problem state, the search space and the goal state. The problem state is represented in the model by a single defined point, which indicates that problems can be characterised by one clear descriptor. The search space indicates the actions and path a learner engages in to

reach a solution. Finally the goal state is reached, which is the end of the problem solving, and this is represented by a single point, indicating that for problems there is a single correct answer. In the model of problem space there is only a single forward movement down the chain that leads directly to the goal state (Middleton, 2000; 2005).

A more in-depth study of human behaviour suggested that the story of problem solving was much more complex than Newell and Simon suggested, and that contrary to their claim, the model of problem space cannot be used to solve all problems that humans encounter (Langley & Rogers, 2011; Middleton, 2005).

### **2.6.2. Revised concept of problem space and the influences of social constructivism**

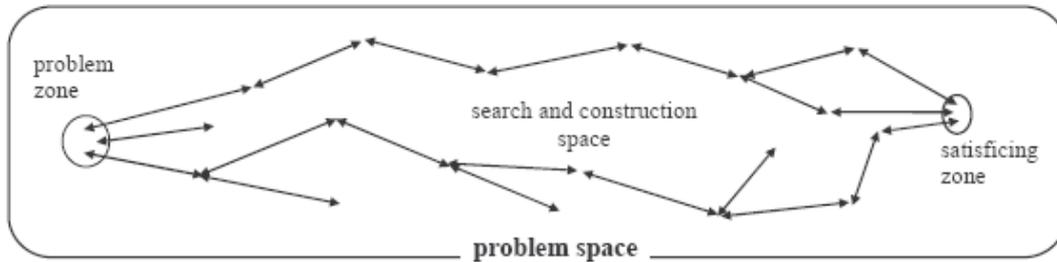
Newell and Simon's model has been useful in solving many problems, including some technological ones, but it has been criticised by many researchers. Middleton (2005) was one such researcher, who argued that Newell and Simon's model was suitable to solve only simple, well-defined problems, such as mathematical sums, games and puzzles. When it comes to design problem solving it has inadequacies as the model is unable to "explain the cognitive processes involved in designing" (Middleton, 2000).

When it comes to Technology Education, problem solving is more complex than this because it involves:

- Creative approaches to achieve a solution, and an algorithm cannot be followed;
- An often ill-defined problem, since one cannot specify how one should design as most often it is a matter of personal taste, experience and needs;
- A range of strategies, materials and processes that one has to consider when solving a problem that results in a range of complex interactions, and thus a much larger search space is required for design problems; and
- Often contradictory goal criteria – for instance, when designing a chair, if the requirements are for a strong but lightweight chair (Middleton, 2005).

In light of this and taking into consideration the requirements for Technology Education, Middleton adapted Newell and Simon's model so that it incorporates the demands of design

and invention problems. This synthesised model is referred to as the revised concept of problem space, shown in Figure 8.



**Figure 8. Revised concept of problem space (Middleton, 2005)**

The new integrated model acknowledges that there can be multiple starting-points for a design problem and it may be difficult to determine which starting-point to take, since some aspects of the problem may be unclear. This suggests that the problems are ill-defined. The problem state as in Newell and Simon's model is replaced by the problem zone, and the process of reaching a solution is defined as a search and construction space, where multiple processes and strategies emerge during the problem-solving process, and there is a to and fro movement from the search and construction space to the problem zone. The solutions that emerge may well vary, and contain a large number of possible paths that could be taken. The learner will solve the problem to a greater or lesser extent; as a result no solution is right or wrong, and thus the end zone is termed the 'satisfying zone' and not the goal state (Middleton, 2000, 2005).

Trends in contemporary Technology Education programmes suggest that when learners engage in design-and-make activities they begin developing problem-solving skills. It is also important to note that although learners encounter ill-defined design problems, they often come up with workable solutions. In some instances the solutions that learners come up with are beyond those that the teachers themselves have considered and provide a lot of fun for teachers and learners (Middleton, 2005; Fisher, 1990).

The learning that takes place in Technology Education lessons differs from that of traditional workshop practice. In a traditional workshop the problem is specified by the teacher, and a set plan is devised by the educator to attain the solution. Assessment is based on how

accurately the model is reproduced. In a Technology Education lesson the teacher creates a problem context for learners to engage in, which encourages and facilitates learning. During this process the teacher takes on the role of observer and facilitator, whereby the teacher guides the learner as the learner tackles the problem. The teacher encourages the learner to discuss their unique solutions with peers, and to question and experiment with ideas and challenges rooted in real-life situations. This occurs within the space and construction zone of Middleton's model. The solutions that are arrived at by the end of the session depend largely on how the learner has integrated knowledge, skill and personal experience as well as guidance from the teacher on the task at hand (Middleton, 2005).

The learner plays an active role in this learning. The quality of the product and end result is determined by the learners' experiences, relevant culture and values, environment and relationships. It is at this point that one can clearly see the compatibility that exists between the revised concept of problem space model, Technology Education and the social constructivist approach to learning (Middleton, 2005; DoE, 2003; Learning-theories.com, n.d.; Williams, 2007).

### **2.6.3. Constructivist approach**

The crux of technology activity is the combination of thought and action together with our experiences and relationships with people and communities. As a theoretical framework, constructivism provides us with insight into how people learn and generate knowledge from their experiences and interaction with people and communities. It allows learners the opportunity for authentic, meaningful experience, through which the learner can search for patterns, question, model, interpret and defend the course of action and strategies. The classroom within which constructivism is used is seen as a mini-society where learners engage in activity, interpretation, justification, evaluation, rejection and communication – all essential aspects used in Technology Education (Fosnot, 2005).

In accepting constructivism as a theory of learning, we follow the path of very influential people like Piaget and Vygotsky. These individuals had different insights into learning, and according to Smith and Cowie (1991), as cited by Donald, Lazarus and Lolwana (1997, p. 42), "A synthesis of these insights provides a more holistic understanding of how

development takes place.” The works of Piaget and Vygotsky impact greatly on Technology Education and assessment of the learning area.

Piaget’s constructivist learning theory sees an individual as an active agent in the learning process that enhances learners’ logical and conceptual growth through adaptation. Children are constantly confronted with new experiences and knowledge regarding their environment. As they make sense of this new knowledge, they begin constructing a more complex ‘map’ of the world. It is these experiences and connections with their surroundings that play a vital role in constructing knowledge (Donald et al., 1997).

Two key concepts in constructivism are assimilating and accommodation. Assimilating is when a learner incorporates new experience into old experiences, which in turn allows the learner to develop new outlooks, evaluate what was important, redevelop perceptions and extend the learner’s knowledge map (Donald et al., 1997).

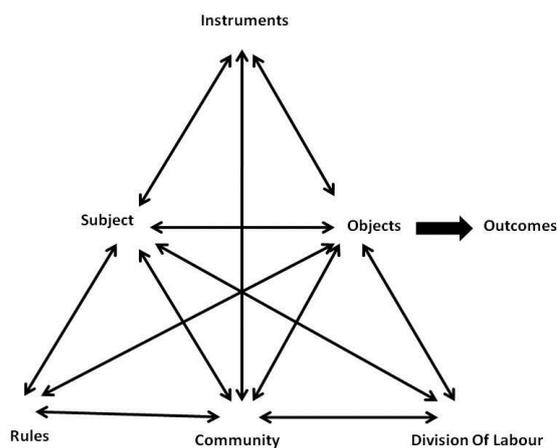
Accommodation is when conflicts arise from a new experience or learning situation, and the learner has to adjust and reshape the new information so that reframing of the world and new experiences occur. A learner has an idea of how the world operates; when things do not occur as the learner has expected, he or she accommodates the situation and makes adjustments, reframing expectations of the experience (Donald et al., 1997).

The role of teachers is extremely important in constructivist learning theory; the teachers take up the role of facilitator, whose role is to aid the learner in developing understanding. Instead of telling, the teacher must begin questioning, and in the end the learner comes to conclusions on their own, creating a learning experience that is open to new directions depending on the needs of the learner, a challenge for teachers. Teachers following Piaget’s theory of constructivism must challenge the learners into becoming effective critical thinkers, and engage them in hands-on tasks that are meant to extend their concepts and thinking process (Richardson, 1997).

Piaget’s constructivist learning theory encourages learners’ ability to interact with others, so that they can learn from the incorporation of their experience. According to Donald et al. (1997), “The social context in which a child is developing and what is demanded by that context has an influence on development.” This interaction will allow learners to develop the

skills and confidence to analyse the world around them, create solutions, and then have the ability to justify their actions, while at the same time respecting and encouraging those around them (Donald et al., 1997).

Vygotsky’s social constructivist approach focuses on the connections between individuals and the social-cultural context in which they interact. He acknowledges that learners are unique individuals whose knowledge base and learning process is influenced by their background, culture, community and worldview. Every time a learner interacts with parents, peers, teachers, issues or artifacts, they adapt and broaden their knowledge base, and this impacts on the outcomes, as illustrated in Figure 9. This impacts on education, as teachers realise that children do not exist in a vacuum and cannot be separated from their social environment (Learning-theories.com, n.d.; Donald et al., 1997).



**Figure 9. Structure of the human activity system (source: Pavlova, 2006, p. 44)**

A learner on his own is unable to maximise and reach the highest level of his or her thinking capability. “Mediation is the ‘engine’ that drives development,” according to Donald et al. (1997, p. 50). In order to understand mediation, we need to understand the ‘zone of proximal development’. The zone of proximal development refers to a range of skills that can be developed with adult guidance or peer co-operation, which the learner would not have been able to attain prior to the interaction. The teacher, parents, peers and others act as catalysts, able to provide the tools of speech, writing, knowledge and skill that are set out in the curriculum. These experiences are mediated with the learner’s social environment (Constructivist Theory, n.d.; Donald et al., 1997; Vadeboncoeur, 1997).

As in Vadeboncoeur's words (1997, p. 28) "Human development is never totally free of cultural influence and human beings are not autonomous with respect to societal forces." It is only when all of these tools are internalised that the learner engages in higher thinking skills, a better understanding of the subject, and arrival at their own version of the truth. Mediation can occur through the use of many different types of tools (material tools as well as mental), including culture, ways of thinking and language (Activity theory, 2011; Constructivist Theory, n.d.; Donald et al., 1997; Vadeboncoeur, 1997).

In the words of Doise and Mugny (1984), as cited by Donald et al. (1997, p. 51): "Under the right conditions, students solving problems in pairs and small groups can promote one another's cognitive development." In a Piagetian sense this involves active exploration and adaption, while in the Vygotskian sense social interaction is essential.

The model of design problem space indicates that when learners are involved in the problem-solving process, they learn through designing, trial and error, collaboration and tapping in and out of various experiences. They assimilate and accommodate their experiences in doing this, and different paths are taken and multiple solutions derived from a situation. This also ties up with the social constructivism idea that each learner is unique and as a result of his/ her own experiences, environment and culture together with guidance from a knowledgeable person, is able to come up with different and unique solutions to a problem (Constructivist theory, n.d.; Learning-theories.com, n.d.).

The use of constructivism as a theoretical framework for this study together with Middleton's revised concept of problem space is qualified by Welch and Lim (1994). In their research entitled 'The strategic thinking of novice designers: Discontinuity between theory and practice', they clearly state that teachers need to consider the tacit experiences and strategies that learners bring into the Technology Education classroom, which may be used as a foundation for development of capability. It would be an error to disregard, ignore or devalue learners' existing knowledge, which is derived from their everyday experiences and interaction with the environment and society (Welch & Lim, 1994).

The Technology learning environment ensures that learners are involved in higher-order thinking and socio-cultural influences mean the learning experience is unique for each

learner. The question thus arises: What are Grade 7 educators who teach Technology Education assessing? How do they carry out these assessments, and what the reasons for employing such assessment strategies?

## **2.7. Conclusion**

The introduction of Technology Education within South African schools was essential and necessary. Its transformative capacity has the benefit of developing critical thinkers, problem solvers and value-orientated individuals who can contribute to the South African workforce (Ankiewicz, 1995; Chapman, 2002; Makgato, 2003). The unique nature of the learning area, especially the design component which revolves around the “technological process” (Ankiewicz, 1995, p. 250), renders Technology Education as having potential to develop such learners.

In order for Technology Education to live up to its true potential, it is essential that all facets of the subject are dealt with accordingly, and that includes assessment. Both nationally and internationally, issues around assessment have been contentious. It is clear that the social and political implications of assessment cannot be cast aside; however, it is vital that assessment practices that are employed are viable, reliable and widely acknowledged (Brady, 1997).

Chapter two outlined the continuing debates that surround assessment practices in Technology Education and the theoretical framework of the study. Chapter three outlines the research design, methodology of the study, and steps taken to ensure validity and trustworthiness, including ethical considerations.

## **CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY**

### **3.1. Introduction**

A research design is a ‘blueprint’ or plan outlining the strategy a researcher embarks upon to obtain answers to research questions or problems (Kumar, 2005). Chapter three addresses these issues as the researcher aims to answer the critical questions of what, how and why relating to assessment in Technology Education. As this chapter unfolds, greater insight is given into the following areas pertaining to the study: the methodology chosen, sample choice, data collection methods used, how the data are going to be analysed, and ethical considerations that were taken into account.

### **3.2. Nature of inquiry in research**

Research is a systematic process of collecting, analysing and interpreting data to answer questions that arise within various professions (Kumar, 2005). It enables individuals to gain a greater understanding of guiding principles, including developing and testing new principles for the enrichment of professional practice, as well as to acquire a greater understanding of the world and how it works (Kumar, 2005; Cohen, Manion & Morrison, 2007).

Researchers understand, view and report the world through different lenses (Anderson & Arsenault, 1998). In research there are three distinct approaches that are used to understand the world and its nature: the positivistic approach, interpretative approach, and critical approach (Cohen et al., 2007; Bertram, 2003). These three approaches are briefly described below to provide a clearer perspective of how researchers understand the world, and in particular to highlight the view taken by the researcher for this particular study.

- Researchers using the positivist approach apply scientific methods of inquiry for research. A logical, deductive system of laws, patterns and axioms is used to make sense of the world and to these researchers these patterns and orders govern the world and keep it stable. Hence, by studying the relationship between these patterns, laws and orders it is possible to find the truth (Bertram, 2003, p. 39).

- Researchers within the interpretative paradigm make use of research to understand and describe social action. They examine beliefs, behaviour, attitudes and perceptions. Unlike the positivists, the world is not seen as stable: it is dynamic and changeable, and it is people that bring about changes according to their values. No group's values are wrong, they are only different. It is by understanding these values in context that greater understanding of a situation is gained. Absolute truth is not possible; it is in uniqueness that strength is gained (Bertram, 2003, p. 40).
- Critical research aims to cause some kind of change which will benefit the oppressed, according to Bertram (2003, p. 45). Its aim is to transform society and people by empowering them with the tools that are needed so that democracy prevails.

### **3.2.1. Locating this study within the interpretative paradigm**

The interpretative paradigm focuses on action and the intentional behaviour of participants (Cohen et al., 2007). For this study the action or behaviour that is to be explored is teacher assessment strategies in Technology Education. By observing how the teachers assess, and questioning the reasoning behind employing such assessment strategies, the researcher will be able to gain a greater understanding of the phenomena. Knowledge within the interpretative paradigm is constructed through observable phenomena, values, beliefs, descriptions of peoples' intentions and self-understanding, and it is thus evident that this study is positioned within the interpretative paradigm (Cohen et al., 2007).

### **3.3. Approach to inquiry**

As a researcher embarks on a process to answer the research questions, an approach to inquiry needs to be selected: is it going to take the form of quantitative or qualitative research?

If the research is quantitative, then the approach to inquiry is more structured. All aspects that form part of the research process, from the inception of the objectives to the design, including the sample and the questions that are going to be posed to the respondents, are predetermined. The structured approach is often selected when a researcher sets out to determine the extent

of a phenomenon: for example, how many learners have been bullied in schools? The data are gathered via the use of quantitative measurement scales, and the main aim of the research is to quantify the variation and find causal relationships (Kumar, 2005; Bertram, 2003).

In contrast to this, a qualitative approach follows a more unstructured path since it allows for flexibility in all aspects of the research process, and is used to explore the nature of a phenomenon. In a qualitative study the data are collected from a description of observed situations and people's opinions. The main aim is to describe the variations in attitude and situation; the data cannot be counted. This approach is often used when greater insight and depth are required (Kumar, 2005; Bertram, 2003). A qualitative study has a distinct identity and its own special approach to collecting and analysing of data. Words or images are the product of a process of interpretation (Denscombe, 2003).

Since the aim of this study is to provide an in-depth understanding of Grade 7 teachers' assessment practices when assessing Technology Education within the Pinetown District, this study is qualitative in nature (Burton & Bartlett, 2005; Cohen, et al., 2007).

Once the researcher has located the study within a particular paradigm and selected the approach of inquiry, decisions have to be taken with regard to the methodology.

### **3.4. Methodology**

According to Morrison (1993), as cited in Cohen et al. (2007, p. 86), methodology is the approach that a researcher uses to carry out the research study. There are a number of different methodologies that a researcher can choose from, including:

- naturalistic and ethnographic research;
- case studies;
- life histories;
- surveys;
- experimental research; and
- action research.

The methodology chosen must suit the paradigm that the study is situated in (Bertram, 2003).

Since this research is located within the interpretative paradigm and is qualitative in nature, the researcher has opted to use the case study approach since the emphasis of this study is on understanding Grade 7 Technology teachers' assessment practices.

Case studies are often used to study social phenomena. A comprehensive analysis of a particular case is carried out within a particular setting to ascertain how participants relate to each other in a given situation. This provides a unique example of real people in real situations, and an opportunity to study participants' common and unique features in depth within a limited time scale (Bell, 1993; Denscombe, 2003; Cohen et al., 2007; Kumar, 2003).

Case studies expand our knowledge about the variations of human behaviour, looking at the reality of the participants and their lived experiences, views and actions in a particular context. It is used to answer the 'how' and 'why' questions in research (Anderson & Arsenault, 1998). The advantage of using a case study method is that multiple sources and data collection techniques can be employed to find answers to the critical questions of a study (Bell, 1993; Denscombe, 2003; Cohen et al., 2007; Kumar, 2003; Marczyk, De Matteo & Festinger, 2005; Bertram, 2003; Anderson, 1998).

When using the case study approach a researcher is required to take into consideration various aspects which could define the case; these may include events, an activity, people, organisations, societies and geographical location. In other words, a case study could involve studying a single individual, a group of people or even a community (Cohen et al., 2007; Denscombe, 2003; Kumar, 2003; Bloor & Wood, 2006). For this research the case study is defined by geographical location, as determined by boundaries stipulated by the KwaZulu-Natal DoE - this being the Pinetown District.

In order to enhance the quality of learning and to provide the necessary teacher-learner support services throughout the Province of KwaZulu-Natal, the provincial DoE has the following organisational structures in place: the head office, the district, the circuit and the ward. The head office concerns itself with policy, strategic interventions, monitoring and evaluation, while the districts, circuits and wards focus on implementation of all programmes. There are 12 districts in KwaZulu-Natal, demarcated according to geographical location, and Pinetown is one of these districts. Pinetown District is made up of four circuits: KwaMashu, Phoenix, Hammarsdale and the City of Durban. The number of circuits that make up a district

is determined by infrastructure; on average districts comprise between 90 and 150 schools, depending on topography (Ministerial Executive Committee, 2010). Each circuit consists of wards; for example, the City of Durban consists of the following wards: Westville, KwaSanti, Kranskloof and Ndengezi.

The choice of the case study as the approach in this research has a direct bearing on sample choice.

### **3.5. The sample**

A population refers to all individuals of interest to the researcher, who would be able to assist the researcher in obtaining the relevant answers to the research questions. For this particular study, that would be all Grade 7 teachers teaching Technology Education within the Pinetown District; however, it would be logistically impossible to study the entire population of such teachers in Pinetown District, so a subset or small group of that population is chosen, which is called a sample (Kumar, 2003; Marczyk et al., 2005; Bertram, 2003). For this study the sample was chosen from schools within the City of Durban circuit in the Pinetown District.

Sampling refers to the process that is used to select the participants that the researcher chooses to study. There are different sampling methods that a researcher can use. Most often a researcher will choose a sample and the unit of analysis most suitable to the study (Nieuwenhuis, 2007a). Interpretative and qualitative research is concerned mainly with in-depth understanding and detail. Samples that are selected for qualitative research are usually smaller than quantitative research samples. The size of the sample depends on the purpose of the study (Nieuwenhuis, 2007a).

The participants for this research were determined by purposive sampling and convenience sampling. Purposive sampling is when a researcher deliberately handpicks participants on the basis of particular characteristics or information, so that they are able to produce the most valuable and relevant data available to satisfy the needs of the study. In most instances purposive sampling is used to select people who have in-depth knowledge about a phenomenon by virtue of their profession, role, expertise, power or experience - those that are willing to share the required information as well as for convenience of the researcher (Cohen et al., 2007; Denscombe, 2003; Kumar, 2003).

Convenience sampling involves choosing participants that are closest, and those who are available and accessible at the time. Basically it means that researchers choose participants that they have easy access to (Cohen et al., 2007).

The unit of analysis for this study was four participants chosen by virtue of their professional experience in teaching Grade 7 Technology Education within the senior phase<sup>8</sup>, as well as their accessibility and availability within the City of Durban circuit in the Pinetown District. The critical questions of the research played a vital role in determining the sample, since the focus of this research was primarily to explore Grade 7 teacher assessment practices in Technology Education within the Pinetown District.

### **3.6. Data collection methods**

Research that is empirical means that it is based on the collection of data, and it is in the analysis of this data that light is shed on a particular phenomenon. The range of approaches which researchers use to gather data are referred to as methods. There are two approaches to gathering information about a situation, phenomenon or problem. Sometimes the information is already available in the form of census data, hospital records or an organisation's records, and it only needs to be extracted - these are referred to as secondary data (Kumar, 2003). When the researcher gathers first-hand information about a situation, these are primary data. It is important to note that no single method of data collection provides absolutely accurate and reliable information (Cohen et al., 2007; Denscombe, 2003; Kumar, 2003; Bertram, 2003).

Several methods can be used to collect primary data, each being appropriate for acquiring a specific type of data. Sometimes different types of methods are employed to obtain the information required to answer the critical questions. According to Kumar (2003, p. 119): "Choice of methods depends on the purpose of the study, the resources available as well as the skill of the researcher." One of the advantages of using a case study method is that it allows the researcher to use a range of research methods to collect data, including

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<sup>8</sup> NCS has segmented the first 10 years of formal schooling into bands: the foundation phase is Grade R to Grade 3, the intermediate phase is Grade 4 to Grade 6, while the senior phase refers to Grade 7 to Grade 9.

observations, questionnaires, interviews and documentary analysis (Kumar, 2003; Bloor & Wood, 2006; Van Dalen, 1979; Anderson & Arsenault, 1998).

Since this research is a qualitative study, the researcher chose the following data collection methods: observation of all four participants' Technology lessons; document analysis of learners' books and educators' portfolios; and semi-structured interviews. The use of multiple data collection methods enables the researcher to gain greater insight into and understanding of the phenomena being studied. They also enable the researcher to clarify and confirm data collected from the different instruments, which is known as triangulation and helps to confirm the trustworthiness of data collected, which is of paramount importance in any study (Ary, Jacobs & Razavieh, 2002). Data collection for this study was done in two phases, as outlined below.

In phase one Technology Education lessons were observed, specifically the capability (design and make) task. Observation of the lesson provides vital data with regard to critical question one: What are teachers assessing in Technology Education?, and critical question two: How do teachers carry out these assessments? The capability task was deliberately selected for observation because it provided insight into how teachers assess the higher-order thinking processes involved in problem solving.

Document analysis of learners' books and teachers' portfolios was carried out at the end of the observation session of each participant. This provided valuable insight into how the teachers assess conceptual knowledge in Technology Education. Data collected from the document analysis was used to ensure the trustworthiness of the data collected from observation of the Technology Education lessons, and was used to triangulate data obtained from the interview sessions with the participant.

Phase two of data collection comprised interview sessions with all four participants. These sessions were used to clarify and confirm data collected in phase one of data collection and also to collect data relating to critical question three: Why are teachers employing particular assessment strategies?

Each of these data collection methods will now be discussed in detail, outlining their advantages and disadvantages.

### **3.6.1. Observation**

One way of collecting primary data is through observation, which involves a purposeful and systematic way of watching and listening to an interaction taking place. It also allows the researcher to obtain first-hand data on site, so that greater insight and awareness is gained of the phenomena being observed (Kumar, 2003). Observation is a suitable method of collecting data when one wants to learn about group interactions, patterns of a population and work performance or to study behaviour and personality traits (Kumar, 2003). Hence it was a suitable method to collect data in this study. The researcher would go into the classrooms and observe assessment practices of Grade 7 Technology Education teachers with the intent of providing answers to the following critical questions: What are teachers assessing in Technology Education?; and How do teachers carry out these assessments?

The two types of observations are participant and non-participant observation. Participant observation is when the researcher engages with the group and is actively involved in their activities. For example, if you wish to study the life of factory workers, you could pretend to be a factory worker and join in their activities, at the same time observing your participants. In non-participant observation the researcher does not get involved in any of the activities but plays a passive role, watching and listening to all activities and drawing conclusions from this. This type of observation has its disadvantages, because by not becoming involved in the situation the researcher is unable to fully understand what is being observed (Kumar, 2003; Nieuwenhuis, 2007a).

The nature of this study does not allow the researcher to get involved in the activities that are unfolding in the classroom. The aim of the study is merely to observe the phenomena pertaining to Grade 7 teacher assessment practices in Technology Education and not participating in any of the activities. Hence non-participant observation was used in this study, with observations being carried out in the natural environment - classrooms or Technology workshops.

An unstructured format was followed in the form of running records. This meant that the researcher provided detailed descriptions of what was observed in the classroom in the form of field notes, rather than selecting predetermined alternatives on a schedule. The data that

emerged as the teacher progressed with the lesson and all observable phenomena relevant to the study and critical questions were recorded. The interview session that was scheduled for the next phase of data collection was used to ensure trustworthiness of data collected. Brief descriptive notes were taken down while observing the lesson, and soon after the observation more detailed narrative notes were made (Van Dalen, 1979; Denscombe, 2003; Kumar, 2003; Bertram, 2003).

The advantage of using observation methods is that a researcher is able to gain in-depth knowledge and insight into a situation by seeing exactly what is happening in the classroom, and to obtain data first-hand rather than relying on the perceptions and opinions of others. No method of collecting data is without problems or weaknesses. With observations there are a few aspects that a researcher needs to consider. Observations are generally very selective, and the possibility of observer bias can become problematic. This can easily happen, since the observer has to make important choices regarding what is relevant to the study or not (Cohen et al., 2007; Kumar, 2005). Also, how an observer chooses to write down and interpret the activities in the classroom depends on his or her view of the phenomena and the world. When observer bias occurs, the validity of data is questioned (Cohen et al., 2007; Kumar, 2005).

It is also difficult for a researcher to understand the dynamics of a classroom and teacher-learner interactions just by observing a few lessons, and it is therefore always important to speak to learners and teachers that are being observed in order to get a clearer picture of the situation. Furthermore, observations can be intrusive, and when people (especially children) are aware that they are being observed, they may behave differently. This is referred to as the 'Hawthorne effect' and may distort the data captured, since what is being observed is not normal behaviour (Cohen et al., 2007; Kumar, 2005). To ensure validity of data collected, multiple data collection methods were used. The second data collection method will now be discussed.

### **3.6.2. Document analysis**

Document analysis is generally used to collect data in historical and social research. Documents that have been analysed or read for research vary from manuscripts, charters, letters, files, magazines, films and paintings to log books and catalogues, to mention but a few. All of these provide first-hand information on an event or phenomenon, are considered as primary data sources and play an invaluable part in triangulating data (Cohen et al., 2007).

For this study the documents that were analysed were teachers' files, learners' books, Assessment Guidelines for Technology Education, the Technology Education policy document and Teacher's Guide for the development of learning programmes. Document analysis was done after observation of the Technology Education lesson.

The data obtained from document analysis provided valuable data on the following critical questions: What are teachers assessing in Technology Education?, and How do teachers carry out these assessments? The observation sessions focused on the capability task and designing and making of a product, as described in chapter two. Analysis of the teachers' files and learners' books was carried out to shed some light on how other aspects of Technology Education are assessed, namely the assessment of conceptual knowledge and which tools of assessment the Grade 7 Technology teachers use and how use them. Document analysis helped to validate data obtained from the observations as well as the interviews.

### **3.6.3. Interviews**

Interviews are commonly used to gather information from people. Any person to person interaction between two or more people (in this case a researcher and a respondent) is classified as an interview. Interviews are different from daily day-to-day conversations; an agenda is set, and a researcher asks the respondent questions so that the researcher is able to understand the phenomenon that is being explored through the eyes of the participant (Kumar, 2005). If the participant that the researcher has sampled trusts the researcher and is of the opinion that the topic is important, they will be able to provide rich data that a researcher would not be able to collect with any other method (Bertram, 2003; Kumar, 2005; Nieuwenhuis, 2007a).

Interviews can be structured, unstructured and semi-structured. A structured interview is when the researcher has a set of predetermined questions and asks the respondent these questions in a set order, using the same words as specified in the interview schedule. This type of interview is generally used in multiple case studies or when interviewing a large sample. The interviewer rigidly sticks to the interview schedule. An unstructured interview or open-ended interview is when there is flexibility and the researcher has complete freedom in terms of the content and structure of the interview. The researcher is able to formulate questions as the interview progresses and issues arise. In an unstructured interview the respondent talks freely about a topic, with a series of interviews over time. The focus is mainly on the participant's perception of the aspect that being studied. Semi-structured interviews are generally used to confirm data that have been collected by other data collection methods. They require participants to answer a set of predetermined questions, and the researcher is able to probe and question the participant further so that a clearer understanding is achieved (Kumar, 2003; Van Dalen, 1979; Nieuwenhuis, 2007a).

For the purposes of this study the researcher engaged in semi-structured interviews. An interview schedule was prepared to act as a guide. The researcher was also aware that she may also have to formulate new questions as the interview progressed. The interview session provided the perfect stage to clarify specific issues that had been picked up during the observation session and document analysis of a particular participant. As a result some of the questions varied; hence the use of a semi-structured format of interview was appropriate here.

In interviews it is essential to verify the data that have been collected, and this can be achieved using a strategy known as probing. There are three types of probing:

- Detail-oriented probes, which are used when the researcher needs to understand the 'who', 'where' and 'what' of the responses provided by the participant.
- Elaboration probes, usually used when the researcher wants to understand fully what the participant is saying, and the participant is asked to explain further.
- Clarification probes, used to ensure that the researcher understands precisely what the participant wants to say. Generally the researcher paraphrases what has been said by the participant and receives confirmation from them (Nieuwenhuis, 2007a).

The interviews were conducted a few days after the observation of lessons and document analysis. They were an hour long and held at the convenience of the participant. Where it was necessary to have a follow-up session, this was arranged in consultation with the participant. The semi-structured interviews comprised closed- and open-ended questions. Detailed-oriented probing, probing for clarification and elaboration occurred during the interview when the need arose as the participants responded to the open-ended questions (Cohen et al., 2007; Nieuwenhuis, 2007a). Notes were taken during the interviews, and they were taped with the permission of the participants to ensure that all data were captured. Transcripts of the interview were sent to each participant to verify the data captured; this form of verifying the data is referred to as member checking, and is used to ensure validity and trustworthiness of data captured during the interview.

The step that follows collecting the data is data analysis. This aspect is detailed in the next part of this chapter.

### **3.7. Data analysis**

“Analysing data is like walking through a maze,” according to Anderson and Arsenault (1998, p. 157), meaning that there are many routes a researcher can embark on to make sense of and analyse the data collected. Some routes may lead to satisfying results, while others may lead to a dead end and the researcher may have to retrace his/her steps to find the shortfall. There are two approaches that researchers can consider to avoid this from happening when approaching data analysis. The first is an analytical strategy, where the researcher uses the literature review and theoretical background of the case as a framework to organise the data collected. The second is the qualitative research approach, where the researcher organises the data according to descriptive themes that emerge (Anderson & Arsenault, 1998).

The approach that is chosen often depends on the type of research that is being carried out and the case study selected (Anderson & Arsenault, 1998). According to Bertram (2003) data analysis is a systematic separation of all data collected into categories or themes. The analysis of data in a qualitative study varies significantly from that in a quantitative study. When analysing qualitative data it is the goal of the researcher to summarise what has been seen and

heard, so the analysis involves organising, accounting for and describing data collected according to the participants' explanation of the situation. This is often done by identifying patterns, themes and categories which emerge from the data (Cohen et al., 2007). The aim of the researcher is not to measure but to interpret the data that are collected so that a better understanding is gained of the aspect being studied. In a qualitative research study the data accumulate rapidly, and hence early analysis would reduce the problem of data overload (Cohen et al., 2007; Best, 1970).

Many researchers also opt to merge the two approaches. This is done by first sorting the data into emergent themes and thereafter extending the analysis by examining existing literature and theory (Anderson & Arsenault, 1998). For this study the researcher opted to merge both approaches in the manner described below.

Phase one of the analysis was grouping of all relevant data from the various data streams (observation, semi-structured interviews and document analysis) into broad categories, guided by the critical questions of the study (Cohen et al., 2007): aspects of Technology that are being assessed; how these assessments are carried out; and reasons for educators employing such strategies.

Once phase one was completed the researcher retained relevant data pertaining to the study and discarded that which was irrelevant. The relevant data were then coded (where the researcher assigns a symbol, description or label to an important part in the transcript). These codes act as markers when interpreting the data and identifying themes (Nieuwenhuis, 2007b).

Once the coding of data was completed a more intensive look at the codes was carried out, and the researcher grouped and organised the respective codes. In doing so specific themes and features were identified, and the data began to make more sense. The entire process of data analysis was guided by what Parlett and Hamilton (1976), cited in Cohen et al., 2007, p. 184) call 'Progressive focusing': the researcher took a wide-angle view to gather data and then through grouping, sifting, reviewing and reflecting on the data, themes began to emerge which could then be interpreted.

The researcher then moved to phase two of the data analysis, organising the themes and patterns that emerged from phase one in relation to the literature and theoretical framework of the study, as discussed in chapter two.

### **3.8. Validity in research**

Validity is key to effective research, and refers to how correctly and truthfully the research data have been captured: is the researcher measuring what he/she set out to measure via the chosen instruments, and can we trust the data? If this is not the case, then the research is invalid (Kumar, 2003; Cohen et al., 2007; Burton & Bartlett, 2005).

Data collection instruments do not possess ‘all purpose’ validity, according to Van Dalen (1979). Since we cannot erase the threat of invalidity, we can attempt to minimise it by ensuring that validity is maintained throughout the research by ensuring internal validity, external validity, ecological validity and content validity (Cohen et al., 2007; Van Dalen, 1979), each of which are discussed below.

Internal validity is concerned with how accurately the research is able to describe the phenomena being researched. In qualitative research internal validity can be attained in the following ways:

- By using more than one researcher to observe a situation, so that notes can be compared; what one researcher may have missed, the other would have captured;
- By using more than one data collection method to measure a phenomenon. If data collected from different instruments reveal the same conclusion, this indicates validity of data;
- By asking participants to read the transcripts of interviews so that they can correct and confirm that these are an accurate reflection of what was said;
- Maintaining confidentially and anonymity of the participants; and
- By using mechanical devices to record the data, a good example here being the use of a tape-recorder to record the interview, thus ensuring a more accurate transcript (Cohen et al., 2007; Bertram, 2003; Nieuwenhuis, 2007b).

For this study the following action was taken to ensure internal validity and trustworthiness of the data: more than one data collection method was used to collect data, these being observations, semi-structured interviews and document analysis. The interview was used to triangulate the data collected from the observation and document analysis.

All interviews with the participants were recorded and transcripts of the interviews were sent to the participants for them to verify the accuracy of the data captured to ensure validity. This process, according to Maykut and Morehouse (1994), as cited in Burton and Bartlett (2005) is referred to as member checks or member validation. Pseudonyms were used to maintain confidentiality of the participants and the schools at which they teach.

External validity refers to whether the findings of a study can be generalised to the wider population. According to Schofield (1990), as cited in Cohen et al. (2007, p.137), in a qualitative study it is important that the researcher provides a clear and detailed description of the findings. This ensures that others who come across the study are equipped with the necessary information to be able to decide to what extent the findings can be generalised or applied to another situation.

Since this research is a qualitative study it was imperative that detailed and in-depth descriptions were provided, since the aim of this study is to gain a greater and clearer understanding of teacher assessment practices in Technology Education. However, the findings of this study are not generalisable because it is a case study.

Content validity ensures that an instrument addresses the aspects of a study that it claims to (Cohen et al., 2007, p.137). For this study content validity was ensured by using observation and document analysis to answer the critical questions of the study: What are teachers assessing in Technology Education?; How do teachers carry out these assessments?; and Why are teachers employing particular assessment strategies?

### **3.9. Design limitations**

Limitations of the study that are anticipated include educators wishing to withdraw from the research after the interview session. If this happens, then another Technology teacher teaching Grade 7 within the senior phase in the same school or from another school within

the Pinetown District would be approached to participate in the research. Another limitation pertains to the current education system and the uncertainty of Technology Education in the curriculum, and how and when changes are going to be implemented. Presently it seems as though changes have not affected Grade 7 learners. A further limitation of this study is that the sample of four participants was purposively selected and also chosen for convenience, thereby questioning their representation of the population and the reliability of the study.

### **3.10. Ethical issues**

Most research that involves human participants involves some degree of risk. It is essential for researchers to take note of ethical considerations and in the pursuit of truth not to cause harm, discomfort or embarrassment, become intrusive or breach the confidentiality of the participant (Kumar, 2003; Cohen et al., 2007; Marczyk et al., 2005).

The following ethical procedures were followed:

- A written application for ethical clearance was forwarded to the University of Kwazulu-Natal ethical clearance board. As governed by the code of ethics, research cannot embark on fieldwork unless approval is obtained from the ethics committee.
- An application to conduct research in schools was forwarded to the research section of the DoE.
- Once permission was gained from the above gatekeepers, formal written consent was sought from the principals and Grade 7 Technology teachers at the schools where I wished to conduct my research.
- Participants had to volunteer to participate in the research, consent forms were completed and a detailed description of what the study entails was outlined to participants and the principals, with the understanding that they could withdraw from the study at any point in time. Further to that, participants were informed that anonymity and confidentiality would be assured as pseudonyms would be used.
- Participants were assured that all information gathered will be used solely for research purposes, and that no other persons other than the researcher and supervisors of the study would have access to the data.

- All data collected will be kept safe in a locked cupboard and all audio-tapes will be destroyed after data have been transcribed and analysed.

### **3.11. Conclusion**

This chapter outlined the research design and methodology used to ensure that data were collected successfully and interpreted to answer the critical questions outlined for this study. It also highlighted ethical considerations and design limitations. The chapter that follows provides a detailed analysis and description of the results obtained from the data that were collected.

## **CHAPTER FOUR**

### **ANALYSIS AND DISCUSSION OF RESULTS**

#### **4.1. Introduction**

This chapter presents the analysis of data collected using the various data collection strategies falling within the domain of a qualitative study. The chapter begins with a brief introduction to the participants within the Pinetown District, followed by an analysis and discussion of the results obtained from the interviews with teachers, observation of Technology Education lessons and the analysis of teachers' files and learners' portfolios. This is done by addressing each critical question individually and incorporating a discussion of the results obtained from the document analysis and observation with verbatim quotations from interviews. The analysis and discussion of results are presented thematically.

Before moving on to the discussion of results, in order to personalise and contextualise this study the researcher provides a brief introduction to each of the participants.

#### **4.2. Brief description of the participants**

In this section the following aspects were addressed: the location of each school, infrastructure of the school (specifically relating to Technology Education), the number of learners per class, and a brief description of each participant and their qualifications. Due to ethical considerations pseudonyms have been allocated to each teacher and their school.

##### **4.2.1. Mr Jasper at Willow Primary School**

Willow Primary School is a senior primary campus found in the affluent part of Pinetown District. It is an ex-Model C<sup>9</sup> school, and the demographics of the school encompass the essence of a democratic South Africa. In keeping with the excellent facilities of the school, the school has a fully equipped Technology workshop. The average number of learners per

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<sup>9</sup>During the apartheid era the education system was determined along racial lines. Each race group ran their own schools. Schools for 'white children' had the best facilities and were called Model C schools. Now with democracy and admission of children across the colour barrier, these schools are now referred to as ex-Model C schools.

class is approximately 25. For the learning area Technology Education learners are provided with booklets for each content area, which they keep as notes in a file.

Mr. Jasper is a white male who has been in the profession for 25 years; he has a Higher Education Diploma and is one of the senior members of staff. He has been teaching Technology Education for over seven years. Mr. Jasper is bilingual<sup>10</sup> and has had no formal training in teaching Technology Education. According to the interview he teaches Technology Education because: “I was always able to work with my hands and make things and I am pretty clued up with that sort of thing.”

#### **4.2.2. Miss Shanti at Wisteria Primary School**

Wisteria Primary School is a private institution tucked away within an affluent residential suburb of Pinetown District. Apart from following the NCS, their curriculum is also aligned to a certain religious sector of the community. Presently they have approximately 200 learners from Grade 0 to Grade 7; however, in the years to come they hope to expand to Grade 12. The Grade 7 class consists of six learners. There is no specialised room for Technology Education. Learners work in their classroom and bring most of their own equipment and resources. The teacher provides some basic equipment. Pupils work in books and keep all design portfolios and assessments in a file.

Miss Shanti is an Indian female who has been teaching for less than two years and teaching Technology Education for just over six months. She has just completed her PGCE<sup>11</sup> at UNISA<sup>12</sup>. Miss Shanti has no formal training in teaching Technology Education. She also studied Indian Classical Dancing in India and was initially appointed by the Board of Governors<sup>13</sup> of Wisteria Primary to teach Arts and Culture. At the beginning of 2011 she was asked to teach Technology Education.

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<sup>10</sup>Person with the ability to communicate (speak and write) in two languages, specifically relating in this study to a person who is able communicate in English and Afrikaans.

<sup>11</sup>PGCE is a Postgraduate Certificate in Education.

<sup>12</sup>The University of South Africa is a university where one studies through correspondence.

<sup>13</sup> A group of people who oversee and manage the running of an institution.

#### **4.2.3. Mr. Mario at Azalea Primary School**

Azalea Primary School is an ex-Model C school that caters for children from Grade 0 to Grade 7; however, it is not equipped with the same infrastructure as Willow Primary School, but it does have necessary equipment that learners require for Technology Education. The teacher keeps the equipment in his classroom and hands it out when it is time to work. Many of the learners come from socially disadvantaged backgrounds, with English being their second language. The average class size is 30 learners per class. Learners work in books, and worksheets are run off and handed to them. All assessments are kept in files.

Mr Mario is a white male who has been in the teaching profession for about five years and has been teaching Technology Education for three years. Mr. Mario is bilingual, and having graduated from the University of KwaZulu-Natal Edgewood Campus he has had some formal training in Technology Education - he specialised in Sports Science.

#### **4.2.4. Mr. Yadav of Hycentia Primary School**

Hycentia Primary School is an ex-House of Delegates<sup>14</sup> school situated in a middle-income group residential area that caters for children from Grade 0 to Grade 7. The children from these middle-income group families attend the neighbouring ex-Model C schools. The children that attend Hycentia Primary are from the nearby informal settlement<sup>15</sup>. The school previously had a fully equipped handwork room, but this room has been converted into a classroom. According to the Mr. Yadav not much equipment is left as the school is prone to vandalism and theft. The average class size is 35 learners and English is their second language. Pupils have books in which they work; most of their notes are handwritten, and all assessments are pasted in the work books.

Mr Yadav is an Indian male who has been teaching for approximately 12 years. Prior to teaching at Hycentia Primary he taught Design and Technology and Mathematics in London. He initially had no formal training in Technology Education, but when in London he attended many Design and Technology workshops that enabled him to successfully teach the learning

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<sup>14</sup> Prior to democracy the educational system was determined along racial grounds. Each race group ran their own schools. The House of Delegates was the Indian run school system.

<sup>15</sup> Unplanned settlements that have no legal claim over land and are not in compliance with planning and building regulations.

area. On arriving back in South Africa he joined Hycentia Primary and was awarded the opportunity to teach Technology Education due to his experience in London. Mr. Yadav's interest in Technology Education continued and he attended the Engen short course<sup>16</sup> conducted by Technology for All at the University of Kwa-Zulu Natal.

Under the current dispensation, three out of the four schools that have been selected for this case study from the Pinetown District are presently classified as government schools, while Wisteria Primary is a private institution. All schools are governed by the South African Schools Act and follow the NCS.

### **4.3. Discussion of results**

As the rest of the chapter unfolds, each critical question is analysed individually and the findings are presented thematically with verbatim quotations from interview sessions. The interview sessions were used to gather information and clarify data collected from the observations and document analysis.

For this research study nine themes have emerged from the findings these are as follows:

Themes emerging from research question one: What are Grade 7 teachers assessing in Technology Education? are,

- teachers are assessing that which they feel is important in Technology Education
- Is the finished product or the process being assessed in Technology Education?

Research question two : How do Grade 7 teachers carry out these assessments? are,

- Assessing the problem-solving element
- Are teachers assessing creativity and novel ideas, and if so how?
- Tools teachers use to assess conceptual knowledge and procedural knowledge
- Is feedback being provided after assessment

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<sup>16</sup>A short course sponsored by Engen aimed at equipping teachers with basic knowledge of how to teach Technology Education.

Research question three: Why are Grade 7 teachers employing particular assessment strategies? are,

- Limited knowledge of subject matter and assessment strategies
- Providing real-life contexts for assessments,
- Reasons for using particular assessment strategies

Each critical question is addressed below with a detailed discussion of the corresponding themes that have emerged.

#### **4.3.1. What are Grade 7 teachers assessing in Technology Education?**

**Theme one: Teachers are assessing that which they feel is important in Technology Education**

Cognitive and procedural knowledge is imperative in order for learners to become literate in design and the design process, according to Crossfield et al. (2004). Van Niekerk et al. (2005) are in agreement with the above, stating that within the South African scenario Technology Education must include conceptual knowledge and procedural knowledge on designing and manufacturing of products. This is qualified by the LOs that are to be achieved, as stated in the NCS:

LO1 – Encompasses the technological processes (design process), which is referred to as the creative, interactive approach and the skills associated are investigate, design, make, evaluate and communicate.

LO2 – Technological knowledge and understanding, which outlines the three core content areas of processing, structures and systems, and control.

LO3 – Deals with technology, society and the environment; learners become aware of indigenous technology and culture, changes in technology over time, impact of technology on society and the environment, and bias, the influence of technology on values, attitudes and behaviours (Pudi, 2008; DoE, 2002).

In light of the above, within the South African context it is evident that both procedural and conceptual aspects should be assessed. These assessments should be designed and weighted so that all LOs are covered in exciting and varied ways (DoE, 2007).

The NCS further states that assessments in Technology Education as well as in all other learning areas need to be both informal and formal. Assessments must also take place on a continuous basis, and the type of method that the teacher employs depends on what is to be assessed. Apart from the above, the number of formal assessments that teachers are required to carry out for Technology Education are outlined in Table 2 (DoE, 2007, p. 14). The NCS thus allows for varied interpretations. No specific direction is given as to what aspect of Technology Education is to be assessed and how it should be assessed.

**Table 2: Number of Formal Recorded Assessment Tasks for Grades 7-9**

<b>LEARNING AREA</b>	<b>TERM 1</b>	<b>TERM 2</b>	<b>TERM 3</b>	<b>TERM 4</b>	<b>TOTAL</b>
Language 1	4	4	4	4	16
Language 2	3	3	3	3	12
Language 3 Optional	3	3	3	3	12
Mathematics	3	3	3	3	12
Natural Science	2	2	2	2	8
Social Science	2	2	2	2	8
Technology	1	1	1	1	4
Economic and Management Sciences	1	1	1	1	4
Life Orientation	1	1	1	1	4
Arts and Culture	1	1	1	1	4

As a result, it was not surprising that data revealed that although the participants within the Pinetown District are covering the relevant content as outlined in LOs in the Technology Education curriculum, they differed as to which aspects of Technology Education were being assessed:

**Mr. Jasper** focused on the procedural aspects of Technology Education and was of the opinion that the practical competence is paramount: *“I think they need to be*

*competent. If they go away and they can fit a plug safely, then I'll say ... that is what it is all about. Ja. To me they need to learn to work with their hands.*" As a result, his formal assessment was based on the completed project.

Document analysis revealed no evidence of conceptual knowledge being assessed. There were no summative assessments or any other form of assessment in the learners' portfolios or the teacher's files.

**Miss Shanti**, according to her interview, states that to her conceptual knowledge is important: *"From my point of view the theory is more important once they grasp that then it is very easy for them to make the end product. I feel as long as they understand the theory that is most important."*

Document analysis confirmed the emphasis placed on conceptual knowledge as summative assessments for the end of each term were found in learners' files as well as Miss Shanti's file. However, document analysis and observation of Technology Education lessons also revealed that Miss Shanti uses a portfolio as an assessment tool and she also assesses the completed manufactured product.

However, procedural knowledge forms only 25% of the end of term mark, while the rest consists of the summative test. This confirms Miss Shanti's emphasis on conceptual knowledge as mentioned in the interview.

**Mr Mario** emphasised conceptual knowledge and procedural knowledge. He assessed conceptual knowledge in the form of summative tests and procedural knowledge by assessing the capability task at different stages: *"I assess the manufacturing of the product in stages. We do stage one, we do an assessment, then we move on to stage two, and then obviously overall product and then at the very end we have a summative test."*

Mr. Mario also awards learners a group dynamic mark as they proceed with the designing and making. Data from the interview further revealed that Mr. Mario also considers the process that the learner engages in when manufacturing the product in Technology Education: *"The entire process is important because if you look at the*

*end product there was work being done to get to the end product so you need to assess everything that they do, that's why I rather put emphasis on the whole performance."*

**Mr. Yadav** believes that conceptual and procedural knowledge are vital; however, given the school environment he tries to incorporate both the procedural and conceptual aspects to the best of his ability when assessing Technology Education: *"I think it is the design process and the final product is important. Most of them here are second language learners as well ... difficult to do a lot of theory, but I try to incorporate it when designing and making the final product. Yes I do the practical and I bring in the content to show them visually what is going on."* His main focus, however, is the manufacturing process, so he allocates most of his marks for the manufacturing project. Data analysis of learners' books revealed that short tests are given to learners to assess basic theory.

The above data confirm Welch's (2001) findings that most teachers will assess that which they consider to be important in Technology Education. This is because no matter where teachers are geographically located, the trend with regard to assessment in Technology Education is that teachers place emphasis on and assess aspects of Technology Education that they feel are important, whether procedural or conceptual knowledge or a combination of both.

This is the result of not providing teachers with specific guidelines on what aspects of Technology Education are important and how these should be assessed, which allows for varied interpretations and various aspects of Technology Education being assessed.

### **Theme two: Are teachers assessing the finished product or the process?**

The design process is referred to as the "backbone of Technology Education", and according to the NCS: "This is a creative and interactive approach used to develop solutions to identified problems or human needs" (DoE, 2002, p. 7). Similarly, the APU document (1991) outlines the essence of Technology Education as the interaction of hand and mind. This begins simply by developing solutions to a problem, by going through a series of back and

forth movements, progressing from hazy ideas in the head to designing, making, evaluating and eventually creating the prototype.

By looking at Technology Education through these lenses it is evident that the process that the learner goes through when coming up with a solution is more important than the manufactured end product. As a result, the focus is now on the thinking, decision making and thought processes that go into the designing and making of a product, thus developing learners' capability. The concern is that if the design process is an integral part of the learning area, are teachers assessing this aspect; more especially, are the teachers in this study assessing the process:

Observation of Mr Jaspers' lessons revealed that emphasis is placed on the end product. If his learners have completed the end product according to specifications, they are awarded marks; if they have not followed specifications, then the learners are penalised. Mr. Jasper confirmed this in his interview by stating: *"For now obviously the emphasis is more on the product. On the final, the final product."*

Observations further revealed that when learners are engaging in the manufacturing process they are all following a basic example that was revealed to them prior to them embarking on their task. So with a visual image and the detailed specifications, learners proceed to make the final product. There is very little variation in the products produced. The assessment task basically revolves around manufacturing the product according to what the teacher wants.

Document analysis and the interview session revealed that even though Mr Mario assesses at different stages - *"I assess in stages. So if we do stage one ... we do an assessment on that, then stage two and then obviously overall"* - observation of the Technology Education lessons and document analysis indicated that the main focus of assessment is, however, mainly the manufacturing process. It is the manufacturing of the product that Mr Mario assesses at different stages, and no other aspect of the design process is incorporated.

Observations and document analysis further revealed that learners did not come up with their own designs and did not engage with different ideas or designs to come up

with the best solution, they merely copied the design example provided to them by Mr. Mario and focus was on getting to the end product. Furthermore there was no development of ideas or variation of designs; learners were merely given specifications that they were to adhere to and were assessed at different stages. Once the final product was completed a final assessment mark was given.

This was confirmed by data collected during the interview: *“They have the basic measurement, they have certain requirements like the floor should be 30 cm by 40 cm. That would be the standard, the actual material that they use that will be different recycled materials, so it won’t all look the same but will all have the same dimensions and be dome-shaped.”*

Mr. Yadav also placed emphasis on the manufacturing of the product: *“After peer assessments, we look at the final project and give a mark for that, for example structure stability, and design.”* He confirms his stance that the end product is important when he states that he is flexible about using their creativity and own ideas: *“because at the end of the day I am not going to get a product if I am not flexible”*.

Miss. Shanti does not place much emphasis on the manufactured product as stated earlier she regards the content as more important this is reflected in her planning. The manufacturing task although is completed amounts for only a small percentage of the learners’ mark.

It is evident from the data that all participants assessed a final completed product. Their assessment techniques revealed that they plan their assessments and learning programmes around manufacturing a product rather than the development of the design process. This is what McCormick and Davidson (1996) refer to as tyranny of product outcomes, where the focus of Technology Education is tipped towards making rather than following the design process and problem solving.

McCormick and Davidson (1996) suggest that the reason for teachers placing more emphasis on product outcomes rather than the development of the process is that in most countries, teachers that teach Technology Education have different philosophies about the subject and

many come from a traditional craft background, which has a strong focus on manufacturing of products. Mr. Jasper is a good example of this type of teacher.

McCormick and Davidson (1996) also go on to state that another factor that impacts on teachers approaching Technology Education in a product-outcomes fashion is that teachers are aware of the motivational role that the manufacturing process plays in keeping the learners interested:

Mr. Yadav makes mention of this in his interview that he concentrates more on the making aspects to sustain learners' interest, because they are second language learners and the conceptual knowledge that is supposed to be taught is beyond his learners' abilities: *"The kids here in SA, a lot of them find it difficult to understand the content so to keep them interested I must make things with them. I am talking from our school context now. Most of them here are second language learners, the content is way beyond some of them, that is why I place more emphasis on making"*

#### **4.3.2. How do Grade 7 teachers carry out these assessments?**

As Technology Education emerged in curricula of various countries, the design process has become synonymous with problem solving (Mawson, 2003). Problem solving, according to Williams (2000), as cited in Crossfield et al. (2004), is a natural activity for humans since we are always faced with problems and are constantly trying to solve them. Within the South African context the problem-solving element and the design-make-appraise approach (design process) are clearly evident in Technology Education policy documents (DoE, 2002).

It is clear from the data collected from the interviews as well as analysis of documentation that three out of the four participants provided their learners with a problem context and a problem that has to be solved:

**Miss Shanti** relies on the textbook with regard to problem solving: *"I follow the textbook in terms of the problem that they have. They give you the problems in there and you got to solve it. Put the children in a situation so that they can give you a specific kind of finished product."*

**Mr. Jasper** also uses the problem contexts set out in textbooks: *“In the book that we use. What it does is that it sets it out for you ... example ... Two kids are working in a tree house. Design a pulley system, so that they can get stuff into the tree house.”*

**Mr. Yadav** adapts the problem context to what the learners can identify with: *“I like them to see that Technology is not just taking wood and knocking things, it needs to become a reality to them so it depends on the topic in some cases; if I am doing the section on structures, I would probably introduce the topic in one or two lessons and then bring in the problem context.”*

**Mr. Mario** uses the Class Smart Technology Programme<sup>17</sup> and integrates his Technology Education lessons with his English lessons. Presently the Grade 7 learners are reading the novel called *Devil on my Back*. Using this as a theme, Mr Mario designs a Capability Task.

If problem solving is incorporated into the Technology Education lesson of three out of the four participants, the question arises as to how this aspect is being assessed. This gives rise to theme three.

### **Theme three: Assessing the problem-solving element**

Problem solving has become a dominant rationale for learners engaging in Technology Education (Williams, 2007). Problem solving develops higher-order thinking, which, according to Bloom’s taxonomy, encompasses the use of abstract ideas to modify and change ideas so that one is able to construct and assemble elements into novel patterns or structures by constantly evaluating the quality and value of the product (McMillan, 2011).

This impacts on assessment practices employed in Technology Education, because as problem solving becomes more complex it allows for varying interpretations and a variety of solutions. There are now multiple solutions to a single problem, as described in Middleton’s model of revised concept of problem space, and most often learners develop solutions beyond

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<sup>17</sup> Technology programme developed by an independent company that has all lesson plans and teaching aids prepared according to the NCS.

the expectations of their teachers (Middleton, 2005). Observation of Technology Education lessons revealed the following aspects:

Although Mr. Jasper provides learners with a problem context to work within, very little problem-solving activity is involved as he provides his learners with strict specifications to follow and assesses the completed project based on his specifications. Mr. Jasper confirms this in his interview when he states: *“They [the learners] know exactly what to look for if they just comply [with specifications] ... if they stick to my specifications they will get full marks”*.

Miss Shanti’s lesson observation reveals some interesting aspects. She provides the learners with a problem context. This problem context, however, is only given to the learners as part of their portfolio, on the day that the learners start with the manufacturing process. The learners began with the making process and by the end of the lesson had completed the structural aspects of the pencil holder; all that remained to complete the project was to decorate the pencil holder in the next lesson. The portfolio was to be completed as homework. Observation confirmed that the portfolio is completed in isolation of the manufacturing process. There is no evidence of problem solving or engaging in different ideas. Learners merely bring the material asked and proceed in making their product.

There is some evidence from the observation of the lessons that in Mr. Yadav’s class the pupils are engaging in some sort of evaluation and refining of the manufactured product before they hand in their finished product for assessment. The teacher was actively involved in the process he walked around and checked on learners constantly, asking them questions, and providing feedback to them on their progress. He stops at a desk and points out that what the learner is making is not like the actual drawing that the learner has designed. The learner replies that he decided to change his idea; when asked why, the learner replied ‘this looks better’. On hearing this, other learners asked Mr. Yadav if changing the design was okay. When the teacher answered yes, a lot of them began to make changes, borrowing ideas from others.

It is evident from the data collected that when engaging in problem solving, the process that is being followed is a linear one, as described in chapter two. The process that is described by

Middleton, where there are multiple starting-points for a design problem and various paths that one takes to reach a solution, is not taking place in the Technology Education lessons observed.

A problem context is provided for the learners, after which they go on to manufacturing the product, which is assessed by the teachers. The process that the participants are adopting is as described in the model of problem space, where there is only a single, forward movement down the chain that leads directly to the goal state, indicating that when encountering problems there is only one single, correct answer (Middleton, 2005). Mr. Jasper confirms this: *“they know exactly what to look for if they just comply ... if they stick to the specifications they will get full marks”*.

The design process is not being used as an interactive loop which allows for the development and refinement of ideas and back and forth movement between the various stages of the design process, allowing for varied solutions to a problem (APU, 1991; Fisher, 1990). Teachers are merely assessing the finished product and not the process or technological capability.

Technological capability is when learners engage in a problem set in a context, and by following the design process attempt to come up with a solution using the skills and knowledge they have been exposed to (Welch, 2001; Middleton, 2005). According to Williams (2007) this invariably influences teaching and learning, and since we are assessing learner capability assessment becomes complex as we are no longer just assessing the final manufactured product – the process is important. Van Niekerk et al. (2005) are in agreement with the findings of the APU document and Williams (2007), stating that in Technology Education assessment is more than just the end product being assessed. This impacts significantly on how Technology Education capability should be assessed.

According to McCormick and Davidson (1996, p. 240), “When the product takes precedence over the processes of design and problem solving it prevents learner’s from learning of these process and will prevent them from learning through failure.”

Dekker and Feijs (2005) state that teachers who retain conventional assessment techniques focus on the tangible and award basic skills while ignoring different strategies used by their

learners to solve a problem. Welch and Lim (2000), as cited in Crossfield et al. (2004, p. 4), suggested that the current trend in schools is to present design tasks in a form that assumes that there is only one correct way of arriving at a solution. They go on to say that this should not be the case, because problem solving allows for varied interpretations.

It is clear from the observation as well as the documentation analysis that participants are not using the design process as it should be. It was surprising to note that teachers' perceptions of novel and varied solutions were basically limited to just different types of materials used to make the product - yet again tyranny of product outcomes rears its head, since all teachers were more interested in the product and not the development of ideas and the process that the child has experienced.

#### **Theme four: Are teachers assessing creativity and novel ideas, and if so how?**

The revised concept of the problem space model clearly highlights that when learners engage in problem solving they learn through trial and error, collaborating and tapping into various experiences. In doing this they come up with multiple and novel solutions (Middleton, 2005; Constructivist theory, n.d.). In light of the above, participants were asked 'Do you encourage learners to come up with novel and creative ideas and how do you assess these creative and novel ideas?'. Responses from the interview were as follows:

**Mr. Jasper:** *“Well, that is fine, I don't have a problem with that. That is why I said with the lamp not all of you come with a 2l coke bottle. Think out of the box, think of something else. Ja, of course. I allow it.”*

From the observation of Mr. Jasper's lessons, most of the learners brought 2 litre cool drink bottles as the base of the lamp; a few brought bottles of different shapes that did not allow for much creativity as the end products were very much alike.

Document analysis showed that the criteria that are set for assessment do not allow for creativity and novel ideas.

**Mr. Yadav:** *“Well in general the kids are quite flexible. I mean you do get one or two children that go the extra mile. I do get different products. I encourage it and*

*obviously if it is a very creative idea you will have to assess it, look at the basics that you need to assess and then give an extra few for their... for their what you call it brilliance, thinking out of the box whatever or creativity. I actually give up to 40% of marks for innovation.”*

Document analysis confirmed that Mr. Yadav allows for creativity and originality in his rubrics when marking the product. Assessment rubrics stuck in the learners’ books further confirmed this.

**Miss Shanti:** *“Probably if they do, say with their project portfolio, if they give me a reasonable explanation for their design. Obviously you can’t expect them to do exactly what you want, so you have to be open to their creativity. If it is a workable solution and satisfies all the criteria, it will be assessed.”* However, from the document analysis there was no visible evidence that Miss Shanti allowed for creativity or novel ideas.

**Mr. Mario:** *“They have got to meet certain requirements and stick with the guidelines and then obviously I allow for innovation and creativity because that is what technology is about, moving forward.”*

Document analysis revealed that rubrics used to assess the manufactured product showed that a very small percentage of the mark is allocated towards creativity and innovation.

### **Theme five: Tools teachers use to assess conceptual knowledge and procedural knowledge**

The curriculum assessment guideline for Technology Education clearly states that various forms or types of assessment tools may be used to assess learner achievement. The type of assessment tool used depends mainly on the teacher and what is to be assessed.

Document analysis, interviews as well as observation of lessons revealed that for formal assessments participants are employing multiple methods of assessment, for example design portfolio, summative tests, and project work in the form of completing the capability task.

Informal assessments are also used, like peer and group assessments. All of these are in keeping with the requirements of the NCS and within the framework of authentic assessments.

Evidence collected from Mr. Jasper's interview suggests that he treats a Technology Education lesson like an art and craft lesson. Predetermined criteria are set and learners are assessed accordingly. Mr. Jasper is merely concentrating on the workmanship skills of the learners and not their design skills. For example, according to the interview:

*"They are given the specifications, for instance: it must be able to lift 300 g or 500 g 30 cm off the ground, with two or more pulleys; winch and the structure is stable. Each of these I will allocate marks: 10 marks if it has two pulleys. If it only has one then it is 5. If they use bought pulleys then I take away marks, because I want them to make pulleys. If it has a winch they get 10, and if it lifts the weight 30 cm off the ground then it gets 10. If is stable its 10 or 5 whatever. Then it adds up to 50 or 100 whatever the total will be."*

This is what Kimbell (1999) asks Technology Education teachers to guard against, because Technology Education is more than just the completed end product.

Document analysis revealed that the only mark that Mr. Jasper awarded for the term is that for the manufactured product. No other form of formal assessment was carried out. There was no evidence of tests in the learners' files or teacher's file.

Miss Shanti uses rubrics that have been provided by publishing houses as a guideline to assess the finished product: *"When I went to an exhibition they had given me a sample copy of a booklet on how we should assess, so basically I am using that as a guideline at the moment to do my assessments"*.

Observation of Technology lesson and document analysis revealed that portfolios are also used to assess the manufacturing process and summative tests are used to assess the content. Informal assessment is also done during the manufacturing process. Document analysis showed that formal tests are kept in files together with portfolios from previous tasks. Assessment sheets in the form of rubrics from previous capability tasks were also in pupils' files. The teacher has assessment sheets and

copies of tests in her assessment file. There is evidence of planned assessments in the teacher's file.

Mr. Mario uses predetermined criteria and rubrics based on specifications provided to assess the final product. On completion of the product learners were given a mark according to criteria specified in the hand-out given to them: *“Have some sort of lighting that inhabitants would have to use. Be made in a way that you can see the items on each floor. Be to scale, everything must be in proportion. Each floor is to be approx. 30 cm with a spacing of 10 cm between floors. Have some sort of covering to be like or to resemble the dome. Have a lift that operates from ground floor to the fifth floor.”*

From document analysis it was ascertained that learners' books are marked regularly, and that summative tests given to learners at the end of each term were content-based. Assessment tasks were pasted in learners' books, and it was evident that Mr. Mario drew up his own assessment sheets with listed criteria and used a variety of assessment methods.

Mr. Yadav incorporates multiple methods of assessment in his classroom practice; for example, peer assessment, teacher's evaluation and minor tests. Mr. Yadav's reason for using peer assessment is that it works well for him: *“For me what seems to be working is peer assessment that works quite well. Drawing for example, you get them to look at their friends' work, and give good, very good, excellent, and they give a mark out of 10, and I get them to justify. Say if it is 7 out of 10 they have got to tell me why or show me why they have given that mark.”*

Once the structures were complete they were placed around the classroom and peer assessment was done, with each learner assessing another learner's structure on an assessment sheet. Thereafter the teacher assessed the finished products by allocating a mark.

Document analysis revealed that the teacher's mark on a sheet split into columns headed drawing, peer evaluation, final product and test. The interview confirmed this; when the participant was asked how he assessed he said: *“I have a mark sheet and I*

*split it into columns, design, end product and self-assessment, and then we add it and give them the final mark.”*

It is evident from the above that the assessment tasks set basically revolve around manufacturing the product according to what the teacher wants. This is exactly what Kimbell (2002) meant when he spoke out against using criterion reference-based assessments to assess Technology Education. Teachers have become so increasingly concerned with details and specifics that their assessments have lost their authenticity. The teacher is not concerned with whether the design is a working design or an innovative one. Learners are penalised because they have not met the criteria specified by the teacher.

There is no doubt from the data collected that participants are incorporating different types of assessment techniques to assess learners' work, as prescribed by the NCS. Participants are however not using the most appropriate method of assessment when assessing the capability task, and not providing sufficient feedback to learners in Technology Education.

Data further revealed that apart from Mr. Jasper all other participants were finding it difficult to move away from summative tests which focused on recall and memorising. Using traditional assessment practices in the form of tests, according to McLaren (2007) and the APU document (1991), is inappropriate and destructive to the essence of Technology Education, as it isolates and tests only conceptual knowledge. Contemporary understanding of Technology Education curricula, is not conceptual understanding for itself but rather a display of learners' use and their understanding of the knowledge and skills when tackling a design and make task (McLaren, 2007; APU, 1991).

### **Theme six: Providing feedback after assessment**

“Feedback,” according to McMillan (2011), refers to “confirming the correctness of an answer or action that is whether it is right or wrong.” When engaging in problem solving feedback is essential for learners, as described in the revised concept of problem space model. Learners use the feedback provided by the teacher to improve, change or modify the solutions that they have come up with. It is also the task of the teachers to provide adequate feedback to learners after an assessment, whether this is formal or informal. This is a vital component of teaching, learning and assessment (DoE, 2007).

From the observation of Mr. Jasper's Grade 7 lesson, it was found that there was minimal interaction and feedback between learners and teacher during the manufacturing process. Mr. Jasper was busy on his laptop assessing Grade 6 learners' work. The Grade 6s came into the workshop with constructed pulley systems. Mr. Jasper assessed them according to his criteria, by measuring the height and whether it supported a load. Marks were punched into the computer and the learners left. No proper feedback was given to learners as to their shortcomings, where they could improve or if it was a good working product. Mr. Jasper managed to assess most of his Grade 6 project during the time of observation.

With regard to the Grade 7 lesson that was being observed, learners carried on with the task at hand; the few that required assistance approached Mr. Jasper and he helped them by connecting the switch for them, and learners then returned to their tables to finish off their product. His method of assessing the Grade 7 learners' lamps followed a very similar pattern as that of the Grade 6 class. Once learners had completed making their lamps, they went forward to have their projects assessed. Learners plugged in their lamps and marks were allocated; these marks were punched into the computer and learners were sent to their seat. It was evident that no feedback was provided to the learners to outline their weaknesses and strengths.

Observation of Miss Shanti's lesson revealed that she walked around and provided informal feedback to the groups as they were busy working. She questioned them on the different types of material used as well as the type of glue they were using. The group that had brought the different lengths of PVC pipe to construct their pencil holder eventually aborted the idea of using the pipes and settled for wooden pegs and paper towel holders after Miss Shanti's intervention.

Observation of Mr. Mario's lesson reveals that he is actively involved with learners during the manufacturing process; he walked around observing and providing feedback to learners and assisting them when needed. As the teacher observed learners, a group dynamic mark was given on an assessment sheet. The teacher informed learners that as soon as they had finished getting the structure of the dome and structural aspect completed, it must be brought to him to be assessed. The dome

structure was assessed and Mr. Mario advised them on certain aspects so that they could move on to the next aspect of manufacturing, which was to install the elevator mechanism. This was a specification that learners had to comply with in their design. Some groups had forgotten that this was a requirement, but after feedback from the teacher many went back to modify their structure.

Observation of the lesson of Mr. Yadav revealed that the teacher was actively involved in the process; he walked around and checked on learners constantly, asking them questions and providing feedback on their progress. He stopped at a desk and pointed out that what was being made was not like his design. The learner replied that he decided to change his idea, and when asked why said that this version looked better. Upon hearing this, other learners asked Mr. Yadav if changing the design was okay, and when told yes many began to make changes, borrowing ideas from others.

It is evident from observations that adequate feedback, which is an essential element of formative assessment and problem solving, as discussed earlier in the study, is not being carried out. Feedback from assessments is of paramount importance for learners, so that they are aware of their strengths and weaknesses and are able to do what is required to keep them on track to achieve their goals. Furthermore, in a subject like Technology Education problem-solving feedback enables a learner to gauge whether they are on the right track or not; if not they would (with guidance from the teacher) try an alternative route. The national protocol on assessment states that it is necessary that teachers provide feedback to learners on their achievements so that they are able gauge for themselves how much they have learnt and how they could improve their learning (DoE, 2004). Gronlund and Waugh (2009) are in agreement with this, stating that formative assessment involves periodic feedback provided to learners so that the learning process can be monitored and corrective prescriptions to improve learning can be provided by the teacher.

Dekker and Feijis (2005) are of the belief that when curriculum change occurred and learning goals became process-orientated internationally, teachers across the board showed limited understanding of formative assessment and the importance of feedback. This resulted in teachers providing learners with incomplete and inadequate information regarding their progress.

### 4.3.3. Why are Grade 7 teachers employing particular assessment strategies?

#### **Theme seven: Limited knowledge of subject matter and assessment strategies**

Jones and Moreland (2004), cited in McLaren and Dakers (2005, p.2), stated that teacher subject expertise impacts greatly on assessment practices that teachers employ. Davies (2000), as cited in Crossfield et al. (2004, p.5), states that many teachers are not universally multi-skilled in all areas of subjects taught in schools, and as a result are anxious when they are to teach a learning area like Technology Education in which they have had no formal training and are not confident. By their own admission, when asked how they rated their understanding of Technology Education participants revealed that they were not experts in the field:

**Miss Shanti:** *“My understanding of it, I would say good for the time being. It was not too good at the beginning, but I would say I learnt a lot from the time I started.”*

**Mr Mario**, who has had some formal training in his degree, said he understands the policy but cannot be compared to a teacher who has been teaching for 20 years: *“I do understand the whole policy and everything obviously; with regard to experience and stuff I can’t compare myself with a teacher whose has been teaching for 20 years but for teaching it for three years.”*

**Mr Yadav**, who has taught Technology Education and attended teacher development programmes in London and has also been part of the Engen programme<sup>18</sup> held by Technology for All at the University of KwaZulu-Natal, very modestly replied: *“I’d say – average.”*

**Mr. Jasper** has no formal training in Technology Education; however, he believes that his understanding of Technology Education is very good. He also reveals in his response that he does not like the learning area; he finds some aspects boring and has no time to keep abreast with current trends: *“Uhhh ... I think not excellent but very good, not that I like it but very good. Ja. I don’t have the time always keep abreast*

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<sup>18</sup> A short course sponsored by Engen aimed at equipping teachers with basic knowledge on how to teach Technology Education.

*with new developments. I just do what I am told at the moment. I don't really follow the syllabus, I try to give them interesting stuff to do; I think some of the stuff is boring."*

According to Potgieter (2004) the majority of the teachers in South Africa who are teaching Technology Education do not have formal training in Technology Education.

The Pinetown and District office has had Technology Education workshops for teachers, and participants were asked whether they had attended these. Interviews revealed that most of the participants in the case study attended workshops for professional development; some found them beneficial while others did not.

**Miss Shanti:** *"I try to go for workshops and things like that have been organised by Department. I have learnt a lot from these; however, I wish they were longer like an entire day with more practical things. Teach us how to do the things, make things that are the textbook."*

**Mr. Jasper:** *"Not really, I don't have the time always to do it. I just do what is in the textbook and what I am told."*

**Mr. Mario:** *"Yes, Yes. I have attended Technology Education workshops. ... these workshops didn't really benefit me as such because that is what we were already implementing. Mmm, but I am sure it would help a first-year teacher."*

**Mr. Yadav:** *"I have been attending workshops, the last one was last year they had at Pinetown."*

Table 3 provides a summary of the participants' formal training and specialisation, as well as whether they have attended DoE workshops held by the district for Technology Education.

	<b>Mr. Jasper</b>	<b>Miss Shanti</b>	<b>Mr. Mario</b>	<b>Mr. Yadav</b>
<b>Formal training</b>	None	None	Yes	None
<b>Specialisation</b>	Sports Science	Arts & Culture	Sports Science	Computers
<b>DoE workshops</b>	No	Yes	Yes	Yes
<b>Attempt to improve knowledge</b>	No	No	No	Yes

**Table 3. Summary of the participants’ formal training and specialisation**

As a follow-up question, participants were asked in the interview sessions whether the workshops they had attended addressed aspects of assessment.

**Miss Shanti:** *“The workshop I have been to specifically have not.”*

**Mr Mario:** *“Not the Technology ones. But for other learning areas like Mathematics and English we were told to use different ways of assessing. I just presumed it stood to reason for Technology Education.”*

**Mr Yadav:** *“Okay now that was one of my weaknesses where I even asked at the last meeting, I even stipulated that I am battling as far as assessment, because it is completely different coming from overseas and straight away when I came in here and I asked I think it was Lindiwe, and she said okay they would do a workshop, and if I come there and see the one guy that is there now they will do a workshop to help.”*

**Researcher:** *“So have they had a workshop?”*

**Mr Yadav:** *“No they haven’t.”*

The next question that was put forward asked how they then kept abreast with assessment policy and assessment requirements.

**Mr Jasper:** *“I don’t have the time always to do it [keep abreast with new developments]. I just do what I am told at the moment [by management].”*

**Miss Shanti:** *“Well urmm ... not as well as I should be, but like I said I get all the documents and I try read them up you know, and come to terms with that. I follow the examples provided and try to make sense of it.”*

**Mr Mario:** *“Er we do all the assessment according to the Department policy and school requirements. That which is needed.”*

**Mr Yadav:** *“I try to do the best; I read the documents, apply my knowledge from overseas and other learning areas.”*

As mentioned earlier, having a good understanding of Technology Education and the design process is essential for capturing the essence. It is evident from the responses of the participants that due to inadequate professional development by the DoE in Technology Education, the participants of this study are not adequately equipped to teach and assess the learning area.

Having limited knowledge of Technology Education and assessment practices specifically relating to the learning area is problematic. This phenomenon is not exclusive to the South African context; McLaren and Dakers (2005) cited in their research limited knowledge of the subject matter and assessment strategies as reasons for the gap that exists between policy and practice in many countries.

Rietsma and Mentz (2006) brought to the fore in their study that DoE workshops were insufficient and inadequate when the NCS was introduced, and to compound the problem no proper direction was given to assessing Technology Education. From the data collected from the participants it seems that not much has changed in the last six years. DoE workshops are still inadequate and issues of assessment still have not been addressed.

### **Theme eight: Providing real-life contexts for assessments**

Providing real-life contexts for assessments is closely linked to the prior theme. It is evident that teachers are not providing real-life problem contexts for their learners to solve, as a result impacting on the types of assessment strategies issued.

According to the principles of assessment as stated in the NCS, assessment tasks should be authentic and meaningful so that they support every learner's opportunity to learn in order to develop individually and maintain their individuality (DoE, 2002). Van der Horst and McDonald (2005) go a step further, to comment that authentic assessment in real-life contexts provides a perfect vehicle to measure higher-order thinking compared to traditional methods of assessment. It is during authentic assessment practices in real-life contexts that learners are able to demonstrate complex tasks rather than individual skills (Van der Horst & McDonald, 2005).

Participants revealed that the problem contexts that they use to set the scene in their capability tasks often come directly from the textbook.

Miss Shanti: *"I follow the textbook in terms of the problem context they have. It is all done. They give you the problems and you have got to solve it."*

Mr Jasper also uses the problem context provided in the textbook: *"In the book that we use. [Searches for a textbook] I don't have one here with me. It will say 'Design a pulley system. Two kids are working in a in tree house. Design a pulley system'. Ja, so that they can get stuff into a tree house. That is the problem we have to solve. I just follow the textbook."*

Mr Mario uses the Class Smart Technology programme to teach technology Education and integrates his problem context with the novel that is being read at the time, in this instance *Devil on my Back*.

Mr Yadav was the only participant that adapted the problem context to the learners' environment, so that learners could identify with the problem and relate to the text.

Dekker and Feijis (2005, p. 238) state that "Textbooks do not always provide good problems". It is thus important for teachers to take the problem given in a textbook and adapt it to suit the needs of the learners, in this way enhancing the assessments used. The experience becomes more practical and meaningful to the learners, and this enables the learners to engage in authentic learning experiences.

The thinking behind this form of teaching and assessment practice is to assess not only the correct response or finished product, but also the thought process that is involved in arriving at a solution. What this means is that assessments become comprehensive and holistic, so when a learner arrives at a solution they actively engage in reflection of the learning process. Reflection, critical thinking and taking ownership of one's learning is emphasised. As learners are able to use their experiences from their community and relationships with people, they come up with different solutions to a problem (Van der Horst & McDonald, 2005; McCormick & Davidson, 1996).

It is thus evident that due to the lack of an environment for authentic assessment and real-world experiences created by the teacher, learners are unable to tap into and develop their higher-order thinking skills, because the tasks are foreign to them and the forms of assessment are not developing these skills. As Middleton (2005, p. 5) states, the teacher plays a pivotal role in creating tasks and experiences that will enhance this form of thinking. Middleton goes on to say that if a learning environment does not stimulate this form of thinking, then learners engage in only the lower-order thinking of recall, comprehension and application.

It is evident from the data collected that the environments created by the participants are not conducive to higher-order thinking, since Technology Education and assessment strategies in these classes are no different from those used in traditional art and craft lessons. This is detrimental to the learning area as well as to the learners' learning experience.

It is evident that teachers are using textbook scenarios or problem contexts because it is easier, and are not taking the time to create authentic learning contexts. The teachers are not making an attempt to step outside their "existing personal frame of reference" in the words of McLaren and Dakers (2005, p. 3).

### **Theme nine: Reasons for using particular assessment strategies**

Assessments can be done using different forms or types. These are selected according to the purpose of the assessment and the specific learning area (DoE, 2007). It is evident from document analysis that three out of the four participants use a variety of assessment strategies, as discussed previously in this chapter.

In light of the above, during the interview the following question was asked of the three participants who use a variety of assessment tools:

**It is evident from document analysis that you use a variety of assessment tools to assess Technology Education. Why, considering that you are required to do one formal assessment as outlined in the Technology Education policy?**

**Miss Shanti:** *“When I went to workshops, they all emphasised using different ways to assess. So we cater for different learning styles. So that is why I try to use many like, tests, rubrics and portfolios. Yes I know that we were only supposed to have one formal assessment recorded, but I feel I need to do more assessments.”*

**Mr Mario:** *“It is our school assessment policy to use different forms of assessment. It clearly states in the NCS to use different assessment tools. I find using a rubric to assess the making of the product suitable and summative test to test the content appropriate.”*

**Mr Yadav:** *“I don’t place much focus on tests, however I do small tests now and again as you can see. But I think it is necessary to have different forms of assessment, because if a child does badly in one aspect, they can catch up in the next activity. Having just one assessment is not good. It means more work for me, but I think it is a better system to do more than one assessment.”*

The researcher asked Mr Jasper the following question in light of the fact that he uses just criteria referencing for his assessment: **Why do you use only one tool of assessment for Technology Education?**

**Mr Jasper:** *“That is our assessment policy at school. Management only requires one formal assessment from me. Time is too short to do more than one anyway. In eight weeks in a term you basically have four to six weeks to get marks in for the end of this term. You can’t finish all the work. If I had to do pulleys over two terms then I could say right let’s do theory a bit in half a term and test that and then the practical.”*

The researcher probed further by asking how Mr Jasper addressed the issue of lack of time.

**Mr Jasper:** *“The issues with assessing, is we are pressed for time and learners have to take it home.”*

Mr Yadav echoed similar problems in his interview:

**Mr Yadav:** *“My problem is time; I cannot finish making the structure in class. Pupils take projects home.”*

The move towards holistic assessment of Technology Education prioritises the assessment of the design process (Kimbell, 2002; APU, 1991). This method of assessment is closely linked with formative and authentic assessment. Assessment for learning captures the true nature of Technology Education. It enables learners to build continuity and coherence between ideas and actions over time, and as a result tasks that are set out by teachers are often complex. This means that a lot of time is required to develop these ideas into tangible products as compared to other learning areas. The long-term nature of Technology Education thus poses challenges for learning, teaching and assessment since there is a curriculum to finish and limited time (Moreland et al., 2007).

The data revealed that due to time constraints with regard to completion of the curriculum, projects cannot be completed at school and have to be sent home to be completed. Being unable to complete manufacturing tasks at school gives rise to another problem which further compounds the issue of assessment. That is parental involvement: once learners take their projects home, parents assist learners with the completion of the project, and issues of validity of the assessment needs to be addressed. This was evident from Mr Jasper’s interview, wherein he said that he had no other choice but to send projects home:

**Mr Jasper:** *“Being unable to complete the task at school and the lack of space I have to send the cranes home. Look at the cranes we have, this is one here. [Points to the crane on the shelf] I can see when the dad has worked on the crane or when the child has done it. When assessing I can see that and how do you assess that, you can’t penalise the child now because they are meeting the criteria. And then space if I can store 180 cranes, plus 180 lamps and plus 180 of what the Grade 5s are doing, and if*

*I can store all of that then they can do it at school. Then learners don't have to take it home and parents won't finish it for them."*

**Mr. Yadav** echoed similar problems: *"My problem is time; I cannot finish making the structure in class. Pupils take projects home and then it is difficult to assess, for example, if we doing structures and there is a kid whose takes it home and the father has helped him with his work, how do I decide what to give him?"*

Mr. Mario has found a way to work around this; he assesses in stages and monitors the development of the making process. In this way he keeps track of the work done by learners. The issue of not having enough time to complete the content and the practical aspects in Technology Education was pursued.

Document analysis revealed that Technology Education was not given the allocated time as per the NCS (Table 4).

<b>LEARNING AREA</b>	<b>NOTIONAL TIME (%)</b>	<b>WEEKLY CONTACT TIME (h)</b>
<b>Language, Literacy &amp; Communication</b>	20%	5 h 20 min
<b>Human and Social Science</b>	10%	2 h 40 min
<b>Technology</b>	10%	2 h 40 min
<b>Mathematics</b>	13%	3 h 25 min
<b>Natural Science</b>	12%	3 h 10 min
<b>Arts &amp; Culture</b>	10%	2 h 40 min
<b>Economic and Management Science</b>	10%	2 h 40 min
<b>Life Orientation</b>	10%	2 h 40 min
<b>Flexible time</b>	5%	1 h 20 min

**Table 4. Time allocated for the Senior Phase Grade 7 curriculum, 2005.**

Time allocated for Technology Education was only one hour, and three out of the four schools shared the allocated time with Computer Studies. It was also noted that the mark reflected in the learners' report under Technology Education consisted of 50% Technology and 50% Computers. This decision to combine the learning areas came from management and was based on school policy. Said Mr Jasper "*I just do what I am told.*" This qualifies what Jones and Moreland (2000) stated in McLaren and Daker (2005, p. 5), that existing subcultures in schools affects the assessment strategies employed by teachers.

Wisteria Primary is the only school that complies with the NCS and allocates two hours of instruction time to Technology Education. Miss Shanti is able to keep her projects in class and complete them in the allocated time.

#### **4.4. Conclusion**

This chapter focused on presentation of the research findings obtained from the interviews, lesson observations and document analysis, with the aim of providing answers to the critical questions of the study. After analysing the data it is evident that the NCS allows for varied interpretation with regard to how Technology Education should be assessed and what aspect should be assessed. This has resulted in teachers assessing aspects that they feel are important using various assessment strategies. Furthermore there is a need for Technology Education teachers to have more in-depth knowledge of the learning area and implementation assessment practices, as it was found that many teachers continue to focus on the end product of Technology Education and follow the design process in a linear, ritualistic manner.

Mawson states that one of the reasons Technology educators follow the design process is because many of them are non-specialist teachers and have very little understanding of how designing works; the design process models provide them with some structure and sensible logic for completing classroom activities. These models provide the non-specialist teacher with a sense of security and guidance on how to proceed (Mawson, 2003; McCormick & Davidson, 1996).

It is evident that among the participants in this case study a huge gap exists between theory and practice of Technology Education and assessment practices. Chapter four presented the data that were collected from the various participants. Chapter five that follows discusses the findings of this study, appropriate recommendations, the limitation of the study as well as areas that can be addressed in further research.

## **CHAPTER FIVE: RECOMMENDATIONS AND CONCLUSION**

### **5.1. Introduction**

With the emergence of a new political dispensation, change was imminent in all spheres of South African society. There was a need to revitalise South African education so that political and educational objectives would be met. It was also imperative that South Africa aligned its curriculum and assessment practices with international practices. That meant a move towards authentic assessment practices and assessment for learning. This contemporary approach to assessment had to be integrated within the NCS and impacted greatly on all learning areas, including Technology Education.

The focal point of chapter four was to present and analyse the data collected from interviews, document analysis and observation. The aim of chapter five is to reach conclusions and make recommendations that are based on the results presented in the previous chapter, bearing in mind that the primary purpose of this research was to examine assessment practices that Grade 7 Technology Education teachers in the Pinetown District employ. The research questions were as follows:

- What are Grade 7 teachers assessing in Technology Education?;
- How do Grade 7 teachers carry out these assessments?; and
- Why are Grade 7 teachers employing particular assessment strategies?

As the current chapter unfolds the following aspects will be addressed: the findings of the research, recommendations based on these findings, limitations of the study, and finally suggestions for further research development.

### **5.2. Findings of the research**

Upon completion of analysis of the data collected a number of findings or themes came to light in terms of the critical questions of this study:

- Theme one: Teachers are assessing that which they feel is important in Technology Education
- Theme two: Teachers are assessing the finished product more than the process
- Theme three: Assessing of the problem-solving element and creativity
- Theme four: Are teachers assessing creativity and novel ideas, and if so how
- Theme five: Tools that teachers use to assess conceptual knowledge and procedural knowledge
- Theme six: Providing feedback after assessment
- Theme seven: Limited knowledge of subject matter and assessment strategies
- Theme eight: Providing real-life contexts for assessments
- Theme nine: Reasons for using particular assessment strategies

Findings relating to the above themes will be discussed, together with appropriate recommendations relating to them.

### **5.2.1. What are Grade 7 teachers assessing in Technology Education?**

#### **Teachers are assessing that which they feel is important in Technology Education**

As stated in earlier chapters, Technology Education within the South African context must include procedural knowledge on designing and manufacturing of products and conceptual knowledge of technology products. The interaction of mind and hand incorporates both the conceptual and procedural aspects of Technology Education; as a result, if teachers were to use this approach in the classroom together with the design-make and appraise process, continuously drawing the learners' attention to the impact of Technology Education on society, the environment and science, the essence of Technology Education would be captured. If Technology Education is taught in accordance with the interaction of mind and hand model, assessment of the learning area would not pose such a challenge for teachers.

This is confirmed by the words of Le.Grange and Reddy (1998, p.3) "the way in which the learning and teaching process is understood, influences the kind of assessment practices that are used." It is evident that participants don't understand the learning and teaching process

that unfolds when using the interaction of mind and hand model, as a result this inevitably affects assessment practices and they assess that which they feel is important.

It is evident from the data that have been collected that participants are incorporating the procedural and conceptual components when developing their learning programmes: relevant content as outlined in the NCS is taught during the Technology Education lessons, and learners embark on a design and make task. However, participants differed with regard to which aspect of Technology Education was important – procedural, conceptual or a combination of both – and as a result assessed the aspect of Technology Education that they felt was most important.

To compound the issue, the conceptual and procedural aspects of Technology Education are being assessed as two different components, and not as an integrated process. This is because the NCS does not provide specific guidelines with regard to what should be assessed in Technology Education and how it should be assessed.

The only guidance provided for teachers is that assessments in Technology Education must be carried out on a continual basis, both formally and informally. The teacher has to decide what is to be assessed and how it should be assessed. These assessments also need to be designed and weighted so that all LOs are covered in exciting and varied ways. This allows for varying interpretations of the assessment practices employed by Technology Education teachers (DoE, 2003; 2007).

According to Welch (2001), teachers will assess that which they feel is important in Technology Education, and that which they are comfortable with. This was evident in this study: participants who placed emphasis on practical competence assessed solely the final product, while those who considered both procedural and conceptual aspects to be important assessed the final product as well as the content in the form of summative tests.

### **Teachers are assessing the finished product more than the process**

In Technology Education the focus should be on the process that the learners embark on to get to the final product, the investigating, designing, making, evaluating and communication. Evidence reveals that this iterative process is not being adequately addressed, and the focus is

more on completion of the end product rather than on the process. As a result, the assessment is of the final, completed product, while problem solving and following the design process take a back seat. According to Walmsley (2003), as cited in McLaren and Dakers (2005, p.3), teachers in Technology Education are over-emphasising the ‘doing’ over thinking, making meaning and planning.

From the data gathered it is evident that the participants in this study embarked on this course of action, due to the fact that there is no proper understanding of the learning area, the unique methodology and formative assessment practices.

Participants also have limited knowledge of the importance of design and the design process in Technology Education and the fact that design forms the underlying structure for Technology Education (Mawson, 2003). It is this process that introduces the learner to the design and make world, and it is through this process that new ideas are born (Welch, 2001).

The design aspect of the design process is not being utilised effectively to develop learners into creative and critical problem solvers. Participants in this study did engage their learners’ drawing activities before embarking on the making aspect, but only on a superficial level, merely to allocate marks to learners. Learners did not refer to their drawings when constructing their product and neither were they encouraged by their teachers to consult the drawings.

This allows us to reflect on Broadfoot & Black’s (2004) thinking that the current trend around assessment is more than just an attainment of marks. It is evident from the data that participants are still entrenched in their beliefs that assessment is solely for mark attainment and are finding it difficult to make the transition to current trends that there is more to assessment than just marks. The blame also does not solely lie with the participants, but also existing subcultures in schools and assessment policies as stated by Jones and Moreland (as cited in McLaren & Dakers, 2005, p. 5).

Middleton’s integrated model acknowledges that there can be multiple starting-points for a design problem and multiple processes and strategies emerge during the problem-solving process, and there is a to and fro movement from the search and construction space to the

problem zone. Resulting in various solutions emerging with a number of different paths that taken to reach a solution (Middleton, 2000, 2005).

Participants are providing problem contexts however, these did not allow for creative problem solving, since the criteria that are provided to the learners are specific, and learners are aware that if they follow the criteria and give the teacher exactly what they want, full marks could be attained. Learners are following the design process in a linear fashion and are not engaging in developing their own ideas and design but that of their teachers. An exciting and creative process has now become what McCormick and Murphy (1994), as cited in Kimbell (1997, p. 21) calls a “conformist ritual”.

### **Assessing of the problem-solving element and creativity**

Technology Education is a unique learning area where learners are engaged in complex problem solving by following the design process and coming up with solutions using skills and knowledge that they have been exposed to (Welch, 2001; Middleton, 2005; Jones, 2002). Learners begin solving the problem by interpreting the problem in a manner that makes sense to them; as a result, there are multiple starting-points to problem solving. As the learner proceeds through the various stages of the design process, multiple processes and strategies emerge, and there is a to and fro movement between constructing, designing and evaluating until the final product is made. The solutions that emerge vary because of large number of possible paths that could be taken.

This is due to the fact that Vygotsky’s social constructivist approach acknowledges that learners are unique individuals whose knowledge base and learning process is influenced by their background, culture, community and worldview. Every time a learner interacts with parents, peers, teachers, issues or artifacts, they adapt and broaden their knowledge base, and these impacts on the outcomes of any problem solving issue. This knowledge base together with the knowledge imparted by the teacher allows for learners to come up varied solutions to a problem. This impacts on education as teachers need to realise that children do not exist in a vacuum and cannot be separated from their social environment (Learning-theories.com, n.d.; Donald et al., 1997).

This interaction, however, was not evident in the Technology lessons that were observed. The participants that were observed followed a linear, ritualistic approach to design and placed more emphasis on the manufacturing of a final product so that there was a tangible product for assessment. Technology Education is being reduced to a traditional art and craft lesson where beautiful, neat, manufactured products are the main objective.

As McCormick and Davidson (1996) state, the reason for teachers placing more emphasis on the manufacturing of the final product is because teachers that teach Technology Education have different philosophies about the subject, and many come from a traditional craft background, which has a strong focus on manufacturing of products. McCormick and Davidson (1996) also state that another factor that impacts on teachers approaching Technology Education in a product outcomes fashion is because they are aware of the motivation that making a product plays. The problem context that is provided also does not allow for creative problem solving since the criteria that are provided to the learners are specific, and learners are aware that if they follow the criteria and give the teacher exactly what they want, full marks could be attained.

Results also reveal that teachers are aware that developing creativity is an important aspect and it needs to be included in assessment. Creativity is being assessed on a superficial level. In one particular case it is revealed that creativity is used basically as a means to an end – and that is to have a completed manufactured product.

## **Recommendations**

A more structured curriculum and assessment policy needs to be in place with specific guidelines outlining what should be assessed and how it should be assessed. A more structured assessment policy will, not solve our woes with regard to assessments. In order for Technology Education to be assessed appropriately, teachers need to have sufficient pedagogical content knowledge of the learning area and understand the importance of designing and the design process (Crossfield et al., 2004). It is imperative that teachers learn how to incorporate the design process together with the conceptual knowledge into their classroom practice.

The conceptual aspects that are to be taught are sufficiently outlined in the NCS, and learner teacher support material (LTSM) covers the content adequately. However, these factors do not effectively equip teachers to teach and assess Technology Education appropriately. Non-specialist or novice teachers teaching Technology Education, find it difficult to merely pick up the policy document and LTSM and plan a learning and assessment programme.

Adequate professional training in Technology Education and in the assessment of Technology Education is required. Training needs to include the understanding of the nature of design and the process that is involved if they are to optimise learning through design, according to McCracken (2000), as cited in Crossfield et al. (2004, p. 2). Furthermore, being a relatively new learning area with a unique methodology which incorporates both procedural and conceptual knowledge, explicit guidance needs to be provided to teachers with regard to assessment, since teachers don't have the luxury of an established culture of classroom practice or much documented research to guide their assessment practices.

The introduction of C2005 and NCS was a rushed process, training was inadequate, training officers were not experts in their fields, and no guidance was provided with regard to assessment practices (Rietsma & Mentz, 2006). It is therefore important that before embarking on training workshops for CAPS, we learn from the mistakes of the past and ensure that the training that is carried out equips Technology Education teachers adequately for classroom practice. These issues need to be addressed by the subject advisors and officials in the District office.

More time needs to be allocated for professional development workshops. Presently most professional development workshops that are held by the Department of Basic Education are approximately 2.5 hours, adequate training and information gathering cannot be addressed in in this limited time span. Professional development workshops need to be longer and more regular so that more intense training can be done, and it aids in keeping abreast with new trends and developments.

Specific aspects need to be addressed in Technology Education. Professional development workshops need to address the following aspects:

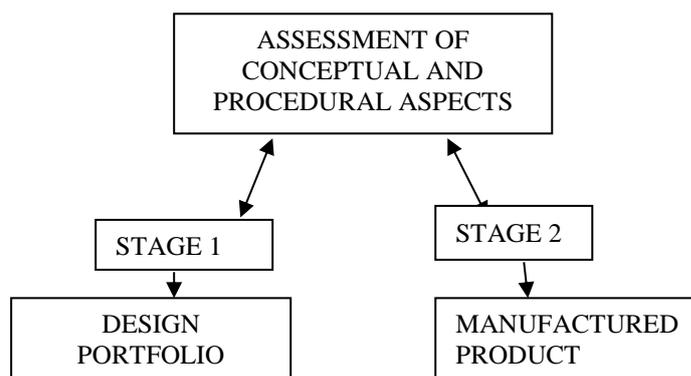
- How the design process can be integrated into the learning programme bearing in mind that it is not a linear process, and how this process is assessed at the various stages
- The importance of design in Technology Education
- Classroom practice and methodology
- The use of the design portfolio as a method of assessment
- Formulating appropriate assessment tools that capture the essence of Technology Education

According to Middleton (2005), having fundamental knowledge of Technology Education is essential for teachers to develop meaningful work schedules. Not having a basic understanding of the nature of Technology Education and its unique methodology compounds the issues around assessment practices, as participants are unsure of what to assess and how to assess (Welch, 2001).

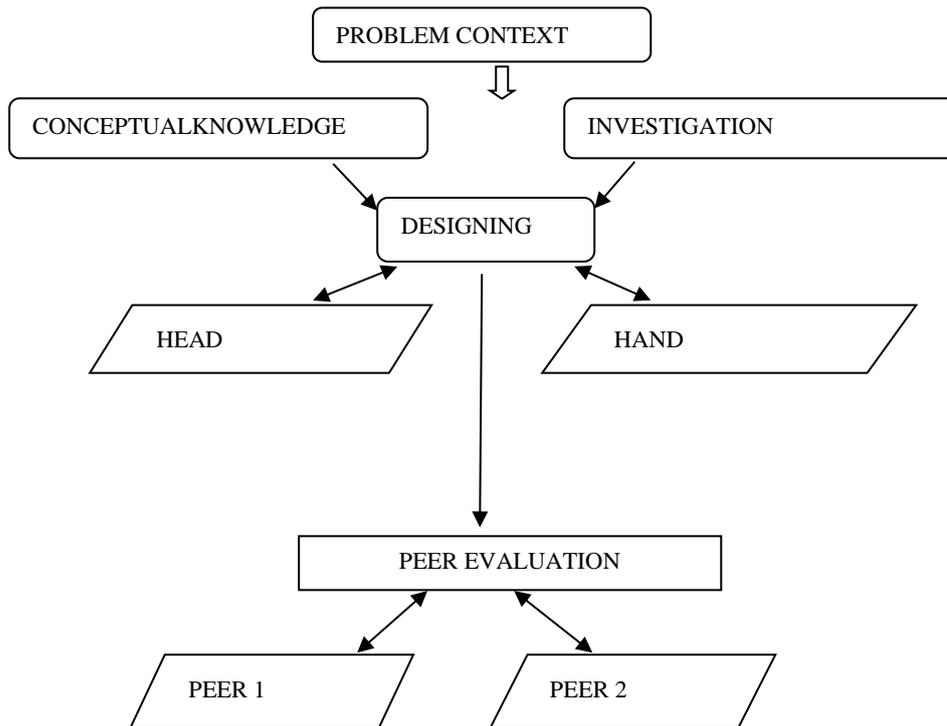
Even though the NCS provides guidelines for teachers to work from, it falls short of clear and specific aspects for Technology teachers to focus on, especially those who are non-specialist teachers or novice teachers. In keeping with the nature of Technology Education, its unique nature and the NCS, the following assessment strategy (Figure 10) has been developed by the researcher. This model is an adaptation of the approach to Technology Education from the NCS, Middleton, Kimbell and the APU. This assessment strategy maintains the problem-solving component of Technology Education and includes the conceptual knowledge and procedural knowledge on the designing and manufacturing of technological products

**Figure 10: Assessment model of conceptual and procedural understanding**

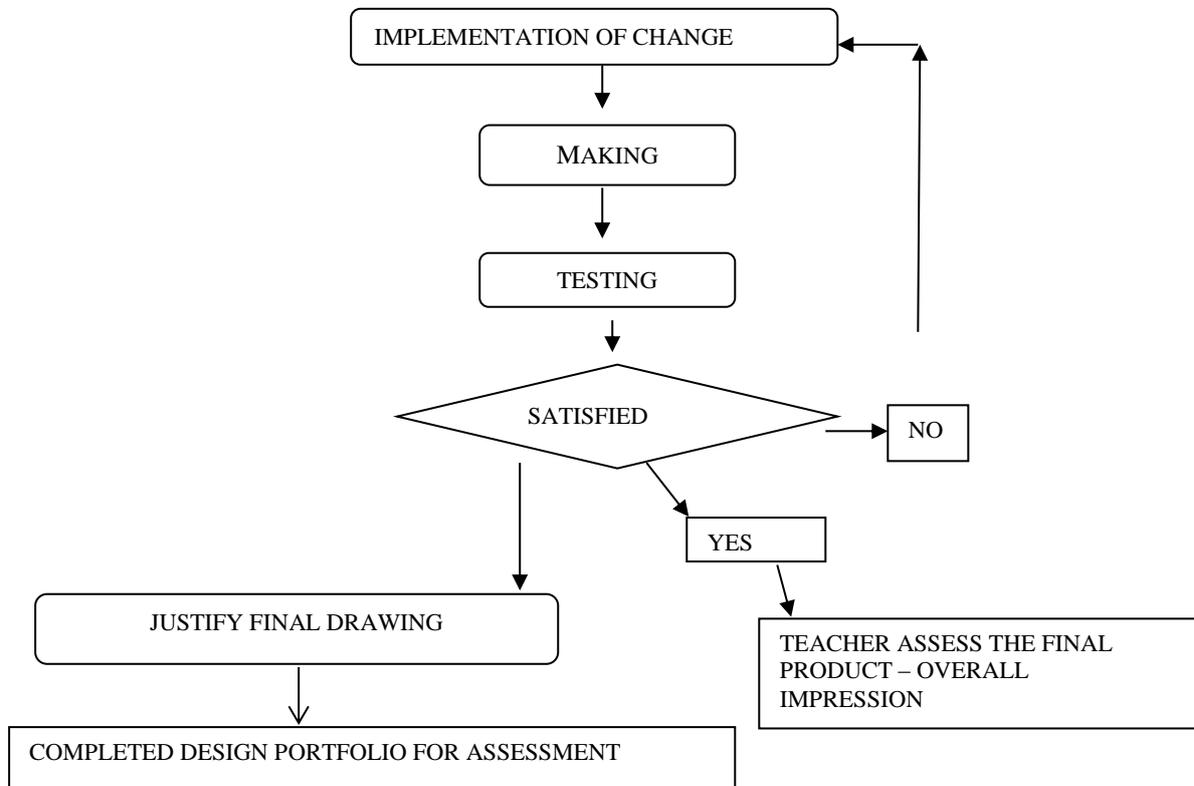
**(Adaptation of approaches: DoE, 2002, Welch, 2001 Middleton, 2005, Kimbell, 1997 and the APU, 1999)**



STAGE ONE : - DESIGN PORTFOLIO- INVESTIGATION AND DESIGNING



STAGE TWO: IMPLEMENTING CHANGES DRAWING AND MAKING



This assessment model is in two stages.

### ***Stage one: Development of the design portfolio***

- The teacher introduces the learners to the authentic problem context and engages learners with content that is to be taught
- Learners will concurrently be developing their portfolio as the content is being taught. Learners will begin by investigating and finding out important information regarding the problem context. All information will be recorded in the design portfolio
- Learners will use the content taught and the information gathered from the investigations and begin to make sketches of the design
- These sketches are passed on to peer 1, who will look at it and make adjustments.
- Peer 2 also looks at the sketch and makes further changes
- The design is then returned to the owner, who will discuss the changes with his peers
- Teacher feedback is provided through the stages.

### ***Stage two: Drawing and making***

- The learner will implement changes after gaining insight from the interaction with his peers
- Making then commences
- The learner tests the product and further changes are made if necessary
- The drawing is then completed, justifying the changes made
- Teacher feedback is provided through the process
- The final prototype is made. On completion it is handed to the teacher for assessment. The teacher makes an assessment of the overall appearance of the product and based on his or her gut instinct.
- The design portfolio is then handed in to the teacher for a more detailed assessment; aspects that will be looked at are the development of ideas and design, reasoning and justification of changes.

### **5.2.2. How do Grade 7 teachers carry out these assessments?**

#### **Are teachers assessing creativity and novel ideas, and if so how?**

In Technology Education, design forms an integral part. Together with design evolves creativity and developing of different ideas and solution prior to a prototype being developed (APU; 1999). This process was explained in chapter two and clearly illustrated in Middleton's revised model of problem space.

From the results, it is evident that participants in this study do not cater much for creativity and development of learners own ideas. All teachers have pre-determined criteria that have to be followed and marks are allocated according to the criteria. Document analysis revealed that marks are allocated for creativity however only a small percentage is awarded. During there is also no evidence during the observation of lessons that indicates a process or a development of a creative thought being assessed. Once again it seems teachers are more concern with the end product and not the design element (Kimbell, 1999; McLaren & Dakers, 2005). It is clear that teachers are not giving creativity much recognition due to their lack of understanding of the importance of design in Technology Education.

#### **Tools that teachers use to assess conceptual knowledge and procedural knowledge**

Assessments are not just an add-on or something that occurs at the end of a learning area. Within the South African context it is a continuous process that is done formally and informally (DoE, 2003; 2007). It has been noted that in this study all but one participant carried out their assessments as recommended, that is on a continuous basis employing multiple methods of assessment as advocated by the NCS.

Multiple methods used by the participants for this study included tests, projects, peer evaluation, group assessments, drawings and the design portfolio. The design portfolio, according to Welch and Barlex (2004), is an important and vital method of assessment that can be used to capture the essence of a designer's world, and allows the teacher to track progression of the learner's ideas from initial rough sketches to final product. The results from this study revealed that this method of assessment was being used by only one participant; however, it is developed separately from the manufacturing process, with a series of questions for the learners to answer at home and present in a neat folder for assessment at

the next lesson. According to McCormick (2003), as cited by Middleton (2005, p. 5), this is incorrect use of the design portfolio; a design portfolio should be developed from the inception of an idea until the manufacture of the prototype, and not as a separate task (Welch, 2001).

All participants used predetermined criteria to assess the final product. According to Kimbell (1999), predetermined criteria are not an appropriate method of assessing Technology Education because the teacher is unaware of how each learner would interpret the problem and how each would develop a solution, as compared to a craft lesson where the product is clearly defined from the start. Middleton's revised concept of problem space indicates that in Technology Education, when learners embark on designing and making, multiple processes and strategies emerge during the problem-solving process. The solutions that emerge may vary, with each learner taking a different path to come up with a solution. Each learner will solve the problem to a greater or lesser extent, and no solution is right or wrong (Middleton, 2000, 2005). By using predetermined criteria participants are not allowing for the development of creativity, problem solving and individualism.

Three out of the four participants tested the conceptual aspect in the form of summative tests; it is evident that they are falling back into old traditional methods of assessment. Summative assessments are acceptable and work well for learning areas like Mathematics and Science, where the main objective is to determine how much the learner knows or can recall (APU, 1991).

Traditional assessment practices in Technology Education split the conceptual and expressive aspects of designing into two separate groups. The conceptual knowledge is tested in the form of written tests and examinations, while the procedural knowledge is tested by graphic representations or modeling/making examinations. The traditional pen and pencil approach to testing conceptual knowledge and the isolated modeling and making task to assess the practical component are destructive to the essence of capability. This is because the focus in contemporary Technology Education curricula is not on conceptual understanding alone but rather on a display of how learners use their understanding of the knowledge and skills that they are exposed to when tackling a design and make task (APU, 1991). Traditional assessment practices in the form of isolated tests of knowledge and skills are inappropriate methods of assessment for Technology Education; the summative tests that the participants in

this study continue to give at the end of each term are inappropriate for Technology Education (APU, 1991; McLaren, 2007).

Teachers are implementing the newly reformed curriculum but they still resorted to traditional assessment techniques. Teachers continued to focus on assessment of basic skills and paid little or no attention to varying strategies that are used by learners to solve problems and to come up with solutions. Emphasis was still on recall and memory rather than teaching and learning for understanding (Dekker & Feijis, 2005). Dekker and Feijis (2005) confirm Broadfoot and Black's (2005, p. 17) claim that these challenges arise when there is a lack of adequate professional training to help teachers be consistent and rigorous in framing and selecting assessment strategies.

Participants continue to use summative tests and predetermined criteria for assessment in Technology Education unaware of the inappropriateness. Teachers are however resorting to these assessment practices due lack of knowledge and of experience and proper guidance in using a design portfolio and other appropriate methods of assessment. Broadfoot and Black (2005, p. 10) qualify this by stating that there are a variety of tools for assessment that have potential for great educational value. However, some of these tools of assessment are not currently understood well and used effectively.

### **Providing feedback after assessment**

Feedback is an essential component of formative assessment (Taras, 2005), especially when involved in problem solving. Accommodation occurs is when conflicts arise from feedback provided by teachers, a new experience or learning situation. The learner has to adjust and reshape the new information so that reframing of the world and new experience occurs. So when things do not occur as the learner has expected, he or she accommodates the situation and makes adjustments, reframing expectations of the experience (Donald et al., 1997). It allows for learners to rectify challenges that are faced, so that they can bridge the existing gaps and improve the overall achievements.

Within the constructivist learning theory framework, the teachers take up the role of facilitator, whose role it is to aid the learner in developing understanding. Instead of telling, the teacher must begin questioning, and in the end the learner comes to conclusions on their

own, creating a learning experience that is open to new direction. Teachers are to challenge the learners into becoming effective critical thinkers, and engage them in hands-on tasks that are meant to extend their conceptual and thinking processes by providing constructive feedback (Richardson, 1997).

Results indicate that all teachers are engaged in some sort of feedback during the manufacturing process; however, this feedback is minimal and does not allow for sufficient opportunities for learners to improve on their designs. This is due to teachers showing a limited understanding of formative assessment and the importance of feedback, which results in inadequate and incomplete information being passed on to learners about their achievements (Dekker & Feijis, 2005).

### **Recommendations:**

Guidance in formative assessment that is specific to Technology Education is required, in order to avoid the incorrect usage of assessment techniques such as the ‘design portfolio’ and resorting to use of traditional tests. According to Dekker and Feijis (2005) teachers are not confident in using formative assessments in the classroom because of their lack of knowledge on these assessment practices.

Literature reveals that when teachers were exposed to workshops that were specific to formative assessment, that there was a significant change in attitude towards assessment and their assessment practices. Dekker and Feijis (2005) further stated that it was recorded that when teachers learned to utilise formative assessment practices in their classrooms “as a consequence of appropriate professional development” there was a positive spin-off on student learning and achievement.

It is recommended that teachers attend professional development workshops pertaining specifically to assessment practices in Technology Education, to develop their skills in using formative assessment techniques and practices that are explicit to and which will enhance the effective teaching and learning of Technology Education.

It is important that teachers are provided with specialised support from the District Offices, because according to Warner (2003), as cited in McLaren and Dakers (2005, p.3), Technology Education is a learning area that provides a unique challenge to teachers. More

support that teachers receive from District Offices in the form of workshops and regular school visits by subject advisors will definitely be beneficial. There is a need for ongoing support by the District Offices as well as the subject advisors before and after implementation of any changes in Technology Education.

It is also recommended that teachers develop their skills in using the design portfolio effectively so that they can incorporate design and creativity into their assessment. If this method of assessment is used as it should be – and that is as an instrument that tracks designs from the first rough designs to the final prototype – it uses a combination of conceptual and procedural knowledge, and the teacher would be able to incorporate multiple strategies of assessment into the design portfolio. These multiple assessment strategies need to be used in order to assess the varying abilities of different learners and to ascertain if learners have achieved the set outcomes. The design portfolio allows teachers to see the progression of the learners' ideas from the initial rough sketches to the final product. It allows teachers to capture the fundamental nature of Technology Education, since it provides for practical and intellectual evidence that will turn ideas into products that can be used and evaluated (Welch, 2001). A design portfolio captures the essence of a designer's world and will provide greater insight into the mind of the learner. The design portfolio should be developed and compiled as the learning programme unfolds, thus tracking the progression of the learner's ideas from the initial rough sketches to the final product. Once the final product is completed, the teacher can make the first judgement based on the overall impression of the quality of the learner's solution, and then progress onto working with the details of the design portfolio. This would capture the essence of Technology Education and encompass what Kimbell (1999) refers to as holism.

### **5.2.3. Why are Grade 7 teachers employing particular assessment strategies?**

#### **Limited knowledge of subject matter and assessment strategies**

It is clear from the findings that Technology Education was allocated to the participants for the following reasons:

- They were willing to teach the learning area,
- They had prior experience of teaching the learning area, and

- Some were just awarded a chance to teach it because they were good with their hands in terms of woodwork and electrical work.

Management did not consider the fact that participants had no formal training or expertise in teaching the learning area. Teachers' personal understanding of the purpose of Technology Education and the previous experience of Technology Education has a profound effect on how the subject is taught and assessed. This impacts on the confusion with regard to the development of teaching programmes, pedagogy and assessment practices. As McLaren and Dakers (2005) said, teaching Technology Education is more than just instruction on manipulating skills of using tools and making drawings.

Once again it is due to a lack of formal training, inadequate guidance and lack of training at DoE workshops that participants have the incorrect perception of Technology Education, and are assessing the learning area as they would a traditional art and craft lesson.

### **Providing real-life contexts for assessments**

Authentic learning experiences are not being provided for the learners to engage in which results, in learners being unable to identify with the problem situations. They are unable to relate to the problem situations and are therefore incapable of using their experiences and interaction with other people and the environment to solve problems and come up with creative solutions. LTSM are used as is; participants are not adapting them to the learners' environment. In doing this teachers are not allowing the learners to develop higher-order thinking skills. Cohen et al. (2004) confirm this, stating that when teachers don't provide authentic learning experiences for learners, teachers do not develop learners' life skills and furthermore are unable to ascertain what the learner is capable of doing in the real world.

There also seems to be general apathy among teachers with regard to professional development. They seem to be content with the situation that they are in, and are not prepared to go out and find out more about the learning area or assessment practices. If the DoE is not providing professional development that caters for their specific needs, they are not prepared to seek other avenues of professional development, for instance completing an Advanced Certificate in Education in Technology Education.

## **Reasons for using particular assessment strategies**

Compounding the issue, management personnel and principals also have a traditional belief that Technology Education is all about making and creating products, as in a typical art and craft class, and that computers form part of Technology Education. As a result, three out of the four schools add a computer mark to the Technology Education mark. This brings us back to existing subcultures in schools and assessment policies as stated by Jones and Moreland (as cited in McLaren & Dakers, 2005, p. 5).

The time allocated to Technology Education is also shared with Computer Studies, which is not in keeping with the NCS; Technology Education was allocated a full two hours for a specific reason because of the nature of the learning area.

When learners engage in the design process they build continuity and coherence between ideas and actions over time, and tasks that are set out by teachers are often complex and time-consuming. This means that a lot of time is required to develop these ideas into tangible products, and poses a challenge in Technology Education for learning, teaching and assessment. Schools reducing the number of hours allocated to Technology Education means teachers are unable to do justice to the design process: it is rushed, and the emphasis is more on making because there is also a curriculum to finish (Moreland et al., 2007).

McLaren and Dakers (2005) confirm issues that have been highlighted in this study: that existing subcultures at schools and direction provided by management of schools determine how teachers plan their assessments.

## **Recommendations**

Teachers are on the threshold of another new phase in South African schools. If our national curriculum continues to seek to develop creative, enterprising and risk-taking leaders, the starting-point is to improve teachers' professional development. The training that is due to take place for CAPS should be carefully planned and implemented. Specific workshops pertaining Technology Education need to be held. This would clarify important aspects like

the development of the design process, and outline to teachers that the emphasis is not on the finished product but on the process that unfolds.

The subject advisors must ensure that the facilitators conducting these workshops for professional development are adequately trained and knowledgeable about Technology Education and assessment techniques that are most appropriate. There is also a need for more frequent workshops and follow-up workshops to be held by the Department of Basic Education in each district, and for subject advisors to meet with teachers who are teaching Technology Education on a regular basis, so that the teachers can keep abreast of new developments, changing methodologies and challenges. According to McLaren and Dakers (2005), teachers' subject expertise impacts on assessment practices that are employed. Attendance at these workshops must be compulsory, and if teachers do not attend there must be measures in place so that the District Office can follow up on reasons for non-attendance so that teachers are held accountable.

Principals and senior management should be included in the training and professional development workshops. The importance of Technology Education and the rationale for including the learning area in the curriculum should be outlined to principals and senior management, so that when appointing teachers to teach this learning area the most qualified teacher is allocated, and not just those that are available or that need to fill up their teaching timetable.

The time that is allocated to Technology Education in the NCS must be strictly followed by school management, and subject advisors and district managers need to ensure that the NCS times are being followed. They need to devise a system whereby principals and senior management are held accountable for ensuring that the correct times are followed.

Teachers need to learn how to develop authentic learning experiences for learners, so that their learners can gain ownership of the problem situation and identify with the task at hand. This will be more meaningful to the learner, and is an important aspect that needs to be addressed at professional development workshops.

Bursaries and incentives should be made available to all teachers, not only those in previously disadvantaged schools, to study further in the field of Technology Education.

Teachers who further their studies should also be rewarded by a re-grading that would ensure an increase in salary. This would be a form of motivation for all teachers to engage in professional development.

Subject advisors need to play a more active role in meeting with teachers in their district to address matters of concern and develop programmes that will address the challenges facing Technology Education educators. According to Dekker and Feijs (2005), teachers that were involved in their professional development programme stated that the most influential aspect of the programme was the frequent personal contact with colleagues. It didn't matter whether it was a professional meeting or informal contact, as long as frequent contact was maintained and they were able to exchange ideas and learn from each other.

### **5.3. Limitations of the study**

There are at least four main limitations of this study that the researcher felt could impact on the research findings. Firstly, the study was limited to one specific district, and only four participants were selected. Although from the outset the focus of the research was to gain a better understanding of Grade 7 teachers' assessment practices in Technology Education in the Pinetown District and not to generalise the findings, the researcher cannot but wonder whether the findings would be the same if more participants were selected and the study was extended to include other districts.

The second limitation was that the researcher had assumed that the participants that were selected were implementing Technology Education as it was intended and were knowledgeable about the learning area, and as a result the study focused on assessment practices. However, it was evident from the findings that it was not possible to focus only on classroom assessment practices and ignore other factors like teacher expertise and other contextual factors that inevitably impact on assessment practices. In the current educational system these are all interdependent with each other.

Finally, it would have been beneficial if a longer period had been spent with the teacher and class with regard to lesson observations, to really track the development of the lesson from the inception of the learning programme to the final product assessment, instead of piecemeal observations of only the capability task.

#### **5.4 . Further research**

In comparison to other countries, Technology Education in South Africa is still a relatively new learning area. There is no prior curriculum design or historical data to measure our achievements or shortcomings against. All research carried out in the field of Technology Education will be valuable to all stakeholders, since it allows for a greater understanding and more effective implementation of this learning area within the South African context, and more informed decisions by policy makers and curriculum developers.

Possible areas of future research that stand out at this moment are as follows:

- As academic leaders of schools, how informed or knowledgeable are management about Technology Education? Are they aware of the unique nature of Technology Education and how this impacts on teacher selection with regard to teaching of the learning area?
- A similar study should be carried with teachers that are qualified to teach Technology Education, to ascertain whether lack of knowledge and professional expertise in teaching Technology Education is the main reason for the learning area being assessed in the manner in which it was in this study, where the focus was on the final product and not on the process.
- Finally, a study that would really impact how Technology Education is implemented would be to examine how effective the subject advisors and Departmental workshops are with regard to adequate cascading of information, and following through with policy and school visits to make sure that teachers and management are implementing policy accordingly.

## 5.5. Conclusion

History has proven time and again that change is often accompanied by problems and challenges, which could be regarded as either adverse or beneficial to institutions and organisations. The impact that change brings always depends on the nature of involvement by those participating in the events and processes that effect the change.

Changes within the South African education system have been accompanied by many challenges. Teachers were expected to teach the new learning areas and apply OBE principles and strategies to all decisions. The introduction of Technology Education in the curriculum posed more of a challenge to teachers than other learning areas, since it was a relatively new learning area and is yet to develop a well-established culture of classroom practice. These changes were further compounded by the shift away from traditional methods of assessment (Van Niekerk et al., 2005; Vandeyar & Killen, 2003).

Data presented in this study reveal that Technology Education is not making the significant impact in classrooms that it should be. Insight has been provided with regard to the critical questions that this study addressed, but it is evident that aspects such as limited knowledge of subject matter, inadequate Department of Basic Education workshops, and varied interpretation of the Technology Education policy document and assessment practices, have been identified as reasons for the wide gap that exists between policy and practice, and for assessments being carried out in the manner that they are.

Assessment is a contentious issue that affects all facets of education; it cannot be ignored. Assessments need to be fair and reliable, and to meet the needs of society. The continued uncertainty around this area of education, especially in Technology Education, indicates that it requires further research and analysis.

However, we need to acknowledge that within the South African scenario we are experiencing similar – if not the same – challenges that countries like England, Canada and Wales experienced when they initially introduced Technology Education. There is a need for all stakeholders to consult and interrogate existing literature from the above mentioned countries when we are designing our curriculum, this would ensure that we do not make the same or similar mistakes

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## APPENDIX A



**kzn education**

Department:  
Education  
KWAZULU-NATAL

**NARISHNEE NAIDOO  
96 DESAI CRESCENT  
EFFINGHAM HEIGHTS  
DURBAN  
4051**

Enquiries: Sibusiso Alwar  
Date: 22 February 2011  
Reference: 0012/2011

### **PERMISSION TO INTERVIEW LEARNERS, EDUCATORS AND DEPARMENTAL OFFICIALS**

The above matter refers.

Permission is hereby granted to interview Departmental Officials, learners and educators in selected schools of the Province of KwaZulu-Natal subject to the following conditions:

1. You make all the arrangements concerning your interviews.
2. Educators' programmes are not interrupted.
3. Interviews are not conducted during the time of writing examinations in schools.
4. Learners, educators and schools are not identifiable in any way from the results of the interviews.
5. Your interviews are limited only to targeted schools.
6. A brief summary of the interview content, findings and recommendations is provided to my office.
7. A copy of this letter is submitted to District Managers and principals of schools where the intended interviews are to be conducted.

The KZN Department of education fully supports your commitment to research:  
**An Exploration into Grade Seven Teacher assessment Practices in Technology Education within the Pinetown District.**

It is hoped that you will find the above in order.

Best Wishes

**Dr SZ Mbokazi  
Acting Superintendent-General**

...dedicated to service and performance  
beyond the call of duty.

KWAZULU-NATAL DEPARTMENT OF EDUCATION

POSTAL : Private Bag X9137, Pietermaritzburg, 3200, KwaZulu-Natal, Republic of South Africa

PHYSICAL: Office G25, 188 Pietermaritz Street; Metropolitan Building; PIETERMARITZBURG 3201

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## APPENDIX B



Research Office, Govan Mbeki Centre  
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Private Bag x54001  
DURBAN, 4000  
Tel No: +27 31 260 3587  
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ximhap@ukzn.ac.za

25 November 2011

**Mrs N Naidoo (205524506)**  
School of Mathematics, Science and Technology

Dear Mrs Naidoo

**PROTOCOL REFERENCE NUMBER: HSS/1253/011M**  
**PROJECT TITLE: An exploration into Grade Seven teacher assessment practices in Technology Education within the Pinetown District**

In response to your application dated 24 November 2011, the Humanities & Social Sciences Research Ethics Committee has considered the above mentioned application and the protocol has been granted **FULL APPROVAL**.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. Please note: Research data should be securely stored in the school/department for a period of 5 years.

I take this opportunity of wishing you every thing of the best with your study.

Yours faithfully



.....  
Professor Steven Collings (Chair)  
Humanities & Social Sciences Research Ethics Committee

cc Supervisor – Dr Martin Combrinck  
cc M. M P Moodley  
cc M/s S Naidoo/Mr N Memela

## APPENDIX C – PRINCIPAL’S CONSENT

96 Desai Crescent  
Effingham Heights  
Durban  
4051

Tel.no .083 7775770  
email. narishnee1305@gmail.com

The Principal

Re : INFORMED CONSENT DOCUMENT - PRINCIPAL  
UNIVERSITY OF KWAZULU NATAL – FACULTY OF EDUCATION M.Ed RESEARCH:

Dear Madam

I, Narishnee Naidoo, am currently studying towards my Masters Degree in the field of Technology Education at the above institution. My supervisors are Dr. Martin Combrink from the School of Education Studies (031-260 3688) and Mr. Mervyn Moodley, from School of Mathematics, Science and Technology ( 031- 2603655) . As part of my degree I am required to conduct research at schools.

My research is entitled: An exploration into Grade Seven teacher assessment practices in Technology Education within the Pinetown District. The purpose of this research is to explore what Grade Seven teachers within the Pinetown District assess in Technology Education, how they carry out these assessment practices and why.

I would like your consent to conduct my research at your school. The process would be as follows:

Phase one: I would meet with the grade seven Technology Education teacher and confirm dates and times for observation of Technology Education lessons. Thereafter learners’ books and the teacher’s portfolio would be looked.

Phase two: I would conduct an hour long interview session with the teacher at their convenience.

Participating in this research is voluntary and at any time should you feel the need to withdraw your school from the study you are at liberty to do so. The data that is collected would be used solely for research purposes, anonymity and confidentiality of the participants and participating schools would be maintained as pseudonyms would be used.

Participation in this research would contribute greatly to the field of Technology Education within the South African context and it is hoped that a better understanding of educators' assessment practices would be gained from it.

Yours Faithfully

Mrs N. Naidoo

## APPENDIX – D – PARTICIPANT’S CONSENT

96 Desai Crescent  
Effingham Heights  
Durban  
4051

Tel.no .083 7775770  
email. – narishnee1305@gmail.com

Grade Seven Technology teacher

Re : INFORMED CONSENT DOCUMENT - PARTICIPANT  
UNIVERSITY OF KWAZULU NATAL – FACULTY OF EDUCATION M.Ed RESEARCH:

Dear Sir / Madam

I, Narishnee Naidoo, am currently studying towards my Masters Degree in the field of Technology Education at the above institution. My supervisors are Dr. Martin Combrink from the School of Education Studies (031-260 3688) and Mr. Mervyn Moodley, from School of Mathematics, Science and Technology ( 031- 2603655) . As part of my degree I am required to conduct research at schools.

My research is entitled: An exploration into Grade Seven teacher assessment practices in Technology Education within the Pinetown District. The purpose of this research is to explore what Grade Seven teachers within the Pinetown District assess in Technology Education, how they carry out these assessment practices and why.

Should you volunteer to participate in the study. The format of the data collection process is as follows:

Phase one: I will observe your design and make tasks in Technology Education and analysis learners’ books and your lesson portfolio.

Phase two : Is an hour long interview session at your convenience.

A meeting will be arranged prior to data collection to confirm dates, times and other important issues of concern that you may have. During both phases of data collection field notes will be recorded and with your permission, I hope to record the interview to ensure all relevant data is collected. A transcript of the interview would be sent to you for verification of data captured.

Participating in this research is voluntary and at any time should you feel the need to withdraw from the study you are at liberty to do so. The data that collected would be used solely for research

purposes, anonymity and confidentiality of the participants and participating schools would be maintained as pseudonyms would be used.

Your participation in this research would contribute greatly to the field of Technology Education within the South African context and it is hoped that a better understanding of educators' assessment practices would be gained from it.

Yours Faithfully

Mrs N. Naidoo

## APPENDIX – E- INTERVIEW SCHEDULE

1. How long have you been teaching grade 7 Technology Education?
2. How would you rate your understanding of the grade 7 Technology syllabus?  
Excellent    good    average    poor
3. Do you keep abreast with the new developments in Technology education?  
Yes                      No
4. How?
5. Are you familiar with assessment policy requirements?
6. What according to you is most important to assess in Technology Education? probing  
(*The content, design or the final product*)
7. How do you assess these aspects?
8. A major part of Technology Education methodology allows for learners to engage in problem solving and higher order thinking. Do you cater for this in your assessments?
9. What assessment strategies do you employ to assess these higher order thinking?
10. How do you do cater for multiple solutions to a problem?
11. What are some challenges and strengths that you have encountered when assessing Technology Education?
12. How have you over-come these challenges?
13. Are there any suggestions/ solutions that you would like to put forward that would help make assessment practices more effective for teachers?

This interview will also allow me the opportunity to clarify data that arise from the observation of Technology Education lessons and document analysis.

APPENDIX F- DOCUMENT ANALYSIS

NAME OF EDUCATOR : \_\_\_\_\_

SCHOOL: \_\_\_\_\_

DOCUMENT ANALYSIS – Educator’s file

1. Evidence of assessment planning .  Yes  No

2. How often are assessments done?

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3. List of assessments tools the educator uses?

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4. Is there evidence of formative and summative assessment?

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5. How is the above carried out?

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DOCUMENT ANALYSIS – Learner’s file

1. Do learners have copies of their assessments? Yes No.

2. Is there a link with teacher’s planning and assessments carried out? Yes No

3. What is tested and what form of assessment tool is used ? Content, Design, problem solving.

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4. Other observations:

