TEACHER ATTITUDES TOWARDS THE IMPLEMENTATION OF THE LEARNING AREA TECHNOLOGY

by

THABO ISRAEL PUDI

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I dedicate this study in memory of my late father, Abel Seisa Pudi, a shining example and inspiration, and to my mother, Mmatieho Pudi, a great lady, for her love and encouragement.
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Above all, our Heavenly Father, who is the alpha and omega of my purpose and plans in life and without whom neither I nor this thesis would have come to be.

Mthimkhulu
DECLARATION

I declare that Teacher attitudes towards the implementation of the learning area technology is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

SIGNATURE
(MR TI PUDI)

DATE
2002/11/18
SUMMARY

TEACHER ATTITUDES TOWARDS THE IMPLEMENTATION OF THE
LEARNING AREA TECHNOLOGY

People’s attitudes at the beginning of a task determine how successfully the task will be
completed. In the same way, teachers’ attitudes have an influence on the implementation
of technology education. The study investigated the influence of teacher attitudes
towards technology education under nine themes relevant to the technology learning area.
These themes, together with the results of the exploratory study were used to design a
questionnaire. This questionnaire was used as the main data-capturing instrument in the
empirical study. Technology teachers’ attitudes were determined according to the
responses to the questions in each of the nine themes. The responses were summarized
according to the themes. The summary of each theme was used to answer the research
questions

(a) Does technology education teachers’ gender have an influence on any of the
nine research themes?
(b) Does technology education teachers’ level of achievement in mathematics
have an influence on any of the nine research themes?
(c) Does technology education teachers’ level of achievement in science have an
influence on any of the nine research themes?

This study revealed that technology education teachers’ gender had no influence on any
of the nine themes. However, technology education teachers’ level of achievement in
mathematics was found to have an influence on four of the themes, namely gender bias,
relationship with mathematics and science, relationship with other learning areas and
didactics and assessment. Technology education teachers’ level of achievement in
science was found to have an influence on five of the research themes, namely gender
bias, culture, values and beliefs, teacher’s working conditions, relationship with other
learning areas and didactics and assessment. Critical and creative thinking, education
policies and entrepreneurship were not influenced by technology education teachers’
level of achievement in mathematics and/or science. A model to enhance teacher
attitudes towards the implementation of technology education was designed, using the
responses to the research questions on the influence of technology education teachers’
level of achievement in mathematics and science.

The study found that teachers’ attitudes towards the implementation of technology
education can be influenced positively. This, in turn, will contribute significantly to the
implementation of the technology learning area in Curriculum 2005.
KEY CONCEPTS

Technology learning area, paradigm shift, Curriculum 2005, outcomes-based education, technological literacy, technological process, attitudes, perceptions, perceptual selectivity, self-concept, self-esteem, stereotypes, personality, indoctrination, motivation, critical cross-field outcomes, developmental outcomes.
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CHAPTER 1

Background to the study

1.1 INTRODUCTION

According to Fullan and Hargreaves (1992:20), a thorough and worthwhile preparation for a curriculum should take a long time to achieve because it does not only involve changes in skills and knowledge but more importantly, attitudes, beliefs and perceptions. Hamilton and Gingiss (1993:193) stress the importance of understanding both the nature of attitudes and concerns that teachers bring to the classroom and their potential effects on curriculum implementation. Changes in attitudes are notoriously difficult to achieve since they challenge the basic principles of the nature, purpose and process of education transformation as it unfolds. Schwartz (Modiba, 1999:69) cites professional insecurity as a major factor in negative attitudes towards curricular change and states that teachers who have invested physically and emotionally in existing curricula may be negative towards change, especially if they do not understand what is required of them or think that they may not have the requisite knowledge and expertise to meet the new expectations. The prospect of being faced with a radically different curriculum that disrupts established ways of working may result in negative attitudes towards the new curriculum itself (Modiba, 1999:69; Burke, 1999:6 and Centre for Education Policy Development, 1995:8). This may lead to feelings of helplessness and a decline in morale. This also applies to the implementation of the new outcomes-based education system in South Africa even though, as Murray (2000:12) states, there are many teachers who are positive and dedicated to implementing the curriculum.
The new curriculum, Curriculum 2005 has eight learning areas, one of which is technology education. This study focuses on the problem of negative attitudes of teachers towards the implementation of technology education in Curriculum 2005. The Independent Projects Trust (1998:1) acknowledges that the winds of change blowing through the education system of this country will bring new challenges and problems. Change, however good, always brings with it skepticism, distrust and possible negative attitudes. To avoid possible unwanted ramifications in the implementation of the technology education curriculum, first-hand investigations need to be conducted in the schools and the classrooms. This will help discern negative teacher attitudes towards the implementation of technology education before they become of grave concern.

1.2 IMPLEMENTING TECHNOLOGY EDUCATION

As difficult as planning the technology education curriculum was, its implementation could perhaps be even more difficult due to the ramifications in the implementation stage. The Minister of Education, Professor Kader Asmal (1999:1) adapted Brecht’s “Songs of the soldier of the revolution” to illustrate the difficulty (challenges) of implementing Curriculum 2005, including technology education, thus

When the difficulty of the mountains (education policy planning and curriculum development) is once behind,

That's when you'll see

The difficulty of the plains (implementation of Curriculum 2005 with the new technology education learning area)
will start.

The plain (*implementation of the curriculum*) is very deceptive and is potentially poised to offer new and more serious challenges that are more difficult to negotiate than the technology education curriculum planning and developmental stages. The deception is that people think that once the curriculum has been developed, implementation is a foregone conclusion. This is deceptive because curriculum planning and design is theory but implementation means and is converting the theory into practice. Making the two coincide sometimes leads to new problems that the curriculum designer as theorist did not anticipate. Curriculum design may be compared to writing a correspondence course for a driver's licence. No matter how well or clearly the course is written and presented, the real test is when the learner actually takes the seat behind the steering wheel of the vehicle. It is a mistake to think that a learner can pass the driving test and obtain a driver's licence solely on the comprehensiveness of the course material or content. For the technology education curriculum to succeed, it must be put into practice. Andre de Vries, a boxing commentator (SABC 2: 2 April 2000) once commented that “on paper boxers may seem evenly matched, but the men don’t fight on paper.” Likewise, on paper the technology education curriculum may seem implementable, but implementation of the curriculum is not done on paper or in boardrooms and offices. Deviations from the expected must be anticipated from the boardroom to the field or classroom just as pre-match statistics in the case of a boxing match cannot be guaranteed once the boxers step into the ring. The proof of the pudding (curriculum) is in the eating (implementation) and not in the cooking or making (design). The implementation of technology education also has to do with the context in which this implementation has to take place. There must be
an attempt to level the playing field. For technology education, this poses a difficult task as it is a new learning area that is by and large vulnerable to misconceptions. With reference to the Centre for Education Policy Development (1995:21), the researcher is of the opinion that an ongoing investigation into teacher attitudes towards the implementation of technology education should be conducted from time to time at different schools. Such ongoing examination and assessment should endeavour to reveal teachers’

- interest, motivation, participation and appreciation of scientific and technological procedures;
- skills, such as critical and creative thinking and decision making, as stipulated by critical outcome (1) for Curriculum 2005;
- didactics and assessment in implementing technology education.

In short, the study of teacher attitudes is crucial to the successful implementation of technology education.

1.3 MOTIVATION FOR THE STUDY

1.3.1 Problems with Curriculum 2005

Garson (2000:37) states that there are some real problems with Curriculum 2005 and the way that it is being implemented. Bisseker (1999:37) concurs, stating that the implementation of Curriculum 2005 is no “walk in the park” and that teachers are
battling to implement it. According to Bisseker (1999:37), this is because the
curriculum is being rushed instead of being phased in slowly; policy stipulations are
implemented badly and there is a general lack of teacher training and support for
Curriculum 2005.

The implementation of Curriculum 2005 started in 1998. It was intended and envisaged
as a seven-year process that would be completed in the year 2005. Based on this, the
researcher was not entirely convinced that the implementation of the curriculum is being
rushed. The failure of policies to make an impact on the implementation of Curriculum
2005 may be due to teacher attitudes or the lack of effective teacher development
strategies (Jansen, 2001:3). This could seriously jeopardise teacher quality and teacher
commitment to the implementation of Curriculum 2005.

1.3.2 Significance of and need for the study

There was a need to determine teacher attitudes towards the implementation of
technology education. These attitudes could be positive or negative. Negative attitudes
could hamper and positive attitudes would facilitate the successful implementation of
technology education. This research focussed on teachers’ negative attitudes because by
changing negative attitudes to positive ones, teachers’ motivation would be raised and the
implementation of technology education be improved. As explained in 1.3.1, there is a
general problem with the implementation of curriculum 2005 which includes the
implementation of the new technology learning area. This (refer 1.3.1) could be due to
teachers’ negative attitudes which are as a result of various factors.
Discovering factors that contribute towards teachers' negative attitudes would be used to
draw guidelines to enhance its (Technology education) successful implementation. For
the purposes of this study, the main attitude forming aspects used were teacher's gender,
level of mathematics achievement and level of science achievement.

1.3.3 Contribution of the study

It is important to look at education through different prisms as no one has the monopoly
on truth and insight (Murray, 2000:12). This might overcome the belief that research
agendas are political instruments (Lewis, 1999:3). This study was intended
to shed some light on teacher attitudes towards the implementation of technology
education from an objective prism.

The researcher hoped that this study would contribute to the demystification of
technology education and to the creation of positive attitudes towards, perceptions of and
aspirations to technology-based careers. Because attitudes are found in all spheres of life,
the findings of this research may even address issues beyond the ones that are studied in
this research (Calder, Phillips & Tybout, 1985:16). Salkind (1991:4) points out that good
research has as its ultimate aim the benefit of society. Like Cronbach, Ambron,
Dornbusch, Hess, Hornik, Phillips, Walker & Weiner (1980:1), the researcher believes
that the investigation into teacher attitudes towards the implementation of technology
education is only "an episode in the broad educational search for truth and insight". The
study of teachers' attitudes would indicate what was really happening in the schools and
in the classrooms. Teachers are a major factor in the implementation of technology
education and their attitudes are pivotal in achieving the envisaged educational ideals.
1.3.4 Outcomes of the study

This study should not be regarded as a vehicle to justify the inclusion or exclusion of technology education in the curriculum or to confirm or contradict the Review Committee's recommendation (Chisholm, 2000:76) that it (technology education) should be dropped from the curriculum. Instead, this study is concerned with factors that negatively influences teachers' attitudes towards the implementation of technology education. This is done by providing solutions to the research problem and questions.

1.4 PROBLEM STATEMENT

The implementation of Curriculum 2005 and in particular the implementation of Technology education has been met with some resistance. To a certain extent this led to the appointment of review committee to make recommendations regarding the implementation of Curriculum 2005. The resistance to the implementation can to a certain extend be attributed to negative teacher attitudes as discussed in section 1.3. The factors that negatively influences teachers' attitudes towards the implementation of the technology learning area should be identified and countered.

1.5 PURPOSE OF THE STUDY

The purpose of this study is to investigate factors that negatively influenced teachers' attitudes towards the implementation of technology education in Curriculum 2005 and to provide a model and guidelines to overcome these negative attitudes.
1.6 RESEARCH QUESTIONS AND THEMES

In order to deal with and examine the research problem adequately, the researcher formulated questions to be answered. Based on the belief (Van Rensburg, Myburgh & Ankiewicz 1996:2) that the will to promote science and technology education and also to encourage and enable women to pursue these fields including mathematics is a national priority, three research questions were formulated. Factors considered in the formulation of the research questions were teachers’ gender; teachers’ level of achievement in mathematics and in science. Gender was concerned with the enablement and encouragement of women in technological fields while the level of teacher achievement in mathematics and science was related to teacher attitudes towards the implementation of technology education on the grounds that both mathematics and science are closely related to technology education.

To focus the study, the research questions needed to address particular research themes that cover the spectrum of teacher attitudes towards the implementation of technology education (see chapter 3).

The research questions were thus formulated as follows:

(a) Does gender influence teacher attitudes towards the implementation of technology education with respect to the identified themes?

(b) Does the level of mathematics reached influence teacher attitudes towards the implementation of technology education with respect to the identified themes?
(c) Does the level of science reached influence teacher attitudes towards the implementation of technology education with respect to the identified themes?

1.7 RESEARCH DESIGN AND METHODOLOGY

1.7.1 Qualitative and quantitative approach

The nature of the study required both a quantitative and a qualitative approach for validity. The questionnaire and the interview were selected as data-collection techniques. The interview was used in the exploratory study and the questionnaire was used as the main data-collection instrument.

1.7.2 Literature study

The researcher conducted an extensive literature review on the topic to sharpen or narrow the scope of the investigation (Primer & Chow 1992:124). The literature study introduced the researcher to perceptions on technology education especially in the outcomes-based education both locally and elsewhere. The researcher approached the literature review critically, in keeping with the requirement of outcomes-based education that learners should be critical and creative thinkers (Department of Education, 1997a:16).

1.7.3 Empirical study

The target group for this study consisted of technology education teachers presently
involved in the implementation of the technology learning area in Curriculum 2005. The sample was taken at random from three provinces namely Mpumalanga (157) respondents, Limpopo (70) respondents and Gauteng (2) respondents.

An interview schedule was drawn up for data collection in the exploratory study (see section 4.2.1 and Appendix 4.9). Information obtained in the exploratory study was used in drawing up the questionnaire. In addition, the literature studied and the researcher's experience in the field of technology education played a part in drawing up the questionnaire. A pilot study was conducted to test the questionnaire on a small sample of the target group in order to determine the validity of the questions. Corrections to the questionnaire were done accordingly before the refined questionnaire was administered to the rest of the sample. In conclusion, the collected data was analyzed and interpreted for the purpose of drawing up conclusions.

1.8 RESEARCH PROGRAMME

The study followed a logical sequence of events as indicated in figure 1.1. The general orientation introduced both outcomes-based technology education and teacher attitudes as indicated by the arrows. A relationship between teacher attitudes and the outcomes-based technology education is indicated. The empirical study examined teacher attitudes and outcomes-based technology education as indicated by the arrows. The next step was the development of a model to enhance teacher attitudes from the results of the empirical study. Finally, conclusions were arrived at and recommendations made for further research.
1.9 OUTLINE OF THE THESIS

Chapter 1 gives a general background and orientation to the study. This includes an overview of the implementation of technology education, motivation for the study, statement of the research problem, the purpose of the study, the research design and methodology, and definition of concepts used in the study.
Chapter 2 discusses technology education in the outcomes-based education paradigm, its inclusion in Curriculum 2005 and how it relates to mathematics and science. The chapter also discusses demythologizing technology and technology education, what is expected of a technology education teacher, and didactics and assessment.

Chapter 3 discusses how attitudes are developed and influenced, relates teachers’ working conditions and milieu to their attitudes and describes the main attitude-forming concepts.

Chapter 4 describes the empirical study and accordingly discusses the demographic information, reliability and validity of the study, data collection techniques (i.e. the questionnaire and the interview), data analysis, and the findings.

Chapter 5 discusses the development and testing of a model to enhance teacher attitudes towards the implementation of technology education at school and towards technologically-based careers in general.

Chapter 6 concludes the study and makes recommendations for further research.

1.10 DEFINITION OF CONCEPTS

Hawkins (Waetjen, 2000:1) warns against the danger of using terms unknowingly and indiscriminately, and stresses the need for clarity of concepts used in a text so as to avoid misinterpretation and contradiction. A common frame of reference or clarification of concepts must also take into account the philosophical and etymological meanings that come into play when the reader wants to understand a text. Volti (1988:3) maintains that
the understanding of words is often the beginning of knowledge. Accordingly, key concepts and terms used in the study are defined below.

**Assessment:** This is a way of measuring progress. According to Curzon (Ndlovu, 1997:56) and the Department of Education (2001a:27), assessment involves collecting, measuring and interpreting information relating to learners’ responses to the process of instruction and learning. For Curriculum 2005, assessment is continuous and is based on assessment standards (Department of Education, 2001a:104).

**Assessment Standards (AS):** Assessment standards describe the level at which learners should demonstrate the achievement of a learning outcome and the ways or range (breadth and depth) of demonstrating the achievement. They are Grade specific and encapsulate integration and progression (Department of Education, 2001b:27). They also take into consideration the knowledge, skills and attitudes that the learners need to demonstrate for the achievement of the necessary learning outcomes for each Grade (Department of Education, 2001a:104).

**Attitudes:** For the purposes of this study, an attitude is defined as

*a mental or neural state of readiness represented by cognition, feelings and behaviour; organized through experience, deliberate learning and heredity. This exerts a directive or a dynamic influence upon an individual’s response to all objects and situations with which it is related* (Van den Aardweg & Van den Aardweg, 1988:26; Rajecki, 1990:4;
Kiesler, Collins & Miller, 1969:5; Baron & Byrne, 1994; Lord, 1997 and Mohsin, 1990:1-9)

Critical outcomes (Essential outcomes): Lifelong learning through a National Qualifications Framework and Curriculum 2005: Lifelong learning for the 21st century (Department of Education, 1996a:15 and 1997a:32) and Kotze (1999:32) describe critical outcomes as cross-curricular, broad generic outcomes that inform teaching and learning. Curriculum framework for general and further education and training (Department of Education 1996b:41) also describes critical outcomes as generic, cross-curricular learning outcomes that underpin the unit standard and qualifications on the National Qualifications Framework and inform the specific or developmental outcomes. Critical outcomes together with developmental outcomes are key outcomes of the Draft Revised National Curriculum Statement that are inspired by the Constitution. They include core life skills for learners such as communication, critical thinking, activity and information management, group and community work and evaluation skills (Department of Education, 2001a:104).

Curriculum: The curriculum includes all the learning experiences of a learner at school together with the content of a course as well as its method of delivery, that is teaching, learning and assessment (Centre for Education Policy Development, 1995:6; Wheeler, 1983:11 and Carl, 1995:31). Learning experiences may be limited or enhanced by the availability of resources and also by the teachers’ attitudes and beliefs.

Curriculum 2005: Curriculum 2005 is an outcomes-based education system for South Africa. It is underpinned by the twelve critical outcomes (Unterhalter, 1999:26; Claasen,
Developmental outcomes: Developmental outcomes are learning outcomes that are specific for individual areas of learning at different levels of complexity (Department of Education, 1996b:42). They can also be defined as contextually demonstrated knowledge, skills and values reflecting essential outcomes (Department of Education, 1996a:15, 1997a:32, 2001a:105 and Kotze, 1999:32).

Integration: This is a key design principle of the Draft Revised National Curriculum Statement that requires learners to use their knowledge and skills from other learning areas to carry out tasks and activities in a particular learning area (Department of Education, 2001a:105).

Learning outcome: Learning outcomes are a description of what learners should know and be able to do at the end of any learning. Learning outcomes specify the conceptual understanding embodied in a learning area and may, in addition specify skills, content and/or values, which support one or more critical outcomes (Department of Education, 2001a:29 and 2001b:106).

Outcomes: Outcomes are what learners must be able to show, demonstrate or achieve for a specific task (Department of Education, 1996b:41). These outcomes help to shape the learning process (Department of Education, 2001a:106). Kudlas (Pretorius, 1998:ix) defines an outcome as “a demonstration of learning” and adds that an outcome is what the learner is to know or do. Spady (1993:4) defines an outcome as

- an actual demonstration of learning or experience in an authentic context,
that is high quality, culminating demonstrations of significant learning in context;

- a demonstration of learning that occurs at the end of a learning experience;

- a result of learning and actual visible observable demonstration of knowledge combined with
  - competence
  - orientations, that is the attitudinal, affective, motivational and relational elements that also make up a performance.

For the purposes of this study, an outcome was understood to be a visible, observable demonstration, that is something that learners can do as a result of the entire range of learning experiences and capabilities that underlie it.

**Outcomes-based education (OBE):** According to the Department of Education (2001b:30; 2001c:29) and Kotze (1999:32), outcomes-based education is a learner-centred, result-oriented approach to education. It is based on the belief that all learners can and will succeed. In support of the learner-centredness of the outcomes-based education, Spady (1993:ii) is of the opinion that outcomes-based education is focusing and organizing a school’s entire programme and instructional efforts around clearly defined outcomes which learners need to demonstrate when they leave school. For the purpose of this study, then, outcomes-based education is defined as a focused result-oriented approach to education.

**Paradigm shift:** The Concise Oxford Dictionary (1992: 862) defines a paradigm as “an
example, a pattern or a representative set of the inflections of a noun, verb etc". Lifelong learning through a National Qualifications Framework (Department of Education, 1996a:2) defines a paradigm as "a set of interrelated concepts which provide the framework in which we see and understand a particular problem or activity" and paradigm shift as a "scientific revolution" that occurs when an old paradigm is unable to deal with an outstanding problem or emergent ones. For the purposes of this study, a paradigm shift is a shift from a traditional form of education that stressed rote learning to outcomes-based education (OBE) that focuses on the outcomes of the educational endeavours.

**Technological literacy:** Technological literacy is the ability to know, understand, use, manage, assess and evaluate technology (Waetjen, 2000:2-3; Department of Education, 2001a:112 and Petrina, 2000:181). Understanding the "technological process" is part of technological literacy.

**The technological process:** According to Potgieter (1998:11); Ankiewicz (1995:3) and Pudi (1999:8), the technological process describes everything that should happen in a particular technological endeavour, from start to finish of that particular endeavour. It is generally classified as a systematic approach to problem solving. According to (Department of Education, 2001a:112), this systematic approach to problem solving involves (or translates into) creative human activities of developing technological solutions in order to satisfy human needs and wants. It gives manufacturing, design, repair and restoration as examples of technological processes.

**Technology:** The Technology Learning Area Committee Workshop Report (1996:1)
defines technology as a process of using knowledge, skills and resources to meet human needs and wants, to recognize and solve problems by designing, developing and evaluating products, processes and systems. The Draft Revised National Curriculum Statement (Department of Education, 2001a:14) adds values, skills and knowledge to this definition and emphasizes sensitivity to social and environmental factors. Cross, Naughton and Walker (1986:27) refer to technology as “the application of scientific and other organized knowledge to practical tasks by social systems involving people and machines”.

**Technology Education:** According to Potgieter (1998:3), technology education is concerned with the technological knowledge and skills, as well as technological processes. Technology education involves understanding the use of technology and its impact on both the individual and society. It is ultimately designed to enable and equip learners to perform effectively in the technological environment in which they live and to stimulate them to contribute to its improvement.

1.11 RÉSUMÉ

This chapter introduced the reader to the study, discussed the background to and reason for the study, and formulated the statement of the problem. The research design, methodology and programme were described and key concepts used in the study defined.

Chapter 2 deals with the literature review on outcomes-based education and technology education, with particular reference to the implementation of technology education in Curriculum 2005.
CHAPTER 2

Outcomes-based technology education

2.1 INTRODUCTION

This chapter discusses the paradigm shift in education in South Africa to outcomes-based education, the implementation of outcomes-based education as Curriculum 2005 and the technology learning area in Curriculum 2005. The technology learning area in Curriculum 2005 is discussed with reference to contemporary educational realities and its relationship to mathematics and science. Myths about technology and technology education are dispelled and what is expected of technology education teachers is outlined. Finally, the didactics of technology education, assessment and implementation are discussed.

2.2 DEMOCRATIC GOVERNMENT

The advent of democracy in South Africa in 1994 brought with it many changes, including educational changes. Some people feel that the government should not interfere with education while others are of the opinion that the democratisation of the government should result in the democratisation of education as well. It is against this background that Ankiewicz (1995:1), Gittings (1988:6 & 16) and Van Rensburg et al (1996:1) emphasise that no educational discussion in South Africa today can be done without cognisance of the country’s historical and political background. That is why a change in government together with a paradigm shift in education is not coincidental.
2.3 PARADIGM SHIFT IN EDUCATION

A paradigm shift is necessary when an old paradigm is unable to deal with old problems or emergent ones. In a comparative study of countries that gained independence in Africa, Ndlovu (1997:57-63) found a clear trend that changes in governments are followed by paradigm shifts in the educational systems. To ensure votes, new governments cannot risk to be backed by a constituency that is not educated in line with contemporary needs and the philosophy of the government of the day. Voters who cannot think for themselves are at the mercy of being lobbied by the opposition. That is why a paradigm shift in the system of government will almost invariably be followed by a paradigm shift in the system of education if the new government is serious about staying in power.

According to Salia-Bao (Ndlovu, 1997:57) and Wolhuter (2000:13), after independence in most of the African countries, each government changed the colonial system of education for one that was African and relevant to development. Wolhuter (2000:13) further alludes to initiatives for the Africanisation of the curricula such as the mathematics and science programmes started in the 1960s by African nations. The notion of the Africanisation of the curricula is supported by Jeevanantham (1999:49-54); Lebakeng (1997:4-7); Van der Horst (1993:33) and Tsotetsi (2001:16). The researcher aligns himself with the concept of Africanism (or the African Renaissance) on condition that it does not isolate Africa from the rest of the world or propagate blind patriotism at the expense of worthwhile things that the African continent can learn and benefit from or contribute to the rest of the world. After all, Africa is part of the global
community.

Professor Kader Asmal, the present Education Minister of South Africa has committed himself to ensuring that curricula reflect African realities (Chisholm, 1999a:55). The vehicle for this is the outcomes-based education dispensation in South Africa.

2.3.1 Outcomes-based education in South Africa

According to Claassen (1998:36), outcomes-based education is not a mere reform of the traditional curriculum but a radical paradigm shift. Although Spady (Pretorius, 1998:ix) says that outcomes-based education is nothing new, the researcher does not agree with that within the South African context in general. Outcomes-based education is new to South Africa even though some of the concepts that are professed by outcomes-based education have been practiced before in the traditional education such as writing an essay, doing a project or an experiment in science or working in groups or even baking a cake in the Home Economics class. Those things were done but not with the outcomes-based notion in mind. Outcomes-based education with emphasis on the “outcomes” as is being done now, is really something new. If outcomes-based education is nothing new (as Spady said it), then there would have been no talk of a paradigm shift in education in South Africa in the first place. This is also true of technology education. Pullias (1992:3) emphasizes that technology education must be thought of as something new. A comparison of the old paradigm (standard paradigm of normal practice or traditional education) and the new approach of the reflective paradigm of critical practice (outcomes-based education) is an indication of the nature of the radical shift inherent in the outcomes-based education paradigm. A table indicating the difference and the
similarities between the two approaches in general is compiled.

**Table 2.1 The new paradigm versus the old paradigm**

<table>
<thead>
<tr>
<th>Old approach (traditional education)</th>
<th>New approach (outcomes-based education)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Passive learners. (Learners learn the solution, i.e. the end products of what scientists have discovered).</td>
<td>Active learners. (Learners investigate the problems and engage in inquiry for themselves).</td>
</tr>
<tr>
<td>2. Exam-driven.</td>
<td>Learners are assessed on an ongoing basis.</td>
</tr>
<tr>
<td>3. Rote learning (mind stocked with knowledge). Focus is on knowledge of facts, information and syllabus content.</td>
<td>Critical thinking, reasoning, reflection and action. (Mind flexible; stocked with wisdom).</td>
</tr>
<tr>
<td>4. Syllabus is content-based and broken into subjects. Rigid, compartmentalised and no cross-reference.</td>
<td>Integration of knowledge; learning relevant and connected to real-life situations.</td>
</tr>
<tr>
<td>5. Textbook/worksheet-bound and teacher-centred.</td>
<td>Learner-centred; teacher is facilitator; teacher constantly uses group-work and team-work to consolidate the new approach.</td>
</tr>
<tr>
<td>6. Sees syllabus as rigid and non-negotiable (often independent of the learner’s life-world).</td>
<td>Learning programmes seen as guides that allow teachers to be innovative and creative in designing programmes. These programmes have to bear a relationship with the learner’s life-world.</td>
</tr>
<tr>
<td>7. Teachers responsible for learning; motivation dependent on the personality of the teacher. (Teachers question the learner).</td>
<td>Learners take responsibility for their learning; learners motivated by constant feedback and affirmation of their worth. (Learners and teacher query each other)</td>
</tr>
<tr>
<td>8. Emphasis on what the teacher hopes to achieve.</td>
<td>Emphasis on outcomes – what the learner becomes and understands.</td>
</tr>
<tr>
<td>9. Content placed into rigid time frames.</td>
<td>Flexible time frames allow learners to work at their own pace.</td>
</tr>
<tr>
<td>10. No credits given for prior learning (RPL).</td>
<td>Credits given for prior knowledge and skills acquired outside the formal education situation.</td>
</tr>
</tbody>
</table>

Source: Adapted from Halloun (1998:313) and Department of Education (2001b:11)

According to Artis (Mahomed, 1998:3), “We are moving from a paradigm quotations that enhances the move from the old paradigm to a new paradigm with a focus on QUALITY and EFFICIENCY to a paradigm based on QUALITY and EFFECTIVENESS.”

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Spady (1993) (Mahomed, 1998:3; Lint, 1999:12) states, “In the present system, WHEN and HOW students learn something is more important than WHAT and WHETHER they learn well. In the envisaged new system WHAT and WHETHER learners learn well is more important than WHEN and HOW they learn it.”

The above quotations lay the foundation for a comparison of the dominant assumptions in the two paradigms.

(1) Assumptions of the traditional education paradigm

Resnick (Johnson, 1997:167-169) states that traditional education was more focused on teaching learners to succeed in school but not necessarily in daily life and work. Thus the traditional education paradigm was based on the following assumptions (Department of Education, 1997a:6/7; Department of Education, 1996a:27 – 29 and Pretorius, 1998:viii – ix):

- Education consists of the transmission of knowledge from those who know to those who don’t know.

- Knowledge is about the world, and our knowledge of the world is unambiguous, unequivocal and unmysterious.

- Knowledge is distributed among disciplines that are non-overlapping and together are exhaustive of the world to be known.

- The teacher plays an authoritative role in the educational process, for only if teachers know can learners learn what they know.
• Learners acquire knowledge by absorbing information, that is data about specifics because an educated mind is a well-stocked mind.

In summary, traditional education promoted rote learning. The focus was on examination results.

(2) Assumptions of the outcomes-based education paradigm


• Education is the outcome of participation in a teacher-guided community of inquiry, among whose goals are the achievement of understanding and good judgement.

• Learners are stirred to think about the world when their knowledge of it is shown to be ambiguous, equivocal and mysterious.

• The disciplines in which inquiry occurs overlap and are not exhaustive.

• The teacher’s stance is fallible (one that is ready to concede error) rather than authoritative.

• Learners are expected to be thoughtful and reflective and increasingly reasonable and judicious.

• The focus of the educational process is not on the acquisition of information but on the grasp of relationships within the subject matter under investigation.
Solomon (1993:49) favours an interactive dialogue between teacher and learner to dispel the myth that the teacher “knows it all” and states that if learners are to develop their own views and decisions and relationships, they should have equal access to information. The outcomes-based education paradigm advocates that both teachers and learners should query each other. Thus when everyone is contributing to the discussion and analysis of the problem, the power base (where the teacher plays an authoritative role) is equally distributed (Solomon, 1993:49).

In summary, the outcomes-based education paradigm wants to develop critical and creative and innovative learners who will contribute to their own lives and to the lives of others. Outcomes-based education promotes knowledge, skills and values and attitudes. Against this background, outcomes-based education is relevant and necessary, but the question is, is it implementable?

2.3.2 Outcomes-based education, a pathway to success

According to Van der Vyver (1998), a welcome mat (red carpet) should be laid down to welcome outcomes-based education. Garson (2000:37) is optimistic that outcomes-based education has the capacity to achieve the educational ideals for the new South Africa. But Mahomed (1998:1) is skeptical about the success of the implementation (practicability, feasibility) of outcomes-based education in South Africa. The implementation of outcomes-based education and technology education can be a pathway for success or a recipe for failure, depending on how it is introduced by the education authorities and accepted by teachers and learners.

Teachers are a crucial factor in the implementation of the curriculum. For instance,
because skills and outcomes were not stressed in the traditional education paradigm (see section 2.3.1), the practical aspect of technology education (according to the researcher’s viewpoint), may present problems to teachers if they are not familiar with the manner of presenting science, especially the integration of theory and practice, which requires the use of experimental work in the laboratory or workshop or the presentation of an activity or project that the class must work on under the teacher’s supervision.

Every system has its strengths and its weaknesses. Outcomes-based education can be a very powerful system to transform education in South Africa if properly implemented and used to benefit the country and its people. In this sense, according to Lint (1999:12), outcomes-based education is like a wheelbarrow: it can be used to haul fresh fruit or to haul garbage. Similarly, outcomes-based education can be manipulated to be a pathway for success or for failure. The fate of outcomes-based education is in the hands of those who use it. In South Africa outcomes-based education is being implemented as Curriculum 2005.

2.4 CURRICULUM 2005

Curriculum 2005 is the outcomes-based education model for South African society. Unterhalter (1999:26) maintains it is an important attempt to grapple with transitions and transformations of a changing South Africa. The name Curriculum 2005 is derived from the fact that the Department of Education hopes to implement it fully by the year 2005. Figure 2.1 represents the original implementation schedule for Curriculum 2005 (see also Appendix 2.4).
Figure 2.1 Implementation schedule for Curriculum 2005

<table>
<thead>
<tr>
<th>Year</th>
<th>Orientation and start of training</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>Orientation and start of training</td>
</tr>
<tr>
<td>1998</td>
<td>Grades 1 &amp; 7</td>
</tr>
<tr>
<td>1999</td>
<td>Grades 2 &amp; 8</td>
</tr>
<tr>
<td>2000</td>
<td>Grades 3 &amp; 9</td>
</tr>
<tr>
<td>2001</td>
<td>Grades 4 &amp; 10</td>
</tr>
<tr>
<td>2002</td>
<td>Grades 5 &amp; 11</td>
</tr>
<tr>
<td>2003</td>
<td>Grades 6 &amp; 12</td>
</tr>
<tr>
<td>2004</td>
<td>Making changes</td>
</tr>
<tr>
<td>2005</td>
<td>Full scale implementation</td>
</tr>
</tbody>
</table>

Source: Media in Education Trust (April 1997)

2.4.1 Outcomes for Curriculum 2005

Curriculum 2005 advocates that learning be a combination of knowledge, skills and values and attitudes. Van Rensburg (1996:3) and Elmer (1998:223) state that this holds for technology education as well. The traditional education system only emphasized knowledge and skills neglecting values and attitudes. The inclusion of values and attitudes in Curriculum 2005 marks a significant break with the past education dispensation. Values and attitudes are often thought of as providing space for politicising
the learner in line with the ideals entrenched in the Constitution of the Republic of South Africa that is "they also define the moral aspirations of South African democracies as defined in our Constitution and Bill of Rights" (James et al 2000:1). Lubisi, Parker and Wedekind (1999:130) also alludes to value assumptions as necessary conditions for the unfolding transformation. Based on the above, the researcher designed a pictorial view of the educational ideals as envisaged through Curriculum 2005 and factors that contribute to its realization by making use of a web map.

Figure 2.2 Educational ideals for Curriculum 2005 (SKVA)
2.4.2 Introduction of skills, knowledge and values and attitudes (SKVA)

Van Rensburg (1996:3) states that skills, knowledge, and values and attitudes are “intertwined, inseparable and integrated and not easily identifiable”.

Skills

The Department of Labour’s skills act and its slogan “vhutsila” (meaning skills) highlight the importance of skills acquisition. For the purposes of this study, skills are not only limited to observable skills but include “the learners’ understanding of the social and human dimensions of technology or to think critically about what they (learners) are doing” (Lubisi et al, 1999:62). Rossouw and Lamprecht (1995) and Beyer (1991) emphasize the importance of thinking skills acquisition.

Knowledge

Knowledge can be a scientific or an unscientific concept (Hamm, 1993:68), and conceptual or procedural (McCormick, Murphy & Hennesy, 1994:21 and McCormick, 1997). According to Lubisi et al (1999:62), in the past knowledge was divided into two types considered important, namely academic and technical knowledge. Irrespective of the type of knowledge considered, principles, skills, theories, facts, axioms and values and attitudes represent forms of knowledge. These forms of knowledge are found in all learning areas. Knowledge forms the basis for understanding and applying skills, values and attitudes. Hamm (1993:36) states that education without knowledge is logically impossible.
Values and attitudes

The aim of education is to foster values considered and upheld as important by society. In its attempt to grapple with the transitions and transformation of education, Curriculum 2005 wishes to foster educational values and attitudes such as multilingualism, openness, equity and tolerance (Department of Education, 2001d:13-20 and James, Auerbach, Desai, Giliomee, Jordan, Krog, Kulati, Lehoko, Leibowitz and Tlakula, 2000:1-10).

Gender equity is relevant in technology education and the sciences where there is presently a gender imbalance (Van Rensburg, Myburgh and Ankiewicz, 1996:2). Prime (Conway, 1994:109) is of the opinion that culture, which includes values and beliefs, is made manifest in part in the technological artifacts and systems that a society creates.

2.4.3 Core learning areas in Curriculum 2005

According to Mackrory (2000:9), the change from traditional subjects to the eight core learning areas in Curriculum 2005 will break down the artificial barriers between subjects so that knowledge can be integrated into learning areas. The change to eight new learning areas poses a challenge to teachers. Teachers’ qualifications and knowledge, especially in the field of technology and technology education (since it is a new learning area) could compromise the quality of its implementation. Inadequate knowledge (lack of technological literacy) will impose limits on the depth of the learning activities and programmes that teachers will develop for its implementation.

Figure 2.3 represents the eight core learning areas for Curriculum 2005 as adapted from

**Figure 2.3 Core learning areas in Curriculum 2005**

1. Human and Social Sciences (HSS)
2. Mathematical Literacy, Mathematics and Mathematical Science (MLMMS)
3. Economic and Management Sciences (EMS)
4. Life Orientation (LO)
5. Arts and Culture (A&C)
6. Natural Sciences (NS)
7. Language, Literacy and Communication (LLC)
8. Technology (TECHED)

**Human and Social Sciences (HSS)**

This learning area comprises Geography, History, Democratic Education, Development Studies, Environmental Studies, and World Ethical and Belief Systems. Here learners learn to interact with each other and with their environment. The cultural diversity of South Africa makes it imperative for learners to be exposed to the human and social studies’ learning area. Understanding different cultures and their history will encourage cultural tolerance, especially in the implementation of technology education (see section 3.8.2).

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Mathematical Literacy, Mathematics and Mathematical Science (MLMMS)

This core learning area includes numeracy, mathematics and statistics. Numeracy and mathematics is a way of understanding the world and of expressing relationships of natural phenomena. Mathematics encourages logical thinking, problem solving and enhances analytical skills. Thus mathematics has the potential to equip learners with the skills to cope with the rapidly changing technological environment.

Economic and Management Sciences (EMS)

This core learning area includes Economic Education, Financial Management, Business Education, including Entrepreneurship, and Public Management.

South Africa needs a sustainable economic plan in order to survive. The Economic and Management Sciences develop all people into economically active citizens able to participate in and lead the economic development of the country.

Life Orientation (LO)

This includes Health Education, Career Guidance, Lifelong Learning Skills, Inter- and Intra-personal Development and Religious Studies. Society is rapidly changing. To cope with these challenges, learners need to develop life skills. Life Orientation includes the building of self-esteem, life/survival skills and a healthy lifestyle.
Arts and Culture (A&C)

The core learning area of Arts and culture include Visual, Expressive and Performing Arts, Theory of Art and Physical Education.

Culture and the arts are important areas of life. Promoting creativity and exploring the diverse cultures that exist help learners to develop the spiritual, intellectual and emotional aspects of their personalities.

Natural Sciences (NS)

This core learning area encompasses the learning areas of Integrated Sciences, Biosciences, Physical Sciences, Agricultural Sciences and Engineering.

The ability to understand natural resources and to manage them effectively is important. The physical and natural sciences are the core of the wealth of South Africa. Technology is the use of both physical and natural sciences to benefit society through artifacts and systems.

Language, Literacy and Communication (LLC)

This core learning area includes literacy, South African official languages, classical languages and modern languages.

People interact with the world and each other through language. Clear Communication is vital in all interaction. Miscommunication can lead to misunderstanding, prejudice, war
and accidents, and delay the envisaged transformation and redress. The language or mode of communication used in the implementation of technology education is significant to this study.

Technology (TECH)

The core learning area of Technology includes Technology Education, Information Technology, Technical Education and Applied Arts and Sciences.

Technological advancement globally has surpassed all expectations and predictions. South Africa needs to access this technology to be able to compete internationally. This core learning area aims to promote all aspects of technology, including planning, design and manufacturing.

Technology education (in the core learning area of Technology) is the focus of this study.

2.5 THE TECHNOLOGY LEARNING AREA IN CURRICULUM 2005

Of the eight core learning areas in Curriculum 2005, Technology (and the focus on technology education) is new. The launch of technology education under the auspices of the Technology 2005 Project was done prior to the commencement of Curriculum 2005 (Chetty, 1998:2). Whether technology education should be implemented as a stand alone or be integrated with other learning areas, especially the learning areas of mathematics and science due to the commonalities which they share with technology education, has been debated (Ankiewicz, 1995:6-8 and Chisholm, 2000). But according to Van
Rensburg (1996:1) all parties involved in education agree that technology education should be an essential element of the school curriculum.

2.5.1 Technology education as part of a whole

Technology education can be viewed as a slice of the Curriculum 2005 cake as depicted in figure 2.4 below.

Figure 2.4 The technology learning area in Curriculum 2005

1. Human and Social Sciences (HSS)
2. Mathematical Literacy, Mathematics and Mathematical Science (MLMMS)
3. Economic and Management Sciences (EMS)
4. Life Orientation (LO)
5. Arts and Culture (A&C)
6. Natural Sciences (NS)
7. Language, Literacy and Communication (LLC)
8. Technology (TECHED)

Dauherty and Wicklein (2000:1) contend that technology education can serve as a perfect base for interdisciplinary setting. That is perhaps why there was a suggestion that technology education should be integrated within other learning areas and not be implemented as a stand alone learning area as is the case now (Ankiewicz, 1995:3 and Chisholm, 2000). Technology education’s relationship with other learning areas in
Curriculum 2005, including mathematics and science, was studied.

2.5.2 Technology education's relationship with Mathematics and Science

Technology education's relationship with mathematics and science can be visualized with technology education as a common denominator between mathematics and science, as depicted in figure 2.5.

Figure 2.5 Technology education's relationship with Mathematics and Science

![Diagram showing the relationship between Science, Technology Education, and Mathematics]

The relationship between technology education, science and mathematics can also be visualised as a triangle with the three learning areas at the apex of each angle (see figure 2.6). The area of the triangle represents the commonality between the three learning areas but with differing proportions.
2.5.2.1 Technology education’s relationship with mathematics

According to Moritz (Mathe, 1997:10), "Everything that the greatest minds of all times have accomplished towards the comprehension of forms by means of concepts is gathered into one great science, mathematics." Froebel (Mathe, 1997:10) concurs, stating that "mathematics integrates, unites and mediates between man and nature, inner and outer world, thought and perception more than any other subject". Mathe (1997:10-17) describes mathematics as

(a) way of thinking

It provides strategies for organizing, analyzing and synthesizing data, largely but not exclusively numerical. Mathematics is used to solve simple everyday problems and even complex problems such as in statistics or in the design processes.
(b) an art characterized by order and internal consistency

Mathematics follows strict rules and is consistent. Patterns and phenomena can be explained in terms of mathematical principles such as series and progressions.

(c) a science characterized by exactness

Mathematical answers and calculations are reliable and valid given the same conditions. Thus mathematics can be seen as science in action.

(d) a technical subject of its own

Mathematics has a technical language of its own, using carefully defined terms and symbols. These enhance people’s ability to communicate about science and technology and other real-life situations. Critical outcome number five unequivocally stipulates the need to communicate effectively using visual, symbolic and/or language skills in various modes.

(e) a prerequisite to many occupations.

Reys et al (Mathe, 1997:13) believe that mathematics is a “critical filter” that is used in many vocations.

(f) a link between critical and creative thinking

Mathematics has a relationship with critical and creative thinking skills. Pupils’ thinking and reasoning abilities are sharpened as they solve
mathematical problems. Mathe (1997:14) sees mathematics as an activity of the mind involving actions as well as objects. That is perhaps why Lamon (Mathe, 1997:14) stresses the fact that mathematics is "a free invention of the human intellect".

(g) as a tool

Mathematics is a tool used to achieve mathematical ends, scientific ends and everyday ends and means (life orientation) as brought forth by technology education.

(h) as a communication medium

According to Aichele and Reys (Wessels, 1990:52), mathematics is the language of science and as such uses carefully defined terms and symbolic representations that enhances the ability to communicate. Wessels (1990:52) also believes that mathematics is an international means of communication by which concepts and facts are conveyed without confusion or misunderstanding i.e. mathematics is both precise and meticulous. Graphs, formulae and tables are used in technology education to convey information.

(i) as a logical and compact system

Aichele and Reys (Wessels, 1990:52) assert that mathematics is characterized by order and internal consistency. Patterns such as the Fabonacci series and mathematical and geometrical progressions are just but a few examples of the
internal order and consistency in mathematics.

(i) as a means to understand the world

Mathematics has to do with classification and establishing relationships. The relationships between objects such as the solar system and the gravitational pull on the earth is represented in terms of mathematical relations and formulae.

From the above, it is evident that mathematics links well with technology education. This is because most of the concepts described above also relate to the rationale for technology education.

2.5.2.2 Technology education's relationship with science

(Solomon, 1993:7) is of the opinion that science and technology have an important interdependence. This implies that there is some commonality between science and technology. According to Cross, Naughton and Walker (1986:27), this commonality and interdependence must not assume that whatever knowledge may be incorporated in the artifacts of technology are derived from science. Cross et al (1986:27) points out that many objects of daily use have been influenced by science, but their form and function, their dimensions and appearance were determined by technologists using non-scientific modes of thought. Solomon (1993:7) indicates that in some countries the scientific nature of technology and the technological aspect of science make the subjects a natural continuum while in others the curriculum structures have separated the two, leaving teachers to develop appropriate links.
With regard to the interrelationship between science and technology Volti (1988:56-61) points that both science and technology obey different laws, with science seeking knowledge of the universe and technology seeking what is useful. Stated differently, science answers the question “is it true?” while technology is concerned with answering the question “will it work?”

Science is thus an agent of liberation from superstition and ignorance while technology gives control over the material world (Van Rensburg, 1996:2).

2.5.3 Technology education as part of outcomes-based education

Figure 2.7 illustrates technology education (TECHED) as part of technology, which is one of the core learning areas in Curriculum 2005, which is part of the outcomes-based education approach.

Figure 2.7 Technology education as part of the outcomes-based education paradigm.
Curriculum 2005 is composed of eight core learning areas. Technology education (TECHED) is part of the core learning area of Technology, which is part of Curriculum 2005, which is also part of the outcomes-based education approach (see figure 2.7). In order to study teachers’ attitudes towards the implementation of technology education and its location in the broader education system, it is necessary to demythologize it.

2.6 DEMYTHOLOGISING TECHNOLOGY AND TECHNOLOGY EDUCATION

Dauherty & Wicklein (2000:2) indicates that there is general confusion over what technology and technology education really entail and the meaning of the concepts “technology” and “technology education”. Furthermore, the literature on technology abounds with misrepresentations and stereotypical perceptions of technology and technology education (Dauherty & Wicklein, 2000:2). To overcome this, a concerted effort must be made to demythologise technology and technology education.

2.6.1 Myths about “technology” and “technology education”

The myths about technology and technology education stem from ignorance, a lack of understanding, hasty conclusions and a distortion of the truth (Rudinow & Barry 1984). The presence of myths has the potential to inhibit learning and teaching about technology and technology education. Lewis (1999:5) holds that understanding the conceptions and misconceptions about technology and technology education is a prerequisite for better teaching and learning. To clarify the myths about technology and technology education, the researcher chose to describe them in terms of their opposites. One way to describe a concept is to explain what it is not. According to (Thompson, 1992:89), “to see in
opposites is illuminating sometimes.” For example, instead of describing the arrangement of the furniture in a room, describing the spaces between can be illuminating. Life is full of opposites, for example up or down; true or false; success or failure and positive or negative. However, explaining what a concept is not (the opposite thereof) might in some cases fail to explain what the concept really is. The parts that make up the whole are not the whole, they are part of a whole. For example, technology is not the fixing of electrical equipment, but fixing electrical equipment is part of technology education; technology education is not Curriculum 2005, but is part of it.

There is a need to be wary of circular definitions, such as explaining a kidney as something that is bean-shaped and a bean as something that is kidney-shaped. To an individual who does not know both the kidney and the bean, the explanation is useless/futile, since many other things fit the description of being bean- or kidney shaped. The researcher clarified myths about technology and technology education on the basis of oppositeness and at the same time avoided circular definitions.

Technology is not

- machinery

“Equating technology with machinery (sometimes referred to as hardware) is common nowadays” (Naughton, 1986:2). The equation of technology with machinery may be valid in the sense that it represents common usage, such as referring to a house as a machine for living in. Naughton (1986:2) points out that this has severe limitations because technology is broader than just machinery.
• **scientific knowledge**

In his definition of technology Naughton (1986:3) uses the phrase ‘scientific knowledge’. Cross, Naughton and Walker (1986:27) warns against the fallacy of believing that all technological endeavours are derived from scientific knowledge. Scientific and non-scientific knowledge is necessary in the development of technology. To see technology as developed exclusively from scientific knowledge or thought is restrictive.

• **synonymous with computers**

“Many young people simply equate technology with computers” (Solomon, 1993:55). Technology is more than just computers. It is to do with means and ways to achieve needs and wants. It is a way of life.

• **a technological artifact**

Technology is more than just the finished product or technological artifact. The process of making (planning and designing) a technological product is also an important aspect of technology as well as the ability to understand how it can be used beneficially and ethically and responsibly. Technology is also about understanding systems. To understand how a cellular phone works, people need to first understand how to operate one.

• **a social process**

Technology can be a scientific process or it can be “a spontaneous process as in
crafts, like pottery, where there is no form of social organization” (Naughton, 1986:9).

**Technology education** is not

- **a male domain**

  Women and girls (Zuga, 1999:1-3) often perceive the subject of technology education as a male domain, especially after they have taken a course in technology education. This is deceptive because technology is a way of life for everyone, not just men. Technology is to be found in all spheres of life.

- **the same as technical or vocational education**

  Technology education is not career or vocation based, although it might encompass aspects of vocational fields, such as carpentry or engineering, as a means to achieving the overall purpose of meeting human wants and needs.

- **the same as computer literacy programmes**

  Information technology (IT) together with technology education are part of the core learning area of Technology in Curriculum 2005. Computers play a major role in the technology education approach since they are an integral part of modern technology (Pullias, 1992:3). But technology education is more than just a computer literacy course.
• the same as educational technology

Stone (Daugherty et al, 2000:2) confirms that technology education is not the same as educational technology. Educational technology involves all the machinery used in education such as computers, projectors and video machines.

• engineering

Lewin (1986:11) makes a point when he describes engineering as “the science of the artificial” which is by no means inferior to technology or to science.

• science education

As much as technology is related to science, and science education, cognisance should be taken that technology education is, in fact, a learning area on its own.

If not corrected, such misinterpretations have a damaging effect on the implementation of technology education. Therefore there needs to be a concerted effort to promote technological literacy and explain what technology and technology education really are.

2.6.2 What technology and technology education really are

The question of what technology and technology education really are has been debated since 1980s (Pullias, 1992:3). Kramer (1994) maintains that technology is the blending together of everything that one knows and can do to solve specific problems. Maley and Wenig (Daugherty et al, 2000:2) point out that there is still considerable confusion over
what characteristics exemplify technology education today. This undoubtedly has a negative impact in the implementation of technology education. For effective implementation, any confusion or misunderstanding and half-truths about technology and technology education should be cleared up.

- **Technology**

For the purposes of this study, technology was taken to be the application of scientific and other organized knowledge to solve human problems (wants and needs) by producing and maintaining artifacts and systems that involve people and machinery (see section 1.10).

- **Technology education**

Technology education can be seen as a comprehensive experience-based educational programme that allows learners to investigate and experience the means by which people meet their needs and wants, solve problems and extend their capabilities. It is concerned with the knowledge and skills necessary to develop, produce and use products or services, and how to assess the impact of these activities on humanity and the environment (ethical considerations). While it prioritises the effective use of technological products and systems, it is not gender biased (Grimsley, 1999:1; Van Rensburg et al, 1996:2; Treagust & Mather, 1990:53 and Hansen, 1999:244-296).

According to Pullias (1992:3), the emphasis in technology education is on learning how a computer is used as a tool more than learning “about” computers. The concern in technology education is not so much the proficiency in a certain skill, as the learner’s
understanding of concepts, relationships, problem solving, analysis and evaluation (technological process) because technology education is a series of related projects.

2.6.3 Technological literacy

Technological literacy involves understanding what technology and technology education really are and the proper implementation thereof. According to Waetjen (2000:2-3), technological literacy is

- the ability of an individual to code and decode technological messages.
- having knowledge and abilities to select and apply appropriate technologies in a given context.
- the knowledge and comprehension of technology and its uses; skills, including tool skills as well as evaluation skills and attitudes about new technologies and their application.

For the purposes of this study, then, technological literacy was defined as “the ability to know, use, understand, manage, assess and evaluate technology” (Waetjen, 2000:2-3; Department of Education, 2001a:112 and Petrina, 2000:181).

2.7 EXPECTATIONS OF A TECHNOLOGY EDUCATION TEACHER

With reference to the critical and developmental outcomes, the vision and rationale for technology education as described in the Draft Revised National Curriculum Statement and the views of Burke (1999:5/6), the researcher will highlight salient features that
characterize the ideal technology education teacher.

(a) Technological literacy is an important factor in developing teachers’ confidence, enthusiasm and attitudes towards the implementation of technology education.

(b) Teachers must know and understand policy stipulations for the implementation of technology education (including all expected outcomes for the learning area of technology education). “Knowing how” and “knowing that” about policy stipulations in the implementation of technology education are important to the technology teacher (Cross et al, 1986:29-31). Knowing how, as Cross et al (1986:30) explains has to do with standards of performance that go beyond competence. The technology teacher’s “know how” determine the quality of the implementation of technology education by using the policy requirements. Policy stipulations for the implementation of technology education need interpretation (critical and creative thinking) of the policy stipulations. But interpretation is more an art than a science and depends on the teacher’s background and experience. No wonder that Russell (Cross et al, 1986:29) describes knowing how as knowledge by acquaintance. However, knowing that is the kind of knowledge that the technology education teacher can make explicit. This is necessary in the designing of activities or projects when the teacher formulates and teaches learners on procedures or organized rules to achieve an outcome.
(c) Technology education teachers must have the required knowledge of diverse technological systems, including their functioning and applications.

(d) Technology education teachers must understand the nature of technology and its impact on the environment, the advancement of science, the individual and society.

(e) Problem solving and technological development have much in common and problem solving is an integral part of technology education (De Luca, 1992:26). Teachers must understand the technological process and be able to apply it in problem solving in technology education.

(f) Teachers must make ethical decisions about technology-related issues, including the development and use of technology and technology resources. This includes the use of tools, machines and materials as technological resources in performing technological endeavours.

(g) Teachers must explore technological careers so that they are able to direct learners towards the right careers.

(h) It is important that the technology teacher should have requisite knowledge about gender issues especially for technology education. There is a misconception that technology education is a male domain.
2.8 THE IMPLEMENTATION OF TECHNOLOGY EDUCATION

The implementation of outcomes-based technology education is a challenge. Moreover, technology education is a new learning area and teachers are still grappling with understanding what exactly it entails (Garson, 2000:37). Learners, too, do not know much about technology education as it was not offered before.

Teachers are on the cutting edge of this implementation. However, because of its newness, little or no research on teachers’ capability and attitudes towards technology education and technological careers has been undertaken (Centre for Education Policy Development, 1995).

The implementation of technology education requires an integrated approach. An integrated approach to implementing technology education should take into account the wholeness of the learner. Gravett (1995:3), Lubisi et al (1999:97) and Van der Horst and McDonald (1997:20) stress that education of the learner should be holistic. Holistic implementation of technology education means the use of

- the head which refers to thought, theory and knowledge

- the hands which refers to crafts, practical work or artifacts

- the heart which refers to values, attitudes, love of subject matter, culture, and ethical considerations.

Ntibane (1999) emphasises the interrelatedness of thought, feeling and action quoting Samuels (Peale, 1970:268), “You sow a thought and you reap an action; you sow an
action and you reap a habit; you sow a habit, you will reap a character and when you sow a character you will reap a personality.” Holistic education shapes the personality.

2.9 DIDACTICS AND ASSESSMENT

Learning, teaching and assessment are inextricably linked. Assessment has a developmental and monitoring function to fulfil. Assessment evaluates the efficacy of the teaching and learning processes. Feedback from assessment informs teaching and learning and allows for the critique of outcomes, methodology and materials. Assessment practices can have a profound impact on the processes of teaching and learning in that they set standards which guide these activities. Assessment is thus a strategy to determine whether learning outcomes have been achieved or not (Lubisi et al 1999:14 and Department of Education 2001b:18).

2.9.1 Learning Outcomes

For the purposes of this study, learning outcomes are generic, cross-curricular (critical and developmental) outcomes that include core life skills such as communication, critical and creative thinking, activity and information management, group and community work, and evaluation skills. Accordingly, this study investigated how these learning outcomes are assessed in technology education. Learning outcomes can be assessed as products or processes or a combination of both.

(1) Learning outcomes as products (artifacts)

To look at the product as the sole outcome of learning is deceptive. Some products may
be the result of rote learning or chance discovery (serendipity). A finished product says little if it is not clear how it was developed. The process undertaken to arrive at the final product may be as important as the product itself. In Mathematics, it is not just the answer (product) that is marked correct, but each step followed is considered too.

(2) Learning outcomes as a process

The process followed to arrive at the final product is very important as it depicts the logical reasoning and argumentation (i.e. critical and creative thinking) engaged in by the learner.

(3) Learning outcomes as both process and product

Both the finished product and the process have to be credited during the assessment. The finished product may be a culmination of the thought processes in the build-up or the end results of a motor skill. In assessment both the process and the product have to be taken into consideration.

2.9.2 Learning outcomes for the technology learning area

In an endeavour to simplify the implementation of technology education, the Department of Education (2001a:18) consolidated the unique features and scope of the technology learning area into three learning outcomes:

Learning outcome 1

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

**Learning outcome 2**

The learner is able to apply technological processes and skills ethically and responsibly, using relevant knowledge concepts.

**Learning outcome 3**

The learner is able to access, process and use information in a variety of contexts.

### 2.9.3 Assessment standards

According to the Department of Education (2001a:11), there are assessment standards for each grade. These cover the skills, knowledge and values and attitudes needed to achieve a learning outcome.

### 2.9.4 Types of assessment

There are three distinct but overlapping elements of a coherent system for the holistic assessment of learners (Department of Education, 1996b:20-21):

- formal summative assessment
- on-going formal continuous assessment
- on-going informal formative assessment

### 2.9.5 Assessment methods

Gunter (1990), Hay (1999:6-12), Gravett (1995:9-34) and Bertram (1997) describe
various methods of outcomes-based assessment.

(1) **Self assessment:**

Learners should be taught to assess their own work critically and to indicate their decision by colouring or marking the appropriate box/symbol provided (Gunter, 1990:ii). Learners should assess themselves against given outcomes; for example "My design is good because..." (Bertram, 1997). Figure 2.2 presents an example of a self assessment sheet.

**Figure 2.8 Assessment sheet**

<table>
<thead>
<tr>
<th>NAME:</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTIVITY:</td>
<td></td>
</tr>
<tr>
<td>WHAT I DID:</td>
<td></td>
</tr>
<tr>
<td>WHAT I USED:</td>
<td></td>
</tr>
<tr>
<td>WHAT I LEARNT:</td>
<td></td>
</tr>
<tr>
<td>WHAT I COULD DO NEXT:</td>
<td></td>
</tr>
</tbody>
</table>

Source: Bertram (1997)

According to Gravett (1995:9), self assessment is a valuable tool for effective learning because self-assessment provides learners with an opportunity to take responsibility for
their own learning and gives them greater ownership of the learning which they undertake.

(2) **Group or peer assessment:**

Peers in the group assess and discuss each other’s work in a supportive manner, encouraging and stimulating each other. Because the approach is learner-centred, the teacher acts as a facilitator and educator, observing and asking appropriate questions (Gunter, 1990:iii and Gravett, 1995:24-25).

(3) **Group projects**

A number of learners work on a task together. This might require planning, research, discussion and group presentation. The advantage of this is that it assesses the learners’ ability to work as a team and to complete the task competently. Co-operation between learners is facilitated.

(4) **Written assignments**

This could be essays, reports, paragraphs or notes. These assignments involve descriptions, analysis, explanations and summaries.

(5) **Teacher assessment (observation and interviews)**

☐ **Observation**

This is done during planned sessions while learners are engaged in well-planned activities: verbal, practical and written according to specific performance
indicators.

The teacher determines how and to what extent the different activities contributed to the personal development of the learners in skills and social relationships.

- Interviews and oral presentation

Learners present the work that they have researched orally to the teacher/class. This has the advantage of allowing the learner to tell (communicate) what they have learnt. Teachers can assess both the work completed and the ability to communicate what has been learnt.

(6) **Portfolio assessment (Gunter, 1990:iii)**

These are files or folders that contain the work the learner has done over a period of time. This file/folder should include the learner’s best work as well as initial plans, drafts, self-evaluation and feedback from peers and teachers. This method monitors learners’ day-to-day progress and encourages them to reflect on their own learning. Furthermore, it allows for assessment over a period of time. Learners are not assessed on a once-off performance.

Before compiling portfolios, the teacher (or school) should decide on clear and specific progressive assessments of the learning outcomes learners should achieve. The teacher then decides which learning material should be included as evidence of outcomes reached, such as certain written assignments,
illustrations, group projects, group assessments, group problem solving, the teacher’s check list (observations) and interviews with parents.

The learners can also decide which work they would like to have included in the portfolio. Periodic self-reflection and self-assessment remain an integral part of the portfolio.

2.9.6 Guidelines for sound assessment in Curriculum 2005

The assessment of learning should, according to Gravett (1995:9) be directed at the promotion of what is considered to be of academic value and the provision of feedback to learners on their progress. The guidelines for sound assessment discussed here are also relevant to technology education since it is part of Curriculum 2005.

(1) Aims, educational approach and assessment procedures should be congruent. According to Booyse and Le Roux (1996:68), learners have the right to assessment that is relevant, orientated towards the vocation for which they are preparing themselves, and tests those skills and abilities that are fundamental to their success in their chosen field of expertise.

(2) Multiple assessment methods should be used. Technology education is both theoretical and practical. Multiple assessment methods must be used to assess both the theory and the practical.

(3) The assessment criteria should be communicated to the learners beforehand. Learners have the right to be informed of assessment requirements, that is
what is to be assessed, how, why and when and also how to succeed (Booyse & Le Roux, 1996:65).

(4) Assessment should be conducted regularly. This is notwithstanding the fact that learners have a right not to be subjected to excessive "assessment for the record" (Booyse & Le Roux, 1996:67).

(5) Learners should receive explicit feedback focusing on strength and weaknesses, as well as recommendations for improvement. Learners have the right to receive feedback shortly after every form of assessment as an important part of their educational experience (Booyse & Le Roux, 1996:68).

(6) Self-evaluation by learners should be promoted. This will promote responsibility and greater ownership of the learning (Gravett, 1995:9).

2.10 RÉSUMÉ

This chapter discussed a paradigm shift in education to outcomes-based education, the place of technology education as a learning area in Curriculum 2005 and technology education's relationship to mathematics and science. Certain myths about technology and technology education were clarified, and finally the implementation of technology education and didactics and assessment for Curriculum 2005 were also discussed.

Chapter 3 deals with teacher attitudes with specific reference to technology education teachers' attitudes towards the implementation of technology education and the role and function of technology education teachers.
CHAPTER 3

Teachers attitudes

3.1 INTRODUCTION

This chapter discusses what attitudes are and how people, specifically technology education teachers develop them. The root cause of the technology teacher’s attitudes towards the implementation of technology education is investigated and these attitudes are studied in relation to the nine research themes. Tentative answers where possible (from the literature study), are given to the themes.

3.2 ATTITUDES

Allport (Kuper & Kuper 1985:50-52) contends that the concept of attitude is “the most distinctive and indispensable concept in contemporary social psychology”. Pratkanis (Baron & Byrne, 1994:129) concurs, stating that attitudes shape individuals’ perceptions of the world and their social behaviour.

Attitudes, behaviour and feelings are inextricably linked. People’s attitudes determine their behaviour towards the objects, animals and people that they encounter, and include their relationship with themselves.

3.2.1 What is an attitude?

The Concise Oxford Dictionary (1992:70) defines “attitude” as “1 (a) a settled opinion or way of thinking. (b) behaviour reflecting this. 2 (a) a bodily posture. (b) a pose adopted
in a painting or play especially for dramatic effect...” Other than its contextual versatility, the word attitude has also shown a steady change over time (Kruger, Smit & Le Roux 1996:151).

According to Oskamp (1991:6) “attitude” originally referred to a person’s bodily position or posture. But the term has changed over the years from denoting physical “stance” (posture of the mind rather than the body) to denoting a psychological evaluation (Oskamp, 1991:6 and Lord, 1997:222).

Fazio (Baron & Byrne 1994:129), Rajecki (1990:347) and Secord and Backman (1964:594) assert that attitudes involve associations between attitude objects (virtually any aspect of the social world) and evaluations of those objects. Judd (Baron & Byrne, 1994:129) believes that attitudes can be viewed as evaluations of various objects that are stored in memory that is verbalised or verbalizable tendencies, dispositions or adjustments towards certain acts (Kiesler, Collins & Willer, 1969:7). According to (Oskamp, 1991: 8), the central feature of all definitions of attitudes is the idea of readiness for response, which means that an attitude is not behaviour, or something that a person does, but it is rather a preparation for behaviour, a predisposition to respond in a particular way to the attitude object. (The term attitude object is used to include things, people, places, ideas, actions or situations, either singular or plural.)

3.2.2 Comprehensive definition “attitude”

For the purposes of this study, the researcher with reference to Van den Aardweg & Van den Aardweg (1988:26); Mohsin (1990:1-9); Rajecki (1990:4); Lord (1997); Kiesler,
Collins & Miller (1969:5); Baron & Byrne (1994); Oskamp (1991:8-9); Lewin (1986:154) and Nachamias & Nachamias (1992:241), defines “attitude” as follows:

An attitude is a mental or neural state of readiness represented by cognition, feelings and behaviour; organised through experience, deliberate learning and heredity. This exerts a directive or a dynamic influence upon an individual’s response to all objects and situations with which it is related.

The mental or neural state is a hypothetical construct, thus transducers have to be used in order to operationalize the attitude concept.

3.2.3 The tri-componential view of an attitude

According to Lord (1997:222); Oskamp (1991:9); Rajeci (1990:347) and Secord & Backman (1964:100 & 579), attitudes have three fundamental components: the thought or cognitive component, the feeling or the affective component and the actions or behavioural component. Rajeci (1990:347) calls these three components the A-B-C of an attitude.

According to this model, the A represents the Affective (feeling) domain or component; the B represents the Behavioural component and the C represents the Cognitive component. Whenever one holds an attitude, these three components are present in different proportions. Since these attitude components are interrelated, they can be represented in a circular fashion as follows:
3.2.4 Introduction of the three attitude components

- A thought/cognitive component

A thought or cognitive attitude component consists basically of ideas, experiences and beliefs that the attitude-holder holds about the attitude object (Lord, 1997:223). In the case of this study, the attitude holder is the teacher and the attitude object is the technology learning area in Curriculum 2005. The teachers’ thoughts are influenced by the situation (intrinsic and extrinsic) in which he/she finds himself/herself in relation to the implementation of technology education (Rossouw & Lamprecht 1995:4). The teachers’ thought about his/her own thinking (metacognition) will help to shape his/her attitude. The teacher’s mind in this case is in his/her head, that is the teacher thinks with his/her head (Celliers, 2000).
• **An affective or emotional component**

This refers to the feelings and emotions (likes and dislikes) that the technology teacher holds towards the implementation of technology education. This can manifest itself as enthusiasm, commitment and morale. The teacher’s mind in this case is in his/her body that is the teacher thinks with his/her heart (Celliers, 2000).

• **A behavioural component**

This consists of the technology teacher’s actions and tendencies towards the attitude object. The teacher’s mind in this case is in his/her actions. This means that the teacher believes in his/her actions and shows his/her commitment and personality in the actions or behaviour that he/she portrays. However, this does not mean that the teacher is an impulsive actor.

The three attitude objects exist simultaneously in an attitude though in different proportions. There is a tendency to think that thought is superior to action and emotions. The researcher does not agree with this view. In line with the holistic education of the learner as discussed in section 2.8, all three attitude components are important. Their interrelatedness can be compared to a stool with three legs.
Figure 3.2 Stool with three legs

(a)

Should one of the legs break off, the stool will collapse.

(b)


To understand attitudes, the directive and dynamic influence of attitudes with respect to the implementation of technology education will be discussed.

3.2.5 The directive and dynamic influence of attitudes

According to Doob (Kiesler et al, 1969:94) and Lord (1997) and the tri-componenential view, attitudes are not just a passive result of past experiences. Instead, they have two main dynamisms (drives) namely exerting a directive and a dynamic influence.

- Dynamic influence

They impel or motivate behaviour. These are called drives. What drives teachers to do or not to do something? If teachers “downs the chalk” and take to the street in a
strike action, there must have been a driving force behind that – whether legitimate or not. For teachers to implement technology education successfully, there must be some driving force that impels them to do so. For this study, the driving force is related to the teacher’s attitude in terms of the nine research themes.

- **Exerting a directive**

Attitudes guide the form and manner of behaviour into particular channels, encouraging some actions and deterring others. Teachers will engage in a “go slow” or in a strike action depending on the impact that they wish to make. Teachers do not just act, but try to constrain their action so that it can have maximum impact and less or no repercussions to them specifically. Teachers, like anyone else, will endeavour to rationalise their situation to maximise their gain.

### 3.2.6 Factors that influence the strength/depth of attitudes

According to Ehlers (1984:8), the strength of attitudes can be influenced by

- **Extremeness (depth) of the attitude:** The more extreme the attitude, the more resistant it is to change.

- **Multiplexity:** Change is more likely to occur in a multiplex attitude than in a simplex one. But when the change does occur, the change in multiplex attitudes tends to be slighter in comparison to change in simplex attitudes.

- **Interconnectedness of attitudes:** Attitudes linked to other attitudes that are strongly emotional will not change easily.
- **Attitudes and needs**: attitudes that serve strong wants or needs are relatively more stable. When behaviour contradicts attitudes, people will frequently modify their attitudes mainly because the behaviour can be seen and the attitude not, but when people are forced to behave in a certain way, attitudes usually do not change.

Jordaan & Jordaan (1989:48/49) found that attitudes are context-bound. The context in which attitudes occur has an influence on their impact (Jordaan & Jordaan, 1989:48/49). Their strength plays a role in the detection and isolation of attitudes, especially in data collection.

### 3.3 HOW TO DETECT ATTITUDES

From the comprehensive definition of attitudes, it is clear that attitudes are not physical quantities (tangible). Rajeczk (1990:16) and Secord & Backman (1964:98) state that attitudes are psychological or hypothetical entities which can be detected or reflected only indirectly (see section 3.2.3). Since attitudes cannot be discerned directly (due to their psychological nature), an indirect method of detecting them should be used. Thus attitudes will be detected in terms of their operational definitions.

Vockell and Asher (1995:68) describe an operational definition of an attitude as the actions or behaviour characteristic of that attitude. According to Rajeczk (1990:16), an operational definition of stage fright (an attitude) might be sweaty palms or stuttering speech. But sweaty palms and stuttering speech are not only the symptoms, inferences or results of stage fright. The same symptoms can denote other things, depending on circumstances and contexts. Because of the cognitive nature of attitudes,
operational definitions can only be used to denote certain possibilities.

In an attempt to operationalize (detect) the attitude holder and object, this study will discuss the main attitude forming concepts and then the educational philosophies of attitudes in technology education. Finally, a thematic approach will be taken in an attempt to offer tentative answers to the research questions (see section 1.6).

3.4 HOW ATTITUDES MANIFEST THEMSELVES

Attitudes manifest themselves in different ways. This manifestation is related to attitude concepts such as perceptions, perceptual selectivity, self-concept, self-esteem, self-identity, self-ideal discrepancy, stereotypes, personality, indoctrination and motivation.

In an effort to shed some light on teachers’ attitudes in the implementation of technology Education, the attitude concepts will be discussed and defined in relation to teachers’ attitudes in the implementation of technology education, with reference to the nine research themes where necessary.

3.4.1 Perceptions

According to Morris (1973:551), “an important part of how we perceive people has to do with what we think their attitudes are”. How technology education teachers are perceived has to do with what people think their attitudes are. Technology education teachers’ attitudes towards the implementation of technology education are the focus of this study.

Perception is a cognitive process. According to Luthans (1986:154), perception is “a
unique interpretation of the situation, *not an exact recording* of it. It is a cognitive process that yields a unique picture of the world that may be quite different from reality.” Take for example any optical illusion (Hamachek, 1990:195; Morris, 1973:292) and Appendix 3.5. The picture in the example may be an old woman or a boy, depending on the perceiver’s viewpoint. When the individual perceives, he/she paints the object that he/she is perceiving in terms of his/her own situation or viewpoint of reality. Secord et al (1964:13) maintain that the difference between the perceptual world and the real world is vital to the understanding of human behaviour. According to Luthans (1986:156) and Purkey & Schmidt (1987:26), the perceptual process/tradition involves a complicated interaction of selection, organization and interpretation. The basic assumptions of the perceptual tradition (Purkey & Schmidt 1987:30; Luthans, 1986:156 and Kruger et al 1979:98) are reflected below:

**Basic Assumptions of the perceptual tradition**

1. There may be a pre-existent reality, but an individual can only know that part which comprises his or her perceptual world, the world of awareness.

2. Perceptions at any given moment exist at countless levels of awareness, from the vaguest to the sharpest.

3. Because people are limited in what they can perceive, they are highly selective in what they choose to perceive.

4. All experiences are phenomenal in character. The fact that two individuals share the same physical environment does not mean that they will have the
same experiences.

5. What individuals choose to perceive is determined by past experiences as mediated by present purposes, perceptions and expectations.

6. Individuals tend to perceive only that which is relevant to their purposes and make their choices accordingly.

7. Choices are determined by perceptions, not facts. How a person behaves is a function of his or her perceptual field at the moment of acting.

8. No perception can ever be fully shared or totally communicated because it is embedded in the life of the individual.

9. “Phenomenal absolutism” means that people tend to assume that other observers perceive as they do. If others perceive differently, it is often thought to be because others are mistaken or are lying (or are stupid).

10. The perceptual field, including the perceived self, is internally organized and personally meaningful. When this organization and meaning are threatened, emotional problems are likely to result.

11. Communication depends on the process of acquiring greater mutual understanding of one another’s phenomenal fields.

12. People not only perceive the world of the present but they also reflect on past experiences and imagine future ones to guide their behaviour.
13. Beliefs can and do create their own social reality. People respond with feelings not to “reality” but to their perceptions of reality.

14. Reality can exist for an individual only when he or she is conscious of it and has some relationship with it.

15. Perceptions are hard to erode and any attempt at trying to erode a perception will be looked upon with skepticism and can often be labeled as a cover-up.

16. Perceiving is reduced to a perception image which appears in the consciousness of the perceiver.

17. In perception, the perceiver most often reserves to himself or herself a privileged position.

18. Perception is inactive. The subject (i.e. the homunculus inside the brain) passively waits for the information or stimuli coming into the brain. Then it has to accept them all.

19. Perception is receptive. In other words, to observe is to allow stimuli to enter.

20. Perception is solitary. The homunculus or soul or mind in the brain which performs the observation or, in any case, completes it is alone.

Source: Adapted from Purkey & Schmidt (1987:30); Kruger et al (1979:81-98) and Luthans (1986:156).
An analysis of these assumptions reveals that perceptions are, by and large synonymous with attitudes. These are inherent in individuals, whether teachers or not. They have a strong influence on how people view things and how they will subsequently react to stimuli. Teachers’ perceptions of technology education are the determining factor in how they will react to its (technology education) implementation.

3.4.2 Perceptual selectivity

According to Luthans (1986:153), the impression that one person makes on another is based on the perceptions of the second person (the one to be impressed or the impressee). It is thus important for people to be able to influence or bias (sometimes to persuade) the perceptions of those they wish to impress. This bias is easily strengthened by people’s inherent perceptual selectivity. In the quest to change/influence teachers’ perceptions of the implementation of technology education, the manipulation of their perceptual selectivity could be useful. Lord (1997), indicates that perceptual selectivity can be increased by:

- **Intensity**: By increasing the intensity of the stimulus, people’s perceptual selectivity can be turned towards that stimulus. The higher the intensity of the stimulus, the easier it will be perceived. Thus the effort to implement technology education must be intensified. This means that implementation of technology education should not just be left to the teachers. Policy makers, educationists, provincial implementers, school governing bodies, teachers and learners must be part of the advocacy plan about technology education and its implementation.
- **Repetition:** Repeated stimulus is more attention-getting than a single one. Advocating technology education must not be a once-off undertaking. Instead, follow-ups and feedback on the situation in the schools and classrooms must be reported. Reviews, researches, assessments and evaluations of the situation in the implementation of technology education must be published and debated. Media is a very influential source and must be utilized.

- **Experience:** The things that people have previously encountered always affect their perceptual selectivity. People always perceive with reference to a known standard or their background. Some of the good things of the traditional education system should be encouraged because teachers will perceive this change as continuity and not a disruption of their credibility (established ways of working).

- **Expectancy:** In many instances, people see what they expect to see. People mostly want to hear what they like and not always what they ought to hear. A situation must be created where teachers will look forward to the implementation of technology education (i.e. coincide the want to and the ought to for needs to be the same as wants). This can be achieved by considering and dealing with teachers' needs, such as involving them in policy formulation and curriculum development. The thought that teaching is a labour of love and not for gain or profit as if it is a business enterprise will also hopefully dawn upon teachers. The gap between what teachers want and what they ought to have will be narrowed if not bridged.
Relationship with the object to be perceived: The closer the object to be perceived is to people's hearts, the more its perceptual selectivity is increased. One way of bringing technology education to the teachers' hearts is to help them understand what technology really is (technological literacy). The less teachers understand about technology education, the more they will shy away from it.

3.4.3 Characteristics of the perceiver and the perceived

In an attempt to fathom teachers' attitudes, the characteristics of teachers as both perceivers and the perceived must be discerned. Teachers perceive their surroundings and are perceived by the Education Department authorities and by the parents. The characteristics of teachers as both the perceivers and the perceived will help in the philosophical explanation of the teachers' roles. This can be summarised and linked to teacher attitudes towards the implementation of technology education. The general characteristics of the perceiver and the perceived can be tabled as follows:

Characteristics of the perceiver and the perceived

The Perceiver

- The perceiver's knowledge of himself/herself makes it easier for him or her to see others accurately. People perceive with reference to themselves, (the self) whether they be a group or an individual.

- The perceiver's characteristics will affect the characteristics that he or she is likely to see in others.
- The perceiver's acceptance of himself/herself (self-esteem) will more likely result in favourable acceptance of others.

- Good perception is a culmination of a multiple of skills.

**The Perceived**

- The status of the perceived influences the perception of the perceiver and vice versa (reciprocity).

- The perceived is usually placed into categories to simplify the perceiver's perceptual activities. Two common categories used are status and role.

- The perceiver's visible traits will greatly influence the perceived.

Source: Luthans (1986:175)

**3.4.4 Humanistic view on the nature of the teacher**

According to Bugental (Hamachek, 1990:28/29), there are five basic postulates of the humanistic perceptual view. These may provide a frame of reference for understanding teachers' behaviour towards the implementation of technology education.

*As people, teachers supersede the sum of their parts:* A hand or a head is not a person. People are more than just a combination of their different parts. Teachers are therefore more than the accumulation of their various part-functions and roles.

*Teachers have their being in a human context:* Every teacher is a unique being. This
uniqueness is expressed through the teachers’ interrelationships with their fellow human beings, the learners, the parents and colleagues.

**Teachers as human beings are aware:** Every teacher is in a state of awareness about his/her existence, irrespective of the degree of consciousness that he/she may possess. According to Bugental’s reasoning (Hamachek, 1990:29), teachers would “not move from one experience to the next as if experiences are discrete and independent episodes which are unrelated to each other”. Teachers’ behaviours are related to what happened in the past and connected to their hopes for the future.

**Teachers as humans beings have choice:** “Phenomenologically, choice is a given of experience” (Hamachek, 1990:29). To choose or not to choose is a choice. Under any circumstance or experience, a person’s choice cannot be taken away (Buscaglia, 1989).

**Teachers as human beings are intentional:** Whenever teachers make choices, their intention is demonstrated. Teachers “intend” through having purpose, through valuing and through seeking meaning in their lives. Human intentionality is the basis on which their identity is built (Purkey & Schmidt, 1987). This identity or the “self” is one of the sources through which philosophical assumptions about the technology teachers will be made.

### 3.4.5 The self-concept

Today much emphasis is placed on how people perceive themselves, on personal meanings, values, choices, subjective experiences and perceptions, hence the idea of self or the self-concept is one of the focal points for understanding teachers’ attitudes towards
the implementation of technology education.

According to Hamachek (1990:29), the self in “self-concept” “is that very private picture which each of us has regarding who we think we are, what we think we can do and who we think we can be. It is that part of our personality of which we are conscious”.

The self-concept offers a way of taking into account the subjective experiences of each individual teacher and for understanding the meaning of his/her experiences from his or her point of view (Purkey & Schmidt 1987:32). A person can have a positive or a negative self-concept. A teacher with a negative self-concept is usually demotivated (low morale).

The author, Alexander Dumas (Mathe, 1997:87) likens a negative self-concept to a soldier who enlists in the ranks of his enemies and bear arms against himself: “He makes his failure certain by himself being the first person to be convinced of it.” The evaluation of the self-concept is the springboard for self-esteem. Teachers with low or negative self-esteem can sabotage the implementation of Curriculum 2005.

3.4.6 The self-esteem


People with high self-esteem believe themselves to be fundamentally good, capable and worthy while people with low self-esteem see themselves as useless, inept and
untrustworthy. The opinions expressed by people help shape these attitudes, and outsiders’ opinions sometimes bring about changes in a person’s self-esteem (Baron & Byrne, 1994:179).

Teachers must have ownership of the implementation of technology education. After all, teachers are the last line of the implementation of technology education. Teachers can have ownership in the implementation of technology education if they identify themselves with it.

Self-esteem is related to self-worth and self-identity. People with a low self-esteem think of themselves as worthless and have a tendency not to believe in themselves. As a result, they fail to assert themselves. The beginning of success or failure starts from within the individual. That is why teachers who feel worthless will fail to exert themselves.

The difference between teachers’ perception of how they are and what they are capable of achieving is known as the self-ideal discrepancy (Baron & Byrne, 1994:180). The less discrepancy between a person’s self and a person’s ideal self, the higher that person’s self-esteem.

3.4.7 Stereotypes

Stereotypes are oversimplified generalizations about groups of things, sometimes accurate, sometimes inaccurate, sometimes favourable and sometimes unfavourable (Bushnell, 1995:3). Stereotypes are bad if they are untruthful and malicious generalisations about people and things. According to Secord et al (1964:66), attitudes are relevant to the development of stereotypes.
3.4.7.1 Stereotype threats

Aronson, Wilson and Akert (1994:499) describe a stereotype as a generalisation about a group of people in which identical characteristics are assigned to virtually all members of the group regardless of actual variation among the members. Generalizations such as “women are not good at mathematics”, “technology education is for boys” discouraged girls from taking technological careers (Warren, Warren & Warren, 2000). According to French (Volk & Holsey, 1997:10), sex stereotyping begins with a child’s first days and the introduction to gender-specific clothes, toys and parental behaviour.

3.4.7.2 Teacher stereotypes

Teachers are a combination of what they think they are and what the public thinks they are. The teachers’ attitude and behaviour on a daily basis contribute more to their stereotyping than their actual job description. For example South African teachers have been stereotyped as “cheque collectors”. This is a belief that teachers do not do their work but are merely at school to collect their monthly salary cheques.

3.4.8 Personality

According to Morris (1973: 419), personality refers to the characteristic behaviour patterns, emotions, motives, thoughts and attitudes with which individuals consistently react to their environment.

“Implicit Personality” refers to personality traits that can be grouped together in an individual. Aronson, Wilson & Akert (1994:168) believes that the individual traits that
are close to each other are considered to be likely to exist in the same person. The implicit personality can be used to generalize technology education teachers. For example, a technology education teacher who is scientifically inclined would also be expected to be skilful, intelligent and a clear thinker (critical and creative thinking). Similarly, aggression would be associated with a lack of knowledge and defiance while optimism would be associated with hope, faith and determination.

3.4.9 Indoctrination

Hamm (1993:100) contends that indoctrination is pejorative and related to beliefs. Degenhardt (Hamm, 1993:101) states that to indoctrinate is to do anything with the intention of getting people to hold views in a fixed, unquestioning way. Moreover, Hamm (1993:103) states that indoctrination is essentially anti-educational because “it closes the mind where it should be open and it encourages acceptance where criticism is necessary”. Indoctrinators employ such tactics as selective use of evidence; overgeneralization from insufficient instances; use of authority as “stoppers” to discussion; toleration of inconsistency, contradiction and circularity of argument; suppression of counter-evidence; distortion of evidence; use of programmatic definitions; failure to suggest available alternative points of view; lying; disregard for criticism; use of selected criticism; isolation from contrary influence and the use of “loaded” questions (Hamm, 1993:101).

3.4.10 Motivation

Luthans (1986:183) describes a motive as an inner state that energises, activates, directs
and channels behaviour towards goals, and goes on to say that it is a restlessness state, a yen, or a force. Once in the grip of a motive, the organism does something to reduce the restlessness, to remedy the lack, to alleviate the yen, to mitigate the force. This coincides with the theory that motivation is a result of disequilibrium or dissonance. According to Luthans (1986:183), the key to understanding motivation apparently lies in the meaning of and relationship between needs, drives and goals. Teachers’ perceptions of themselves and their environment (i.e. their work) can be influenced so that their motivational level is increased. High motivation is likely to produce favourable attitudes towards the implementation of technology education.

3.5 RESISTANCE TO CHANGE

Monareng (1998:1) maintains that change is uncomfortable and has a tendency to make people feel temporarily ineffective and inefficient. The researcher agrees with this and adds that this discomfort is in many cases the cause of resistance to change.

As Goethe said (Ehlers, 1984:65) “life belongs to the living, and he who lives must be prepared for changes”. This applies to teacher and school, employee and employer, and individual and organization. Organizations are social forces of great influence and their interests are inextricably bound to those of the community they serve. These interests would be well served if the Education Department as an organization could prepare their clients (learners) and employees (teachers) for unavoidable change. The difficulties should not be underestimated, but doing nothing in this regard would be self-defeating. Keeping pace with change is critical for teachers to continue to implement the
curriculum. The researcher sees change as inevitable. As time passes, change inevitably occurs. The mere passage of time in itself, is change. Both the physiological (growth) and the psychological (maturity) changes take place in an individual with the passage of time. Personal growth and maturity should take place together. It is unfortunate that maturity (wisdom) does not always come with age. Sometimes old age comes up all by itself.

In contrast to the view that change is painful, Washington Irving (Scott, 2000:2) believes that the opposite can be true, stressing that there is a certain relief in change even if it is from bad to worse. He cites his experience whilst travelling in a stage-coach that “it is often a comfort to shift one’s position and be bruised in a new place”. A new paradigm change in education may initially be painful but in the end it will seem the right thing to do. Because of its unpredictability, change can lead to temporary ineffectiveness and inefficiency and to the psychological condition known as fear of the unknown.

The unknown is usually feared most and people’s view of the future depends on the circumstances of today. The idiomatic expression “A bird in the hand is worth two in the bush” sums up the condition of fear of the unknown. Sometimes fear of the unknown can be interpreted as a projection of resistance to change. Resistance to change together with fear of the unknown can have a damaging effect on teachers’ execution of their roles and functions.
3.6 ROLES AND FUNCTIONS OF THE TEACHER

3.6.1 The school as an educational arena

The school can be viewed as a stage where teachers fulfil their roles and functions. Each teacher plays more than one part: as a teacher, a facilitator, an educator, a learner and a parent.

Teachers go to school or workshops to learn or upgrade their studies so as to keep abreast of new developments in education. Teachers are the last line in the implementation of any educational endeavour, which in this case is outcomes-based education. However, this is not the kind of educational system that made them. Today they are expected to impart education in a manner unlike the way they themselves were taught. They have to learn and adapt quickly in order to understand and believe in this new education system. Teachers must have a positive attitude about outcomes-based education in order to impart it successfully. Teachers with negative attitudes towards outcomes-based education are not likely to transmit or implement positive attitudes towards it. Teachers are people and also have feelings, emotions and values. They are more likely – knowingly or unknowingly to transmit what they believe in, and not necessarily what they ought to.

The role of the teacher is assumed to be the essential link in the relationship between the teacher's functions and his/her behaviour and attitude.
3.6.2 The functions of the teacher

According to the Centre for Education Policy Development (1995:11), the function and purpose of the teacher is that of diagnosing, mediating and facilitating in the classroom or workshop.

- As a diagnostician, the technology education teacher identifies what learners have experienced before teaching and learning takes place, and then assesses whether learning experience has been successful or not (pre-knowledge).

- As a mediator, the technology education teacher understands what the scientific view is of a concept or field of knowledge and assists the learners in bridging the gap between their view and the scientific/technological view.

- As a facilitator, the technology education teacher structures positive learning experiences which are relevant to the learners.

- As an educator and a parent, the technology education teacher must be aware that teaching and education are not the same. A person can teach a child to steal, but that is not education. The function of the teacher as an educator is to ensure that learners are educated according to the accepted norms and to instil morality in the learners. In this instance, teachers as educators take the place of parents. This is referred to as “in loco parentis”
3.6.3 The roles of the teacher

In conjunction with the functions discussed above, teachers have certain roles to perform within the educational system.

A “role” is essentially a set of expectations imposed on the teacher by other people such as learners, curriculum innovators, other teachers, parents and society in general (Centre for Education Policy Development, 1995:15). A teacher’s role can also be described as the result or difference brought about by the teacher in a classroom.

Teachers play many roles, sometimes simultaneously, and give various interpretations to each role. Caution must be taken when focusing on a role because in reality, a teacher has to reconcile many or all of these roles in any given situation. Some of these roles as depicted in Centre for Education Policy Development (1995:15/16); Department of Education (1996c:7); Jones & Compton (1998:52) and Martin (1998:45) can be discussed as follows:

(1) The teacher as a subject specialist

This role calls for confidence in the knowledge and methodology in order to convey positive attitudes and enthusiasm to the learners. Adequate support must be offered when a new curriculum is introduced. The teacher is seen as a learning mediator, an interpreter and designer of learning programmes and materials and learning area or subject or discipline or phase specialist. Hargreaves (Martin, 1998:45) points out that teachers must guard against “explaining the world to their learners whilst failing to explain to the world
what they do with their learners”. A teacher’s specialization in a subject must relate to the learners. Teachers teach learners and not subjects. The subject or learning area is just a medium through which teachers reach the learners.

(2) The teacher as a classroom director

This is a demanding and complex role. The teacher’s philosophical background and instructional delivery must be consistent with the new changes and requirements. According to Gifford (Burke, 1999:7), “the teacher needs to be in the role of coach, acting as a mentor, assistant and collaborator who, with a blend of empathy, compassion and fun, guides and instructs”. This means that the teacher is not the fountain of all knowledge from which the learners drink. He/she is but a fellow traveller, “a guide on the side of the road and not the sage on the stage” (Burke, 1999:7). In directing the classroom, teachers must:

- manage the time they have for their own talk and for the activities of their learners with an eye to the learning aims of each lesson

- engage in learning activities which produce critical and creative thinking from the learners

- maintain discipline and a positive learning atmosphere

- manage the physical resources such as the equipment and the materials being used by the class and

- promote skills, knowledge and positive values and attitudes.
(3) The teacher as a member of a profession and/or teacher union

As members of a union teachers are expected to abide by the norms and requirements of their union. Some of these requirements are sometimes in contradiction to teachers’ role and commitment. Teachers’ conduct inside and outside school must be exemplary. As professionals, teachers must be role models (Department of Education, 1996c:12; Department of Education 1999:33 – 36)

(4) The teacher as an employee in a bureaucracy

The bureaucratic top-down approach of the Department of Education reduces the teacher’s role to a pawn on a chessboard. As Tennyson wrote in the poem, “The charge of the light brigade”, “theirs is not to reason why; theirs is but to do and die”. Because of red tape, teachers’ innovativeness is stifled. However, the teacher is seen as a leader, administrator and manager for the Department of Education (Department of Education 1996c:7 & 11 and Department of Education 2001d:1/2).

(5) The teacher as a curriculum implementer

As a curriculum implementer, the teacher resembles a researcher, and a lifelong learner, a learning mediator, interpreter and designer of learning materials, assessor and learning area specialist. The teacher’s role as curriculum implementer should also be that of nurturing, supporting, counselling and guiding learning (Department of Education 1996c:7 & 10).
3.6.4 Attributes of a technology teacher

The inherent attributes of a technology teacher are important factors in determining teacher attitudes. Technology education teachers' attributes that are pivotal in the implementation of technology education are discussed (Burke, 1999:7; Van Rensburg, 1991:279–282 and Vrey, 1992:201-216). These attributes include not only how much teachers know, but also how effective they are in communicating their skills and knowledge. Teachers may be very skilful yet lack the ability to impart knowledge in a meaningful way, that is fail to perform their role and functions effectively. Therefore technology education teachers should have the following attributes:

(a) Broad interest: Good technology education teachers must be well informed and up to date. The rapid technological changes make it imperative for teachers to stay abreast of changes taking place. They must read widely on technological and other matters. Technology is related to other learning areas, especially mathematics and science.

(b) Intellectual preparedness: They must study, work, prepare, read widely and practise new techniques and skills; be confident about teaching and have the will for class participation.

(c) Ability to work with learners of all ability levels: The subject matter must be explained to the learners and the learners must be led right up to it so that they may assign their own meaning to it (Vrey, 1992:208).

(d) Ability to control one's temper and emotions: They need a good
disposition and consistent behaviour (in and out of class); tantrums and unpredictable behaviour are not good attributes. Teachers need to be consistent in doing what they are doing. This will show confidence in what they are doing.

(e) Flexibility: They must be ready to concede their fallibility.

(f) Stable and approachable: Learners feel at home with and are not afraid to query and ask a teacher who is stable, friendly and approachable.

(g) Knowledge of their learners: They must take and show an interest in the learners and their problems.

According to Valesey (1998:31), teachers who regularly engage in professional development exhibit positive professional traits and demonstrate enthusiasm.

3.7 PHILOSOPHICAL ASSUMPTIONS ABOUT THE TECHNOLOGY EDUCATION TEACHER

According to Schein (1970:51) and Department of Education (1996d:2/3), the interaction between the teacher as an employee of and the Department of Education as an employer is “a psychological contract through a process of reciprocation”. The Education Department as an organization which has employed the teacher, does certain things to and for the teacher as an employee and refrains from doing others. It pays the teacher, gives him/her status and not so much of job security anymore (redeployment and voluntary packages) and does not ask him/her to do things too far removed from his job

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description. In exchange, the teacher as an employee reciprocates by working hard, doing a good job and refraining from criticizing the Department in public or otherwise hurting its image (bringing the Department’s name into disrepute). The Department of Education expects the teacher to obey its authority; the teacher expects the Department to be fair and just in dealing with him/her. The Department enforces its expectations through the use of whatever power and authority it has. The teacher enforces his/her will through “downing chalk” and defiance by engaging in strike actions. This is accomplished almost invariably with the aid of teacher unions.

The educational authorities make certain assumptions about the teachers and the teachers have certain expectations of the Education Department. These assumptions, whether they be held consciously or unconsciously, they operate as a theory that influences the decisions taken about teachers and the designing of the policies for education. However, the effectiveness of these assumptions depends on the degree to which they fit empirical reality (Schein, 1970:55).

Schein (1970:55) points out that, historically, “the assumptions about people in organizations have largely reflected philosophical positions on the nature of man and have served as the justification for the particular organizational and political system of the time”. Thus the assumptions about teachers, with special reference to the technology education teachers in the newly introduced outcomes-based education, are discussed with reference to Schein (1970:55-79).
3.7.1 The technology education teacher as rational-economic person

According to Schein (1970:55), the assumptions that underlie the doctrine of the rational economic man were derived from the philosophy of hedonism. This philosophy argues that people calculate the actions that will maximize their self-interest and behave accordingly. With reference to the philosophy of the rational-economic person, the technology teachers can be discussed as follows (Schein, 1970:56 and Rossouw & Lamprecht, 1995:3):

- Teachers are primarily motivated by economic incentives and will do what gets them the greatest economic gain such as striking for a salary increase.

- Since the economic incentives are under the control of the government and the Department of Education, the teachers are essentially passive agents to be manipulated, motivated and controlled by the former. The latest threat is the government’s intention to bring Cuban teachers to South Africa.

- Teachers’ personal feelings are essentially irrational and need to be modified so that they do not interfere with their rational calculation of self-interest.

- The Department of Education must endeavour to neutralize and control teachers’ irrational feelings and therefore their unpredictable traits.

Assumptions about teachers can also be looked upon in terms of McGregor’s theory X and theory Y (Van der Westhuizen, 1995:101 & 197; Schein, 1970:56 & 65 and Miller, Roome & Staude, 1985:65-67). McGregor’s theory X paints a gloomy picture of a
human being while the Y theory portrays a human being in a very positive light.

- **McGregor’s theory X applied to technology education teachers**

  When McGregor’s theory X is applied to the technology education teachers, technology education teachers are seen as lazy people who need external force (motivation) to induce them to work.

- **McGregor’s Y theory applied to technology education teachers**

  According to this theory, technology education teachers are seen as persons who can reason and are willing to see to the proper implementation of technology education as a learning area in Curriculum 2005, and little motivation is required.

### 3.7.2 The technology education teacher as a social person

According to the Hawthorne studies (Manstead & Semin, 1996:96 and Baldrige, 1980:201), the need to be accepted and liked by their fellow workers is as or more important than the economic incentives that teacher may receive such as salary or opportunities to get extra remuneration through extra or afternoon classes (see Maslow’s “belonging need”).

Mayo (Schein, 1970:59) developed a set of assumptions about human nature. The researcher has adapted these to suit the situation of a technology education teacher in the implementation of technology education.

(a) Technology education teachers will be motivated by social needs. They
obtain their basic sense of identity through relationships with other teachers.

(b) Technology education teachers are more responsive to the social forces of the peer group than to the incentives and controls of the Department. Hence strikes are organized through peer group pressure and are sometimes seen as not having any relation to economic incentives as they sometimes end without even achieving that.

(c) Technology education teachers are responsive to the educational demands to the extent that these will meet with their social needs and need for acceptance.

3.7.3 The technology education teacher as a self-actualizer

Teaching has lost its meaning of being "a labour of love", which indicated that people took up teaching for the love of it rather than for the financial reward that they should receive in it. According to the researcher, the self-actualizing teacher is the one that seeks to be mature on the job and is capable of being so. This means that he/she can exercise certain autonomy and independence, the adoption of a long-range time perspective, the development of special capacities and skills and greater flexibility in adapting to circumstances (Schein, 1970).

The technology teacher as a self-actualizer is primarily self-motivated and self-controlled. Externally imposed incentives and controls are likely to threaten the teacher and reduce him/her to a less mature adjustment.
There is no conflict between self-actualization and teacher performance. If given a chance, the teacher will integrate his/her own goals with those of the school or the Department of Education.

3.7.4 The technology education teacher as a complex person

The following assumptions justify the complexity of the technology education teacher:

a. The technology teacher is not only a complex person but also highly variable; he/she has many motives arranged in a hierarchy of importance to him/her. This hierarchy is not rigid but can be changed according to situations.

b. The technology teacher is also an outcomes-based education teacher.

c. The technology teacher is technologically literate.

d. The technology teacher is able to integrate other learning areas into the teaching of technology education.

3.8 ATTITUDE THEMES

The researcher designed themes relevant to teacher attitudes in the outcomes-based technology education. The thematic approach was designed to lay down existing theory on the subject and offer tentative answers to the problem of teachers attitudes towards technology education. According to Schumacher & McMillan (1993:8), theory is a forerunner to empirical study and should offer tentative explanations and provide means for verification and revision of the problem at hand. Further, the researcher was of the
opinion that careful analysis of the theory and its empirical support could suggest
relations between the research variables. It would also help to cement recommendations,
guidelines and conclusions that the researcher would make.

3.8.1 How the themes are designed

Nine research themes relevant to this study were designed (Van Rensburg et al, 1996a;
Van Rensburg, 1996b and Chisholm, 2000). These themes were intended to cover the
whole spectrum of teachers’ attitudes towards the implementation of technology
education from curriculum development through classroom practice to the
implementation of educational policies, namely

- Critical and creative thinking
- Gender bias
- Culture, values and beliefs
- Teachers’ working conditions
- Relationship to mathematics and science
- Relationship to other learning areas
- Education policies
- Didactics and assessment
- Entrepreneurship

Figure 3.3 depicts the themes and their relationship to the implementation of technology
education.
Figure 3.3 Research themes in the implementation of technology education

Outcomes-based education arena

1. Critical and creative thinking
2. Gender bias
3. Culture, values and beliefs
4. Working conditions
5. Relationship to Mathematics and Science
6. Relationship to other Learning areas
7. Education policies
8. Didactics and assessment
9. Entrepreneurship

IMPLEMENTATION OF THE LEARNING AREA TECHNOLOGY

Curriculum 2005
3.8.2 Discussion of the themes

THEME 1:

Teachers attitudes towards critical and creative thinking in the implementation of technology education

What is creative thinking?

Creativity is the bringing into being of a new idea (Grossman & Wiseman, 1993:1).
Baron and Harrington (Alter, 1991:162) define “creativity” or “creative” as an attitude, a process and an achievement as in making original products.

What is the relationship between critical and creative thinking?

De Bono (Bailin, 1987:23) and others have attempted to draw a distinction between critical and creative thinking. In reality, there is no dichotomy between the two. When people think critically, they invariably also think creatively and vice versa. Bailin (1987:24) points out that it is very difficult to separate critical and creative thinking as they are two distinct thought processes feeding into each other. To think critically, a person needs to be creative and to think creatively, one needs to be critical.

The importance of critical and creative thinking

Critical outcome (1) states clearly that learners have to acquire critical and creative thinking skills. This makes it imperative for teachers and learners to be critical and
creative thinkers (Pudi, 1999). Lombard & Grosser (2000:10) asserts that since teachers are “most likely to be instrumental in the cultivation of the nation’s cognitive capacity”, they (teachers) should play a pivotal role in the development of critical (and creative) thinking skills and should reflect competence in the ability to think critically (and creatively) themselves. As a result, all teacher education programmes will have to include the teaching of critical and creative thinking. According to Rossouw & Lamprecht (1995:3), people should invest their time, talents and money in the acquisition of thinking skills. The development of critical and creative thinking articulates well with the cognitive domain of holistic development. Critical and creative thinking forms a strong basis for:

- producing knowledge and formulating one’s own viewpoint (Ennis, 1993:44-48);

- collecting, classifying, analyzing, organizing, evaluating and drawing relationships and making conclusions (Department of Education, 1997b:10; Lipman, 1991:38-43 and Pudi, 1999:15);

- solving problems through logic inquiry and evaluative decision making.

**Inclusion of critical and creative thinking in the curriculum**

There are two contrasting arguments about critical and creative thinking within the curriculum. The first favours the process approach, arguing for the teaching of critical thinking as a separate discipline which can be done by means of special development programmes (Lipman, 1991 and Feuerstein, Rand & Hoffman, 1980). The
other argument that favours the infusion approach, views the teaching of critical thinking as an integral part of subject content. According to this view, the teaching of critical thinking skills should not be separated from the subject content (Lombard & Grosser, 2000:12).

**Critical and creative thinking and technology education**

The improvement of the quality of thinking will add value to any educational programme. Pretorius (1998:3) states that all people need and are capable of good thinking in order to increase their intellectual and social potential and to utilize their experience. Specific outcome (1) for technology education (Department of Education, 1997b:10) stipulates that learners should identify and solve problems and make decisions by using critical and creative thinking. This confirms that problem solving should be part of technology education (Middleton, 1995:1).

**Blocks to critical and creative thinking**

Blocks to critical and creative thinking among teachers in the implementation of technology education include (Rudinow & Barry, 1984):

- Teachers' level of education, intelligence and experience
- Egocentricity and resistance to change
- Wishful thinking and self-deception
- Ethnocentricity and cultural conditioning
- Stereotypes, such as the belief that logical thinking (or rather critical and
creative thinking) is not to be expected from women (Legum, 1998:41-43). Women, it is said, are so busy being beautiful that they pay scant attention to the ability to think. That perception is the actual birth of the phrase “beauty and the brains do not go together”. Besides being stereotypical, this is also gender discrimination (sexism) and derogatory to women.

Critical and creative thinking are integral to any worthwhile education. According to Burger (1993:49); Angelo & Cross (1995:6); Rudinow & Barry (1984) and Lombard & Grosser (2000:10), critical and creative thinking do not simply occur as a result of maturation but have to be taught.

**THEME 2**

Attitudes towards gender in the implementation of technology education

**Introduction**

To be or not to be a woman is not the question. The question is how much equality or human rights do women get? Are women’s physical differences from men related to their difference in the mind? Does this difference signify the inferiority of women to men?

**Definition of gender**

The meaning and usage of the word gender in everyday life is unclear. This results in
confusion when writing about gender where scientific accuracy is crucial. In everyday life, gender is construed to refer to females to the exclusion of men. When reference is made to gender issues, the implication is that it is a matter that concerns females only. What then is gender? According to Thompson & Priestley (1996:36), gender means "the accumulation of roles, related behaviour and attitudes which are conventionally associated with males and females in any given society". He further asserts (ibid:36) that the kinds of identities that human beings develop as part of their social identity as either men or women are learned, constructed and built up in the process of living in particular societies with specific cultures at specific points in time. This, then, confirms that gender roles and identities are not "natural" or "determined biologically" but are "socially constructed" and learned in the process of social interaction.

**Discrimination against women**

Gender or the social construction of society shows much prejudice towards women (Moghaddam, 1998:427). The seriousness of this is seen in describing careers such as technological and scientific careers as suited for males only (Gaganakis, 1999:148). Thus to discriminate women against teaching technology education is to refuse them their constitutional right to participate freely in all human endeavours in society. According to the researcher, there is nothing collectively that makes women inferior to men or less ready to teach technology education; no physical, physiological or cognitive disadvantages that prohibits women from participating in technology education; and nothing that makes males better suited to teach technology education. UNESCO (1997:1) points out that assumptions about roles differ widely between and often within
societies, and may differ significantly between the teachers in an individual institution
and society and also change markedly over time.

Women's ways of knowing

According to Belenky (Babbie, 1998:48) and Zuga (1999), the general intellectual
difference between men and women is growing. Belenky distinguishes five perspectives
on women's ways of knowing:

- **Silence**: Some women, especially early in life, feel isolated from the world of
  knowledge, their lives largely determined by external authorities.

- **Received knowledge**: Women feel capable of taking in and holding
  knowledge originating from external authorities.

- **Subjective knowledge**: This perspective opens up the possibility of personal
  and subjective knowledge including intuition.

- **Procedural knowledge**: Some women feel they have mastered the ways of
  gaining knowledge through objective procedures.

- **Constructed knowledge**: Women view all knowledge as contextual,
  experiencing themselves as creators of knowledge, and value both subjective
  and objective strategies of knowing.

Various studies have been conducted on gender issues, including the following:

- Mthethwa-Sommers (Hayson, 1999:3) found that there is still no change in
sexism in township schools and no change in curriculum choices or teacher attitudes.

- Mukasa (ibid, 1999:3) contends that some changes have to begin within the schools rather than at policy level.

- “Although there are more black girls than boys in the schooling system and more girls than boys pass Grade 12, girls’ career direction and participation in the labour market remain gender specific” (Gaganakis, 1999:148).

- “The research on gender issues remains fairly limited” (ibid, 1999:148).

- Many South African scholars have expressed a concern that any attempts to promote gender equality will be lost in the glamour for reform (ibid, 1999:148).

- “The ANC’s Policy Framework for Education and Training, the Reconstruction and Development Programme and several women’s organisations have prioritised the need for research into gender inequality in all spheres of education” (ibid, 1999:148).

- “Girls’ subject choices in education and training reflect expectations of a role in the society which confirms their place in the home and the family” (ibid, 1999:148).

- “Anything that affects the female portion of society also affects the society as a whole. More than fifty percent of human beings are female. When one
large group of persons is frustrated in trying to accomplish its best, the entire society suffers. Discrimination against women not only hurts women, but the entire society” (Bushnell, 1995:3).

However, Pretorius (1998:vii) predicts a future characterized by, interalia, more women in managerial positions.

The self-concept and gender

“Much of the Western feminist literature suggests the inevitable and pervasive marginalization of women and related to this, the poor performance and self image of girls” Gaganakis (1999:148). Gender has a great influence on the self-concept. Dauherty et al, (2000) and Babbie (1998:48) confirm that it is the self-concept of girls that makes them know that they are girls; that is why they think like girls; that is why they behave like girls and that is why they are indeed girls.

Teachers' culture, values and beliefs in the implementation of technology education

Definition of culture

According to Luthans (1986:34), “culture consists of patterns and behaviour acquired and transmitted by symbols, constituting the distinctive achievement of human groups, including their embodiments in artifacts”. Culture can be defined more appropriately as
acquired knowledge that people use to interpret experience and generate social behaviour.

- **Characteristics of a culture**

There is no consensus on the characteristics that exemplify culture. Luthans, (1986:34) states that culture dictates what people learn and how they behave. Luthans (1986:34) compares the significance of culture to the sea: “We are immersed in a sea. It is warm, comfortable, supportive and protecting. Most of us float below the surface; some bob about, catching glimpses of land from time to time; a few emerge from the water entirely. The sea is our culture.” Thus culture provides the larger context in which human messages are interpreted (Feinberg & Soltis, 1999:83).

According to Devenish (1998:224) and James et al (2000:2), education is “inextricably intertwined” with culture and all education involves a cultural dimension and the imparting of a system of values. According to Hamm (1993:35), education is primarily concerned with the provisioning of worthwhile ends or goals or values of life. It is on the basis of this that Peters (Hamm, 1993:34) is emphatic that education is not value-neutral.

**Values in education**

James et al (2000) believes that education values are important to define the moral aspirations of South African democracy as defined in the Constitution of the Country and the Bill of Rights. Values in education encompass diversity of culture (multiculturalism), tolerance, multilingualism, openness, accountability and ‘ubuntu’ (James et al, 2000:1 and Department of Education, 2001d).
However, Hamm (1993:35) alerts of the fallacy to believe that everything that is of value is educational. To this effect he cites eating and relaxing that are of vital importance but are not educational.

**THEME 4**

**Attitudes’ emanating from the teacher’s working conditions**

Teachers’ attitudes towards their working conditions can be depicted in terms of their characteristics as individuals (uniqueness), the job characteristics, and the work situation characteristics (Stoner, 1978:12).

Teachers’ individual characteristics include their needs and interests within their work environment, and their attitudes towards the self, their job and towards aspects of the work.

Job characteristics include what teachers are required to do and not do (degree of autonomy) and whether the job makes teachers feels more like “cogs” in a machine or requires teachers to think and be innovative.

Work situation characteristics include the immediate work environment (e.g. their learners) and the organizational climate created by the Department of Education as employer. Figure 3.4 illustrates these characteristics diagrammatically.
There is growing pessimism in South Africa at present especially among the role players outside education that the unions, in their fight to better teachers' working conditions are in actual fact contributing to the downfall of education. Concern has been expressed that the government tends to pay more attention to the needs of the teacher trade unions than to education (Murray, 2000:10). The researcher maintains that some of the "needs" are actually unreasoned demands. Concern has also been expressed that the government's contribution is race-based and individual effort is not rewarded. However, in the researcher's view, this concern is not well founded because the present efforts by the government are an attempt to deal with existing need to redress the past in order to level the playing field and promote sound education.

That there is a teaching problem cannot be disputed (Garson, 2000:37; Jansen, 2001:4 and Bisseker, 1999:37). This problem is exacerbated by:

- The number of disputes between the Department of Education and the teachers, which have a crippling effect on schools.
• Lack of the culture of learning teaching and service in schools. Schools are no longer safe from violence and vandalism.

• Although HIV/AIDS is not confined to schools, the death of a teacher is a loss to a whole class, and replacement is costly.

• Lack of adequate teacher preparedness to deliver in terms of the implementation of the curriculum.

THEME 5

The relationship between mathematics, science and technology education

A report in the Sunday Times (Barber, 1996) with the heading “World-class dummies” stated that “South African teenagers are among the dumbest when it comes to mathematics and science and technology. Of the 41 countries, developing and developed, whose data met the stiff standards of the project – known as the Third International Mathematics and Science Study – South Africa was bottom of the class in every category.”

A concerted effort is needed to correct this as follows:

• The importance of Mathematics and Science and Technology education must be stressed.
• The importance of technology education in promoting mathematical and scientific knowledge must be instilled in the teachers and learners.

• The emphasis must be shifted to presenting mathematics and science in a technological framework (Daugherty & Wicklein, 2000:1).

• The fact must be taken seriously that the sciences and mathematics are important to the understanding of the processes and meaning of technology and that their integration with technology education is vital for a technologically literate learner (Daugherty & Wicklein, 2000:1).

• Understand that science and technology (Van Rensburg, 1996b:2) were developed from the seventeenth century onwards with the social justification that they were agents of liberation, both intellectually and materially. Science was supposed to provide true knowledge and liberation from superstition and ignorance. Technology, giving some control over the material world, was supposed to liberate people from excessive manual labour, hunger, poverty, inadequate housing, poor health etc. Thus the interrelationship between science and technology must not be undermined or lost.

THEME 6

Technology education’s relationship with other learning areas

How technology education should be taught can be discussed with in terms of its
integration across learning areas or as a stand alone. Technology education (Daugherty & Wicklein, 2000:2) should be considered as an essential characteristic of quality education.

The aim to effectively implement technology education into the school curriculum cannot be achieved until the purpose of technology education is clearly understood. The Department of Education (1997b:10) stresses “the creation of positive attitudes, perceptions and aspirations towards technology-based careers”. Misinterpretations, misrepresentations and stereotypical perceptions of technology education are prevalent because values and attitudes influence people’s views of technology education. New values and attitudes generated by technology education, in turn, influence the teachers and society in general. In their strategic plan, the International Technology Education Association (ITEA) has outlined as one of the association’s major goals the establishment of technology education as the primary discipline for integrating curriculum towards the advancement of technological literacy.

THEME 7

Teachers’ attitudes towards educational policies

Policy is like a map. However comprehensive the map may be, it is unable to tell one everything that will happen to oneself on one’s journey. A map is unable to indicate the latest trends and changes or depict all problems on the journey. Like a computer programme, the map does not offer an alternative in case of the unforeseen. Maps, like
computer programs are rigid without human intervention. Policy is left open ended for that deliberate intervention. The existing literature on the impact of policy on schools in South Africa is both inadequate and weak due to a lack of research in the topic. According to Chisholm (1999b:87), the weakness relates to

- reading off and extrapolation of consequences from intended policy;

- assessment of policy in terms of whether it has been effectively implemented or not;

- reading of policy as being without history, context and precedent.

Policy and its implementation do not conform to the cause and effect rule. However, Jones & Compton (1998:52) maintains that for teachers to accept policy changes, they must have an acknowledged, legitimated and rewarding role in policy formulation. Assessment of policy should not be guided by the effectiveness of its implementation but by what it stipulates and intends to achieve. According to the researcher, this is because policy does not emanate from a vacuum but is a depiction of what people do and believe, that is the procedure, habit rules and regulations.

**THEME 8**

**Didactics and assessment**

The education system at present in South Africa still has many shortcomings, including
shortages of schools, classrooms, textbooks and learning materials and a large number of teachers without proper educational qualifications (Infrastructure Report, 2000:40). This will obviously have an impact on the transmission (didactics) of technology education especially within the outcomes-based education paradigm.

There is also uncertainty in terms of the following aspects relating to instruction, learning and assessment in as far as technology education is concerned:

- Allocation of marks to a finished product/artifact

- The provision of theory and practice. Should technology education provide more theory than practice? Is the division between theory and practice necessary?

- Simulation of technological systems by class activities might be inadequate.

- Is the process in a technological endeavour more important than the product or not?

- Is thinking more important than doing in technology education?

- How should technology education be taught? According to Montague (1998:4), in teaching technology education, the method and not necessarily the content must be prioritized. The message is in the drawing out and not the pumping in. Holmes (1998:4) concurs, stating that the main part of intellectual education is not the acquisition of facts but learning how to make facts live.

- Jeevenantham (1999:51) maintains that both content and context are necessary in
the curriculum and further stresses that both the content and the context must be Africanized.

**THEME 9**

**Entrepreneurship as part of technology education**

Say (Drucker, 1994:19) describes entrepreneurship as a process of shifting economic resources out of an area of lower and into an area of higher productivity and greater yield. This is achieved through a process of innovation. Drucker (1994:18) describes innovation as "the specific tool of entrepreneurs, the means by which they exploit change as an opportunity for a different business or a different service" and goes on to say that this innovation can be learned and practised. He stresses the need for entrepreneurs to search purposefully for the sources of innovation, the changes and their symptoms that indicate opportunities for successful innovation. With reference to technology and technology education, Sawyer (1978:27) indicates that the sources of innovation are not only restricted to commercial activities but can equally well take place in other spheres as diverse as medical care, warfare and education such as the Bushman Literacy Project of the South African Defence Force as discussed in Van Rensburg et al (1996a:5) where sewing machines were supplied to teach women to sew and make clothing.

According to De Vries (1997:34), entrepreneurship and technology are closely related. But entrepreneurship in technology education is achieved when a technological activity is used for economic achievement, such as selling a technological product or using a
technological product to shift economic yields from a position of low to a position of high. Technology is the use of resources (both material and human) to achieve needs and wants that include economic and survival needs. According to Pretorius (1998:vii), the future will be characterised by the need for entrepreneurship.

3.9 RÉSUMÉ

This chapter discussed teachers' attitudes with particular reference to the implementation of the technology learning area in Curriculum 2005. Teachers' attitudes to policy stipulations for technology education and themes in the implementation of technology education were also examined.

Chapter 4 describes the empirical research, including data collection, analysis and interpretation. Findings are also discussed.
CHAPTER 4

Empirical study

4.1 INTRODUCTION

The rationalistic approach makes use of models and hypotheses to guide empirical research. According to Neale and Liebert (1980:7), empirical research is the foundation of all scientific research and refers to any activity that systematically attempts to gather information through observations and procedures that can be repeated and verified. The empirical approach relies on observable evidence for its objectivity. That is why Sir Francis Bacon (Matheson, Bruce & Beauchamp, 1978:7) stated that the empirical truth about the number of teeth that the horse has is to be found by looking in the horse’s mouth and not in stacked up information and knowledge. The empirical study for this research wished to examine teacher attitudes towards the implementation of technology education.

4.2 EMPIRICAL RESEARCH DESIGN

The empirical study was conducted to establish and gain an insight into teachers’ attitudes towards the implementation of technology education as a learning area in Curriculum 2005. With reference to Van Rensburg et al. (1996a:6), concepts and terminology used, the frame of reference, and how questions are asked influenced the study. The design for this study included both qualitative (e.g. thematic and content analysis) and quantitative or statistical analysis (Mouton & Marais, 1993:67). Figure 4.1
depicts the empirical research design.

Figure 4.1 Empirical research design process

Because this study was concerned with attitudes, and attitudes are composed of feeling (Affective domain), the Behaviour and the Cognition (see section 3.2.3 - the ABC of an attitude), the researcher saw the need to incorporate both qualitative and quantitative approaches in the data collection and analysis. The quantitative approach (also called the positivist view) is concerned with human behaviour and is aimed at uncovering general laws of relationships/or causality (Welman & Kruger, 1999:8). The assumption is that the formation of attitudes by technology education teachers towards the implementation of technology education is a relationship between the technology education teachers and the nine research themes of this study. In the exploratory study (see section 4.2.1) for this research, technology education teachers' feelings and cognition are studied.
qualitatively. The qualitative approach (also called the anti-positivist view) is concerned with understanding human behaviour from the perspective of the people involved (Welman & Kruger, 1999:8).

This study assumed a relationship between teachers’ attitudes and the implementation of technology education. However, for this study to infer a causal relationship between the stated variables, the cause had to precede the effect. According to (Welman & Kruger, 1999:33), in human behavioural sciences, “it is often difficult if not impossible to meet this requirement.” The existence of a correlation between teachers’ attitudes and the implementation of technology might not necessarily indicate that they (teacher attitudes) caused the successful implementation of technology education and vice versa. Positive teacher attitudes might, for example, cause successful implementation of technology education. The successful implementation of technology education in turn, might affect teachers’ attitudes positively so that there is a mutual relationship (reciprocity). Establishing a causal relationship necessitates using a third, or control, variable. In this study, the nine research themes were the third variable. The nine research themes could be controlled to give the researcher a firmer grip on the study of teachers attitudes and the implementation of technology education. The results were then synthesized into comprehensive outcomes or findings. Conclusions were drawn and recommendations made from the findings.

4.2.1 Exploratory study

An exploratory study was conducted to confirm the presence of negative attitudes or problems in the implementation of technology education in the outcomes-based
education paradigm and to provide information for the questionnaire (to sketch a broad picture of perceptions of and attitudes towards technology education).

An interview schedule was drawn up for the exploratory study (see Appendix 4.9). The questions in the interview schedule were open-ended to allow for follow-up questions or discussion. The sample for the exploratory study consisted of teachers, principals, technology education facilitators and school governing body (SGB) members. This sample was taken at random in the Witbank area in the Mpumalanga province. These individuals did not form part of the main empirical research.

Table 4.1 A sample of the exploratory study

<table>
<thead>
<tr>
<th>Type of respondents</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers</td>
<td>10</td>
</tr>
<tr>
<td>Principals</td>
<td>6</td>
</tr>
<tr>
<td>Technology Education Facilitators</td>
<td>3</td>
</tr>
<tr>
<td>School governing bodies</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
</tr>
</tbody>
</table>

The exploratory study revealed

- Skepticism about the outcomes-based technology education and its implementation. This might be because of lack of understanding technology education and what it really entails.

- The need for teacher training for the proper implementation of the outcomes-based technology education.

- A general concern about the technical terms used in technology education and in the
outcomes-based education.

- Dissatisfaction concerning the formulation of policies for the outcomes-based education and technology education.

- A general worry about lack of classrooms, large class sizes; lack of resources; poverty etc.

- A feeling that the outcomes-based education is a first world education model that will not work in a third world country like South Africa. A perception that pupils who are taking technology education are being used as guinea pigs.

- A strong belief that educational standards will be lowered by the introduction of the outcomes-based education and technology education.

**Summary:**

The exploratory study showed that there is a lot of dissatisfaction and apathy in as far as the implementation of the outcomes-based education with specific reference to technology education is concerned. This dissatisfaction is arguably the result of the drop in teachers’ morale. Many aspects of the outcomes-based education are according to the findings of the exploratory study complex and relatively hard for teachers to fathom. It is this complexity that will make teachers feel ‘temporarily incompetent and threatened that their authority will be eroded’ (Monareng, 1998:1). This fear may culminate in negative attitudes (defence mechanism) towards the implementation of technology education and the outcomes-based education.
4.2.2 Connection between the exploratory study conducted and the empirical study

It is important to note that the exploratory study was used as a forerunner to the empirical study. The findings of the exploratory study were used to design a questionnaire for the empirical study. Once constructed, this questionnaire was piloted.

4.2.3 The pilot study

The pilot study sometimes referred to as pre-testing (Bailey, 1987:141) is the final and important stage in questionnaire construction. The pilot study questionnaire for this research was administered to a few respondents that were not to be part of the main study. The purpose of the pilot study was to test and detect any flaws with respect to the content of the questionnaire. The following were revealed from the pilot study:

- A few grammatical mistakes
- Ambiguity in some questions
- Double-barreled questions

In the final questionnaire (see Appendix 4.1) that was drawn up, problems associated with the understanding of the questions, ambiguities, biases and grammatical mistakes were eliminated.

4.2.4 Permission to carry out the study

- **Mpumalanga**: Permission was sought from and readily given by the authorities (see Appendix 4.3 and Appendix 4.4).
- **Gauteng**: The researcher had difficulty in obtaining permission. The Deputy
Director General's office did not respond to the researcher's letters requesting permission to conduct the study in the Gauteng province (see Appendix 4.5). After much delay and efforts, the researcher did not obtain permission from the Gauteng Department of Education to conduct the study in the province. Consequently only 0.9% of the respondents came from the Gauteng province.

- **Northern Province:** The researcher received no reply to his letter to the Education Department for the Northern province (see Appendix 4.6). Since permission was not granted or denied, the researcher exploited the indecision and went ahead with the empirical study in the province.

### 4.2.5 Problems of data collection

According to Ribbens (1994:114), "Science is essentially *verstehen*, or an understanding which arises out of, and is integrated into a critical reflective commitment to problem solving." With respect to the South African situation, the researcher found data collection inhibited by disparities emanating from the apartheid legacy. The lack of exposure to researchers and the general dissatisfaction with, and apathy towards the transitional state of affairs in education have the potential to contaminate data collection. Propaganda is rife and any questionnaire or investigation is viewed with skepticism. Pretorius (1998:v) points out that the general tendency is to politicise everything that occurs.

Moreover, schools are not homogenous. Public and private schools differ. The most
conspicuous difference is among public schools themselves, especially in terms of resources, cultural biases and teacher-pupil ratios.

4.2.6 Research instruments

4.2.6.1 The interview

Kvale (1996:xvii &19) describes an interview as a specific form of conversation where the outcome is a co-production of the interviewer and the subject. However, (Kvale, 1983:172) points out the impossibility of having a general theory of interviews (scientific) because it (interview) is more an art than a science.

The type of interview used in this study is the “non-scheduled structured interview.” It is a structured interview because a list of issues and questions for investigations are drawn up prior to the interview (Bless & Higson-Smith, 1995:105). It is a non-scheduled interview because the interviewer is free to formulate other questions as judged appropriate for a given situation. Respondents are not confronted with already stated definitions or possible answers, but are free to choose their own definitions, to describe a situation or to express their particular views and answers to problems (Bless & Higson-Smith, 1995:105).

4.2.6.2 The questionnaire

According to Bailey (1987:141), the key word in questionnaire construction is relevance. Relevance is achieved (Bailey, 1987:107) when the operational definitions match the theoretical concepts. This means that the questions (items) and the questionnaire, besides
being relevant to the individual respondent, must also measure the goal(s) of the study adequately. (Lewin, 1987:76) points out that the operational definitions specify the operations and measurements which will be used to define a term (or an objective) in a particular study. Nachmias and Nachmias (1992:239) point out that the purpose of the questionnaire is to translate the research objectives into specific questions or statements. These questions and statements will provide data for answering or solving the problem. Based on the foregoing, a questionnaire was compiled with the objective of eliciting teachers’ attitudes towards the implementation of the technology learning area in curriculum 2005. The researcher endeavoured to use simple language (English) and to minimize the use of technical terms. Although one of the official languages for the majority of the South African population, English is not their first language.

The questionnaire was only written in English. There was no attempt to translate it into the different languages of the respondents as that would have been time consuming and would probably introduce another bias through translation. The problems or limitations resulting from the use of only one language – English in the questionnaire far outweighed the difficulty and time factor in translating the questionnaire.

4.2.6.3 Rating

A five-point Likert scale was used to rate and answer questions (Section B) (see Appendix 4.1). The essence of the Likert scale is to increase the variations in the possible scores by coding from “strongly agree” to “strongly disagree” instead of merely “agree” or “disagree” (Duagherty et al, 1999 and Bailey, 1987:346). The responses were rated so that a higher score for a particular statement indicated stronger agreement with
the attitude (5 for either strong agreement with a positive statement or strong
disagreement with a negative one, and 1 for strong disagreement with a positive
statement or strong agreement with a negative one). This situation can be depicted as
follows:

<table>
<thead>
<tr>
<th>Response</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly agree</td>
<td>5</td>
</tr>
<tr>
<td>Agree</td>
<td>4</td>
</tr>
<tr>
<td>Uncertain</td>
<td>3</td>
</tr>
<tr>
<td>Disagree</td>
<td>2</td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>1</td>
</tr>
</tbody>
</table>

The middle response, coded 3 depicts a state of indecision or do not know.

4.3 VALIDITY AND RELIABILITY

Even in the exact sciences (Ribbens, 1994:115), it is difficult to capture the essence of
reality. She further supports this standpoint when she makes an example that what is
called a particle in one moment in science is also called a wave the next moment. The
researcher would like to add that electricity is also at one moment the flow of holes
(called conventional current) and the next moment it is called the flow of electrons or
negative charges (electron flow). One’s viewpoint also makes a difference. A pole
standing upright has a height but when the same pole is lying on the ground, its length is
measured. The distance from one end of a pole to the other is at one stage a height and at
another a length. But this is evidently because of the changing position of the pole and
not its characteristics. Thus it is clear that reality, just like truth is relative (cannot be
value-free).
People once believed that the earth is flat and that was to them the truth. Now science has proved that the earth is spherical (global). This is the new truth until further information proves it otherwise. Thus it is clear that reality, like truth and data collection are relative phenomena. This relativity is the direct cause of subjectivity and misinterpretation of data. Ribbens (1994:115) points out how difficult it is for people to "part the veil of prejudice and preconception" so as to present things as they are; whether that be in an interview or when one is privately answering a questionnaire. What one gets from the respondents is not nature or reality itself, but a nature exposed to our method of questioning. Understanding something is to give up some other way of conceiving it (Ribbens, 1994:115). The elusiveness of reality is emphasized by Zuga (Ribbens, 1994:115), who states that "reality is what we take to be true. What we take to be true is what we believe in. What we believe in is based upon our perceptions. What we perceive depends upon what we look for."

The scientific methodologies for this study have been designed to narrow the gap between reality as is and as it should be.

4.3.1 Reliability

The reliability of any research depends on its repeatability or replicability (Vockell & Asher, 1995:88/89 and Bailey, 1987:235/236). A score is unreliable to the degree that it contains measurement error (i.e. to the extent that it has been influenced by irrelevant chance factors). The questionnaire’s reliability was tested to determine which questions did not measure consistently what they set out to measure.
The questionnaire was statistically analyzed to determine the degree of reliability of questions 9 to 45 individually. This revealed a high alpha value (>0.4921) for the following questions:

<table>
<thead>
<tr>
<th>Question</th>
<th>Alpha value</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>0.5458</td>
</tr>
<tr>
<td>17</td>
<td>0.5160</td>
</tr>
<tr>
<td>25</td>
<td>0.5233</td>
</tr>
<tr>
<td>29</td>
<td>0.5373</td>
</tr>
<tr>
<td>38</td>
<td>0.5014</td>
</tr>
</tbody>
</table>

The high alpha values from these questions indicated their low reliability, which meant that they did not measure consistently what they set out to measure. As a result, the overall reliability of the questionnaire could be increased if these questions were deleted.

In addition, the reliability of the attitude scale used was statistically analyzed. The attitude scale had a good reliability coefficient alpha of 0.6048. This means that the scale measured attributes of teachers' attitudes towards the implementation of technology education consistently. The reliability test was necessary but not sufficient until the validity analysis was confirmed.

4.3.2 Validity

An instrument may be reliable in obtaining information but the information collected may not be valid. Neale and Liebert (1980:30-39) state that validity is the ability of the
instrument or the study to measure reliably the right thing. In the behavioural sciences two types of validity tests are often used, namely the validity of tests or measures used in the research and the validity of the inferences (for example causal inferences) that researchers make from their research findings. The validity of the tests and measures of this study were represented by the correlation among the research themes (see Appendix 4.7). The significant relationships (as shown by the Pearson correlation value at the 0.01 level) between the various themes meant that they were measuring similar attributes about teachers’ attitudes in the implementation of technology education. This indicated the validity of the scale in measuring teachers’ attitudes towards the implementation of technology education. The validity of the inferences conducted in the interpretation of data was based on the theory (literature review), interview content and the researcher’s experience in the field of technology education.

4.4 DEMOGRAPHIC INFORMATION

The demographic information for this study was needed for a comparative analysis of the respondents’ attitudes. This was placed in section A of the questionnaire to allow the respondents the opportunity to answer objective questions before ones requiring more subjective answers. Table 4.1 presents a summary of the demographic data.
Table 4.2 Respondents’ demographic data

<table>
<thead>
<tr>
<th>1. Province</th>
<th>Respondents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mpumalanga</td>
<td>157</td>
<td>68.5%</td>
</tr>
<tr>
<td>Limpopo</td>
<td>70</td>
<td>30.6%</td>
</tr>
<tr>
<td>Gauteng</td>
<td>2</td>
<td>0.9%</td>
</tr>
<tr>
<td>Total</td>
<td>229</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Gender</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>106</td>
<td>46.1%</td>
</tr>
<tr>
<td>Female</td>
<td>124</td>
<td>53.9%</td>
</tr>
<tr>
<td>Total</td>
<td>230</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. Age</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>20-30</td>
<td>27</td>
<td>11.7%</td>
</tr>
<tr>
<td>31-40</td>
<td>125</td>
<td>54.1%</td>
</tr>
<tr>
<td>41-50</td>
<td>71</td>
<td>30.7%</td>
</tr>
<tr>
<td>51-60</td>
<td>8</td>
<td>3.5%</td>
</tr>
<tr>
<td>Total</td>
<td>231</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4. Highest qualifications</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Certificate</td>
<td>17</td>
<td>7.4%</td>
</tr>
<tr>
<td>Diploma</td>
<td>143</td>
<td>62.2%</td>
</tr>
<tr>
<td>Degree</td>
<td>52</td>
<td>22.6%</td>
</tr>
<tr>
<td>Postgraduate</td>
<td>18</td>
<td>7.8%</td>
</tr>
<tr>
<td>Total</td>
<td>230</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5. Did Mathematics up to...</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary school</td>
<td>14</td>
<td>6.2%</td>
</tr>
<tr>
<td>High school</td>
<td>61</td>
<td>26.9%</td>
</tr>
<tr>
<td>College</td>
<td>137</td>
<td>60.3%</td>
</tr>
<tr>
<td>University/Technikon</td>
<td>15</td>
<td>6.6%</td>
</tr>
<tr>
<td>Total</td>
<td>227</td>
<td>100%</td>
</tr>
<tr>
<td>7. Fellow TECHED teachers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td>One</td>
<td>122</td>
<td>58.4%</td>
</tr>
<tr>
<td>2-3 times</td>
<td>56</td>
<td>26.8%</td>
</tr>
<tr>
<td>4-5 times</td>
<td>15</td>
<td>7.2%</td>
</tr>
<tr>
<td>Over 5 times</td>
<td>16</td>
<td>7.6%</td>
</tr>
<tr>
<td>Total</td>
<td>209</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>8. TECHED implementers</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>200</td>
<td>93.0%</td>
</tr>
<tr>
<td>Once</td>
<td>9</td>
<td>4.2%</td>
</tr>
<tr>
<td>2-4 times</td>
<td>2</td>
<td>0.9%</td>
</tr>
<tr>
<td>Over 5 times</td>
<td>4</td>
<td>1.9%</td>
</tr>
<tr>
<td>Total</td>
<td>215</td>
<td>100%</td>
</tr>
</tbody>
</table>

Discrepancies between totals are due to adjustments done by the statistician who did the calculations to accommodate inconsistencies during data collection.

**Explanation of the demographic information**

The demographic information could have an influence on the teachers’ attitudes especially in the implementation of technology education.

(1) **Province in which the respondents are located.** Political and other provincial influence (drive) has a bearing on the way people think about themselves and the changes taking place in South Africa. Some provinces are more rural and poorer than others, which could affect how teachers accept and administer outcomes-based education with specific reference to technology education.

(2) **Gender.** Because of cultural differences, values and beliefs, the issue of gender equality is highly significant. In many cases gender has a major
impact on people’s attitudes. For example, there are still people who believe that Mathematics, Science and Technology are for boys while girls have to do Home Economics and play with dolls.

Contrary to Gloeckner (1998:1) that the moral dilemma is continuing in technology education because of fewer females taking technology education, the empirical study for this research revealed the opposite. It was found that 54% of the technology teachers were females and 46% were males.

(3) Age. Age has a significant effect on people’s attitudes and behaviour.

People’s behaviour is generally classified according to their age. An excerpt from an unknown Reader’s Digest made the assertion: “Like wine, you improve with age.” Hamachek (1990:41) depicts characteristic behavioural trends according to specific age groups. For example, people who are in the twilight of their lives will most probably think altruistically than ones who are still young. The list below is an adaptation of Hamachek’s categorization of age groups and relative behaviour.

Age categorization and relative behaviour

(A) Early adulthood (18-35 years)

- Selecting a partner
- Learning to live with a marriage partner
- Starting a family
- Raising children
• Managing a home
• Getting started in an occupation
• Taking on civic responsibility
• Finding a congenial social group

(B) Middle age (35-60 years)

• Achieving adult, civic, and social responsibility
• Establishing and maintaining an economic standard of living
• Assisting teenage children to become responsible and happy adults
• Developing adult leisure-time activities
• Relating to one’s spouse as a person
• Learning to accept and adjust to the physiological changes of middle age
• Adjusting to aging parents

(C) Later life (60+)

• Adjusting to decreasing physical strength
• Adjusting to retirement and reduced income
• Adjusting to death of spouse
• Establishing an explicit affiliation with one’s age group.
• Meeting social and civic obligations
• Establishing satisfactory living arrangements.

Source: Adapted from Hamachek (1990:41)
The study found that most of the teachers (54%) were in the age group 31 to 40 years, and 30.7% were in the age group 41 to 50 years. Most of the respondents (80%) were in the age group 31 to 60 years.

(4) **Academic qualifications.** Without a doubt, the level of education reached makes a difference in the way one thinks about himself/herself and others. Sometimes this thinking or perception meets the expectations and in other cases it defies them. That is when attitudes come to play a part. In general, the level of education has an influence on the attitude (thought, feeling and behaviour) of the teacher. This is one aspect that cannot be neglected when dealing with teacher attitudes towards their job as teachers. The study found that the majority of teachers (92%) had a diploma and higher qualification.

(5) and (6) **Academic qualifications in Mathematics and Science.**

Did Mathematics up to…

Did Science up to…

According to Pretorius (1998:vi), “modern economies have their roots established in science and technology”. Linked to the teacher’s academic qualifications, academic specialization in subjects such as Mathematics and Science are important for the technology teacher.

Teachers who have a negative attitude towards mathematics and science will most probably also exhibit the same characteristics for technology education due to the relationship that exist between them. College and university
achievement in mathematics is 67% and in science is 53.1%.

(6) **Fellow technology education teachers.** Just as learners are expected to work in groups or teams, it is important for technology education teachers to network. This networking can be in the same school or in schools in the vicinity. The more technology teachers come together to discuss technology education, the more positive their attitude towards it will be. Most of the respondents (57.8%) indicated that they had at least one other fellow technology education teacher in the same school with whom they could network (share views, questions and problems).

(7) **Support by technology facilitators from the department.** Teachers need constant support in technology education particularly because it is a new learning area. Frequent visits and relevant assistance by technology facilitators from the provincial Department of Education would help teachers to understand technology education. According to the empirical data, 90.9% respondents indicated that no facilitators visited their schools to give them support in technology education.

Section A of the questionnaire dealt with respondents’ personal details. It is against this personal information that certain human phenomena with specific reference to teacher attitudes in the implementation of technology education were interpreted. More often than not, one’s behaviour is a direct result of one’s background (demographic information).
4.5 RESEARCH THEMES AND STATEMENTS

In order to examine and assess teachers’ attitudes towards technology education, the researcher divided the attitudes into themes that are relevant to the implementation of technology education. The themes were selected to cover aspects of the implementation of technology education from policy formulation through to the conditions of classroom practice. Care was taken to make the themes as distinct from each other as possible in order to avoid overlapping, which would cause unnecessary confusion when analyzing and interpreting the themes. Having divided the themes, the researcher then developed statements for each theme to probe (elicit) teachers’ attitudes towards the implementation of technology education with respect to each theme. Table 4.3 represents the themes and the statements covering the various themes.

**Table 4.3 Themes and statements measuring specific themes**

<table>
<thead>
<tr>
<th>Themes</th>
<th>Questions/statements measuring the theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Critical and creative thinking</td>
<td>12; 24; 38 &amp; 39</td>
</tr>
<tr>
<td>2. Gender bias</td>
<td>9 &amp; 22</td>
</tr>
<tr>
<td>3. Culture, values and believes</td>
<td>11; 15; 21; 27; 34; 35; 40; 41; 45</td>
</tr>
<tr>
<td>4. Working conditions</td>
<td>10; 31; 32; 33; 37; 43 &amp; 44</td>
</tr>
<tr>
<td>5. Relationship to Mathematics and Science</td>
<td>23 &amp; 39</td>
</tr>
<tr>
<td>6. Relationship to other Learning Areas</td>
<td>17; 18; 25; 27; 28; 29 &amp; 39</td>
</tr>
<tr>
<td>7. Education policies</td>
<td>14; 16; 26; 30; 36 &amp; 45</td>
</tr>
<tr>
<td>8. Didactics and assessment</td>
<td>10; 13; 14; 20; 21; 37; 38 &amp; 42</td>
</tr>
<tr>
<td>9. Entrepreneurship</td>
<td>19; 27 &amp; 39</td>
</tr>
</tbody>
</table>

It is evident from the table that some questions/statements are used in more than one theme. Each statement or question will be interpreted according to the theme in which it is located. For example, the interpretation of question 14 in theme 7 may differ from the
interpretation of the same question (14) with respect to theme 8. Common questions and their relevant themes are depicted below:

<table>
<thead>
<tr>
<th>Question/statement</th>
<th>Corresponding themes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question 10</td>
<td>Themes 4 &amp; 8</td>
</tr>
<tr>
<td>Question 14</td>
<td>Themes 7 &amp; 8</td>
</tr>
<tr>
<td>Question 21</td>
<td>Themes 3 &amp; 8</td>
</tr>
<tr>
<td>Question 27</td>
<td>Themes 3, 6 &amp; 9</td>
</tr>
<tr>
<td>Question 37</td>
<td>Themes 4 &amp; 8</td>
</tr>
<tr>
<td>Question 38</td>
<td>Themes 1 &amp; 8</td>
</tr>
<tr>
<td>Question 39</td>
<td>Themes 1, 5, 6 &amp; 9</td>
</tr>
<tr>
<td>Question 45</td>
<td>Themes 3 &amp; 7</td>
</tr>
</tbody>
</table>

A total of eight questions are each used more than once among the nine research themes.

4.6 ANALYSIS AND INTERPRETATION

Statistical data analysis is the culmination of a long process of problem formulation, instrument construction and data collection (Bailey, 1987:370). The presentation of data in the form of tables simplifies analysis and interpretation. The purpose of data analysis is to translate information gathered into a form which allows the researcher to develop “a thick description of the findings” (Mathe, 1997:169).

A three-point Likert scale, combining “agree” with “strongly agree” and “disagree” with “strongly disagree” as in a funnel (Nachamias & Nachamias, 1992:250), was used to narrow the focus and analyze and interpret the data (see figure 4.2).
Figure 4.2 Funnel technique: reduction of the Likert scale

Step 1: The 5-point Likert scale viz. Strongly Agree; Agree; Uncertain; Strongly disagree and disagree

Step 2: The 3-point Likert scale viz. Agree; Uncertain and Disagree

The funnel technique demonstrates a shift from the general to the specific.

The themes were analyzed and interpreted according to the corresponding questions or statements as depicted in table 4.2. Responses above 10% were considered significant and responses below 10% represented a small minority of the respondents and were consequently considered insignificant.

4.6.1 Theme 1: Teachers’ attitudes towards critical and creative thinking skills

The purpose of this theme was to establish a relationship between critical and creative thinking skills and teachers’ attitudes in the implementation of technology education. Critical outcome (1) for outcomes-based education stresses the importance of critical and creative thinking skills. It is imperative for teachers to be critical and creative thinkers. In technology education, critical and creative thinking skills are applied when learners are engaged in problem solving.

Question 12. It is imperative that the technology education teachers should posses
critical and creative thinking skills.

**Table 4.4 Question 12 responses (Theme 1)**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>9</td>
<td>4.0</td>
</tr>
<tr>
<td>Agree</td>
<td>13</td>
<td>5.7</td>
</tr>
<tr>
<td>Uncertain</td>
<td>12</td>
<td>5.2</td>
</tr>
<tr>
<td>Disagree</td>
<td>83</td>
<td>36.2</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>112</td>
<td>48.9</td>
</tr>
<tr>
<td>Total</td>
<td>229</td>
<td>100</td>
</tr>
</tbody>
</table>

**Reduction of data**

- Total Agree : (4.0 + 5.7) = 9.7
- Uncertain      : 5.2
- Total Disagree: (36.2 + 48.9) = 85.1

**Analysis and interpretation**

Most respondents 85.1% disagreed with the statement.

The cultivation of critical and creative thinking indicated by critical outcome (1) is important for technology education and for Curriculum 2005 (The Technology Learning Area Workshop Committee Report, 1996:3; Department of Education, 1997a:16 and 1997b:10). Technology education teachers are expected to be critical and creative thinkers. Teachers or leaders cannot impart or encourage in others what they do not have or do not themselves deem necessary. The majority of the responses to this statement contradicted critical outcome (1) which indicated that the respondents have a negative
attitude towards critical and creative thinking.

**Question 24.** Technology education should have more to do with thinking than doing.

**Table 4.5 Question 24 responses (Theme 1)**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>20</td>
<td>8.8</td>
</tr>
<tr>
<td>Agree</td>
<td>39</td>
<td>17.3</td>
</tr>
<tr>
<td>Uncertain</td>
<td>23</td>
<td>10.2</td>
</tr>
<tr>
<td>Disagree</td>
<td>93</td>
<td>41.1</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>51</td>
<td>22.6</td>
</tr>
<tr>
<td>Total</td>
<td>226</td>
<td>100</td>
</tr>
</tbody>
</table>

**Reduction of data**

- Total Agree: $8.8 + 17.3 = 26.1$
- Uncertain: $= 10.2$
- Total Disagree: $41.1 + 22.6 = 63.7$

**Analysis and interpretation**

Most respondents (63.7%) disagreed with the statement.

In line with the skills, knowledge, values and attitude (SKVA) notion of Curriculum 2005 (see section 2.4.1) and the integrated approach to implementing outcomes-based technology education (see section 2.9.1), it is evident that the education of the learner should be holistic. Critical outcome (1) states the requirement to identify and solve
problems and make decisions by using critical and creative thinking while specific outcome (1) for the technology learning area requires learners to understand the technological process. The requirement to think critically and creatively and to understand the technological process emphasizes the importance of thinking in technology education. However, 63.7% of the respondents disagreed with this notion. This could be due to the view that technological subjects in schools are regarded as low status craft oriented subjects that are not relevant for university entrance or leadership positions in the public and private sector (McCarthy & Moss, 1990:207 and Hansen, 1999:295). Of the respondents, 26.1% agreed with the statement.

This could indicate that the respondents were conversant with the policy stipulations for the implementation of technology education and Curriculum 2005 in general. The respondents (10%) who were uncertain were perhaps of the opinion that thinking is not the only thing that is important in the implementation of technology education as demonstrated by the holistic approach to education of the learner. Moreover, Barnett (1994:51) maintains that teachers and pupils are confused about what exactly counts as technology.

**Question 38.** By specifying the specific outcomes and the performance indicators in technology education, the initiative of the teacher is stifled.
Table 4.6 Question 38 responses (Theme 1)

<table>
<thead>
<tr>
<th>Opinion</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>15</td>
<td>6.8</td>
</tr>
<tr>
<td>Agree</td>
<td>51</td>
<td>23.1</td>
</tr>
<tr>
<td>Uncertain</td>
<td>85</td>
<td>38.5</td>
</tr>
<tr>
<td>Disagree</td>
<td>62</td>
<td>28.0</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>8</td>
<td>3.6</td>
</tr>
<tr>
<td>Total</td>
<td>221</td>
<td>100</td>
</tr>
</tbody>
</table>

Reduction of data

- Total Agree : $6.8 + 23.1 = 29.9$
- Uncertain : $38.5 = 38.5$
- Total Disagree: $28.0 + 3.6 = 31.6$

Analysis and interpretation

From the data, teachers seemed to have divided opinions on this question as demonstrated by the almost equal split of the responses. The respondents who indicated that critical and creative thinking was not necessary for technology education, would accordingly not see any relationship between stifling the teacher’s initiative and critical and creative thinking in technology education whether through specifying the outcomes and the performance indicators or not.

**Question 39.** Integration across the learning areas is easily achieved through technology education.
Table 4.7 Question 39 responses (Theme 1)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>10</td>
<td>4.4</td>
</tr>
<tr>
<td>Agree</td>
<td>16</td>
<td>7.1</td>
</tr>
<tr>
<td>Uncertain</td>
<td>33</td>
<td>14.7</td>
</tr>
<tr>
<td>Disagree</td>
<td>124</td>
<td>55.1</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>42</td>
<td>18.7</td>
</tr>
<tr>
<td>Total</td>
<td>225</td>
<td>100</td>
</tr>
</tbody>
</table>

Reduction of data

- Total Agree: $4.4 + 7.1 = 11.5$
- Uncertain: $14.7 = 14.7$
- Total Disagree: $55.1 + 18.7 = 73.8$

Analysis and interpretation

Most of the respondents (73.8%) disagreed with the statement.

According to Daugherty & Wicklein (2000:1) and Ankiewicz (1995:4), technology education can make a contribution to the integration of the curriculum. Daugherty & Wicklein (2000:1) state that in the USA, the emphasis is on “presenting mathematics and science concepts in a technological framework”. However, technology education in South Africa is still in its infancy and teachers are not yet conversant with its integrative power.

The minority of the respondents (11.5%) agreed with the statement that integration through learning areas can be achieved through technology education. This response
could be due to the respondents' technological literacy. Technologically literate teachers will be able to use their critical and creative thinking skills to link the technology education curriculum with other learning areas.

The respondents (14.7%) who indicated uncertainty perhaps did not understand the question or are not technologically literate.

**Summary for theme 1**

From the findings, it is evident that many of the technology education teachers are of the opinion that technology education is a practical rather than a thinking (critical and creative thinking) subject. Technology education teachers seem to have missed the vital link between technology, technology education and thinking. The split in the response about stifling the teacher's initiative in technology education indicated that the respondents are not sure what characterizes technology education. Furthermore, 73.8% of the respondents do not believe that integration across learning areas can easily be achieved through technology education.

### 4.6.2 Theme 2: Gender bias

Here the empirical study wished to establish what attitudes the technology teachers had towards gender. Does gender influence the technology teachers' perception of technology education? What kind of relationship is there between technology education and gender? According to Zuga (1999:1), women and girls often perceive the subject of technology education as a male domain, especially after they have had a course in
technology education itself. The questions, response rate, and analysis and interpretation of the data follows.

**Question 9.** Female teachers should not be involved in facilitating (teaching) technology education.

### Table 4.8 Question 9 responses (Theme 2)

<table>
<thead>
<tr>
<th></th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>13</td>
<td>5.7</td>
</tr>
<tr>
<td>Agree</td>
<td>9</td>
<td>3.9</td>
</tr>
<tr>
<td>Uncertain</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td>Disagree</td>
<td>38</td>
<td>16.5</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>169</td>
<td>73.5</td>
</tr>
<tr>
<td>Total</td>
<td>230</td>
<td>100</td>
</tr>
</tbody>
</table>

### Reduction of data

- Total Agree : $5.7 + 3.9 = 9.6$
- Uncertain : $= 0.4$
- Total Disagree: $16.5 + 73.5 = 90$

### Analysis and interpretation

An overwhelming majority (90%) of the respondents disagreed with the statement. According to statistics (Van Rensburg et al, 1996a:2 and Gaganakis, 1999:148), the reality on the ground depicts far too few women in science and technological careers. For this study, however, the sample consisted of 46.1% male and 53.9% female.
technology teachers.

Based on this response, it was concluded that the respondents had no bias towards the technology teacher's gender.

**Question 22.** Only boys should take technology education at school.

**Table 4.9 Question 22 responses (Theme 2)**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>162</td>
<td>70.7</td>
</tr>
<tr>
<td>Agree</td>
<td>57</td>
<td>24.9</td>
</tr>
<tr>
<td>Uncertain</td>
<td>4</td>
<td>1.8</td>
</tr>
<tr>
<td>Disagree</td>
<td>2</td>
<td>0.9</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>4</td>
<td>1.7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>229</td>
<td>100</td>
</tr>
</tbody>
</table>

**Reduction of data**

- Total Agree : $70.7 + 24.9 = 95.6$
- Uncertain : $1.8 = 1.8$
- Total Disagree: $0.9 + 1.7 = 2.6$

**Analysis and interpretation**

The overwhelming majority (95.6%) of the respondents agreed with the statement.

According to Van Rensburg et al (1996a:2), there is a shortage of girls taking technology education and other technological careers. Perhaps this stems from the belief (or stigma) that technology has more to do with hands and not thinking and the myth that only boys
should take technological careers while girls are restricted to Home Economics and playing with dolls. Warren, Warren & Warren (2000) maintain that efforts should be directed towards developing enabling strategies rather than different contexts for boys and girls.

The paradox in this response is that in question 9 the respondents indicated that teaching technology education is not gender sensitive. If female teachers should teach technology education, then girls should take technology education at school too. The myth that only boys should take technology education at school has possibly contributed to the low number of girls taking technology education.

Summary for theme 2

The findings from this theme indicate mixed gender bias among teachers. Teachers were of the opinion that gender applied only to adults and that learners should be treated in the traditional way. This depicted a misconception about gender equality. The researcher maintains that if gender equality is good for the teachers, it is also good for the learners.

4.6.3 Theme 3: Culture, values and beliefs

This theme investigated the impact of culture, values and beliefs on the technology teachers' attitude towards the implementation of technology education. Cultural biases, such as gender discrimination, values and beliefs were investigated with respect to the implementation of technology education. The questions, response rate and analysis and
interpretation of the data follows.

Questions 11. Learners’ attitude towards technology education is negative

Table 4.10 Question 11 responses (Theme 3)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Agree</td>
<td>9</td>
<td>3.9</td>
</tr>
<tr>
<td>Uncertain</td>
<td>25</td>
<td>10.9</td>
</tr>
<tr>
<td>Disagree</td>
<td>75</td>
<td>32.6</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>114</td>
<td>49.6</td>
</tr>
<tr>
<td>Total</td>
<td>230</td>
<td>100</td>
</tr>
</tbody>
</table>

Reduction of data

- Total Agree : $3 + 3.9 = 6.9$
- Uncertain : $= 10.9$
- Total Disagree: $32.6 + 49.6 = 82.2$

Analysis and interpretation

Most of the respondents (82.2%) disagreed with the statement.

According to Department of Education (1997a:84), an understanding of technology education should contribute to more positive attitudes towards, perceptions of and aspirations to technology-based careers. Because learners’ (82.2% response) attitude towards technology education was positive, it was concluded that they did have an understanding of technology education.
Of the respondents, 10.9% were uncertain. No conclusion could be reached as to why the respondents were uncertain.

**Question 15.** Cultural differences play a part in the implementation of technology education.

**Table 4.11 Question 15 responses (Theme 3)**

<table>
<thead>
<tr>
<th></th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Uncertain</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>16</td>
<td>36</td>
<td>32</td>
<td>96</td>
<td>47</td>
<td>227</td>
</tr>
<tr>
<td></td>
<td>7.0</td>
<td>15.9</td>
<td>14.1</td>
<td>42.3</td>
<td>20.7</td>
<td>100</td>
</tr>
</tbody>
</table>

**Reduction of data**

- Total Agree : $7.0 + 15.9 = 22.9$
- Uncertain : $14.1$
- Total Disagree: $42.3 + 20.7 = 63$

**Analysis and interpretation**

Most of the respondents (63%) disagreed with the statement, which implied that most of the respondents believed that cultural differences did not play a role in the implementation of technology education.

Specific outcome (5) for the technology learning area stipulates the need for learners to
“demonstrate an understanding of how different societies create and adapt technological solutions to particular problems” (Department of Education, 1997b:84). The adaptation of technological solutions to particular problems in different societies is an acknowledgement of the use of cultural differences in the implementation of technology education. Critical outcome (10) stipulates the need for learners to be “culturally and aesthetically sensitive across a range of social contexts” (Department of Education, 1997b:84). With reference to the two above critical outcomes for Curriculum 2005, then, it may be concluded that cultural differences should play a part in the implementation of technology education if the policy stipulations are implemented accordingly.

Of the respondents (63%) stated that cultural differences did not play a part in the implementation of technology education, which indicated a lack of knowledge of the critical outcomes for Curriculum 2005 as well as lack of technological literacy.

However, 22.9% of the respondents agreed with the statement. If technology and technology education are part of society, then culture which as part of society, too, must influence the implementation of technology education.

The respondents (14%) who were “uncertain” possibly were not sure of how “culture” is defined and what constituted “cultural differences” in this context.

**Question 21.** I like reading magazines which have a technological content.
Table 4.12 Question 21 responses (Theme 3)

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>4</th>
<th>1.7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree</td>
<td>18</td>
<td>7.9</td>
</tr>
<tr>
<td>Uncertain</td>
<td>8</td>
<td>3.5</td>
</tr>
<tr>
<td>Disagree</td>
<td>122</td>
<td>53.3</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>77</td>
<td>33.6</td>
</tr>
<tr>
<td>Total</td>
<td>229</td>
<td>100</td>
</tr>
</tbody>
</table>

Reduction of data

- Total Agree : 1.7 + 7.9 = 9.6
- Uncertain : = 3.5
- Total Disagree: 53.3 + 33.6 = 86.9

Analysis and interpretation

The majority of the respondents (86.9%) disagreed with the statement, which indicated that many teachers do not enjoy reading technological magazines. This was interpreted as a negative attitude towards technological content. This could be due to the teachers' low morale or lack of technological literacy or simply because of the low value that they placed on technology (Chisholm, 2000:56-58). This is a disturbing factor because to teach technology, teachers must be well read in the subject. Moreover, technological magazines keep teachers abreast of the latest technological data necessary in the implementation of technology education. Specific outcome (3) for the technology learning area stresses the need to access, process and use data for technological purposes.
Question 27. Technology is to be found in all spheres of life.

Table 4.13 Question 27 responses (Theme 3)

<table>
<thead>
<tr>
<th>Response</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>3</td>
<td>1.3</td>
</tr>
<tr>
<td>Agree</td>
<td>2</td>
<td>0.9</td>
</tr>
<tr>
<td>Uncertain</td>
<td>6</td>
<td>2.7</td>
</tr>
<tr>
<td>Disagree</td>
<td>96</td>
<td>42.5</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>119</td>
<td>52.7</td>
</tr>
<tr>
<td>Total</td>
<td>226</td>
<td>100</td>
</tr>
</tbody>
</table>

Reduction of data

- Total Agree : $1.3 + 0.9 = 2.2$
- Uncertain : $= 2.7$
- Total Disagree: $42.5 + 52.7 = 95.2$

Analysis and interpretation

The majority of the respondents (95.2%) disagreed with the statement, which implied that they believe that technology is to be found only in certain spheres of life.

The definition that technology is the use of scientific and other organized knowledge to satisfy human needs and wants (see section 2.6) points to the fact that technology is found in all spheres of life. Spady & Schlebusch (1999:25/26) stated that the basic principles and features of outcomes-based education can be found in all spheres of life. Thus, technology education being part of the outcomes-based education will also be found in all spheres of life.
Question 34. Technology must be applied ethically and responsibly.

Table 4.14 Question 34 responses (Theme 3)

<table>
<thead>
<tr>
<th>Response</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>3</td>
<td>1.3</td>
</tr>
<tr>
<td>Agree</td>
<td>7</td>
<td>3.1</td>
</tr>
<tr>
<td>Uncertain</td>
<td>8</td>
<td>3.5</td>
</tr>
<tr>
<td>Disagree</td>
<td>93</td>
<td>41.2</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>115</td>
<td>50.9</td>
</tr>
<tr>
<td>Total</td>
<td>226</td>
<td>100</td>
</tr>
</tbody>
</table>

Reduction of data

- Total Agree: $1.3 + 3.1 = 4.4$
- Uncertain: $3.5$
- Total Disagree: $41.2 + 50.9 = 92.1$

Analysis and interpretation

The vast majority of the respondents (92.1%) disagreed with the statement. This means that the respondents believed that there is no need to apply technology education ethically and responsibly.

Specific outcome (2) for the learning area technology (Department of Education, 1997b:84) specifies the need to apply a range of technological knowledge and skills ethically and responsibly. The overall response to this question indicated that the respondents were not conversant with this specific outcome for the technology.
Question 35. Learners’ positive attitudes towards technology and technological careers must be encouraged.

Table 4.15 Question 35 responses (Theme 3)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>2</td>
<td>0.9</td>
</tr>
<tr>
<td>Agree</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Uncertain</td>
<td>2</td>
<td>0.9</td>
</tr>
<tr>
<td>Disagree</td>
<td>53</td>
<td>23.2</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>171</td>
<td>75.0</td>
</tr>
<tr>
<td>Total</td>
<td>228</td>
<td>100</td>
</tr>
</tbody>
</table>

Reduction of data

- Total Agree : $0.9 + 0.0 = 0.9$
- Uncertain : $= 0.9$
- Total Disagree: $23.2 + 75 = 98.2$

Analysis and interpretation

The vast majority of the respondents (98.2%) did not see the necessity of encouraging positive learners’ attitudes. This could be because learners’ attitudes are already positive as described in Question 11 Theme 3.

Question 40. Teaching technology is fun.
Table 4.16 Question 40 responses (Theme 3)

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>13</th>
<th>5.8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree</td>
<td>10</td>
<td>4.5</td>
</tr>
<tr>
<td>Uncertain</td>
<td>23</td>
<td>10.2</td>
</tr>
<tr>
<td>Disagree</td>
<td>77</td>
<td>34.4</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>101</td>
<td>45.1</td>
</tr>
<tr>
<td>Total</td>
<td>224</td>
<td>100</td>
</tr>
</tbody>
</table>

Reduction of data

- Total Agree : $5.8 + 4.5 = 10.3$
- Uncertain : $= 10.2$
- Total Disagree: $34.4 + 45.1 = 79.5$

Analysis and interpretation

The vast majority of the respondents (79.5%) disagreed with the statement which indicated that teaching technology is not fun.

Most of the respondents did not like reading magazines with technological content. If teachers do not enjoy reading about technology they would probably not find teaching it fun or interesting.

Of the respondents, 10.2% were uncertain, and 10.3% agreed with the statement. The reason for this could be due to lack of resources, inadequate teacher training or policy overload (Chisholm, 2000:58).
Question 41. Teachers’ attitudes towards the implementation of technology education are negative.

Table 4.17 Question 41 responses (Theme 3)

<table>
<thead>
<tr>
<th></th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Uncertain</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>13</td>
<td>13</td>
<td>35</td>
<td>80</td>
<td>87</td>
<td>228</td>
</tr>
<tr>
<td></td>
<td>5.7</td>
<td>5.7</td>
<td>15.4</td>
<td>35.1</td>
<td>38.1</td>
<td>100</td>
</tr>
</tbody>
</table>

Reduction of data

- Total Agree: 5.7 + 5.7 = 11.4
- Uncertain: = 15.4
- Total Disagree: 35.1 + 38.1 = 73.2

Analysis and interpretation

Most of the respondents (73.2%) disagreed with the statement.

According to the Review Committee Report (Chisholm, 2000:56), there is overwhelming support for the principles of Curriculum 2005 and teachers generally “have a positive attitude to the intent and purposes of Curriculum 2005 and are taking seriously the challenges of implementation”.

A few of the respondents (11.4%) agreed with the statement. Low morale, low
motivation and lack of understanding of what technology education really entails could contribute to teachers' negative attitudes.

Of the respondents, 15.4% were uncertain. Von Papendorf (Chisholm, 2000:56) submitted that some teachers did not make efforts to read and attend workshops, cluster meetings and learning area meetings. Such teachers would be uncertain about teacher attitudes as they did not have an opportunity to mix with others.

**Question 45.** Although it was reinstated the proposal to drop technology education as a learning area from the curriculum by the review committee on curriculum 2005 was appropriate.

**Table 4.18 Question 45 responses (Theme 3)**

<table>
<thead>
<tr>
<th>Response</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>11</td>
<td>4.9</td>
</tr>
<tr>
<td>Agree</td>
<td>25</td>
<td>11.0</td>
</tr>
<tr>
<td>Uncertain</td>
<td>42</td>
<td>18.5</td>
</tr>
<tr>
<td>Disagree</td>
<td>82</td>
<td>36.1</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>67</td>
<td>29.5</td>
</tr>
<tr>
<td>Total</td>
<td>227</td>
<td>100</td>
</tr>
</tbody>
</table>

**Reduction of data**

- Total Agree : $4.9 + 11.0 = 15.9$
- Uncertain : $= 18.5$
- Total Disagree: $36.1 + 29.5 = 65.6$
Analysis and interpretation

Most of the respondents (65.6%) disagreed with the statement.

The Report on Curriculum 2005 recommended the phasing out of the core learning areas of Economic and Management Sciences and Technology on the basis that the majority of South African schools that offer the General Education and Training band do not have teachers trained in these fields (Chisholm, 2000:66). But Spady (2000) argues that the learners’ need for the two core learning areas cannot be phased out. He further goes on to say that the alternative should be to train teachers in these fields as the need will always be there. Technology education should be perceived as an important part of the curriculum (Daugherty & Wicklein, 2000). This indicates that technology education has a value in the curriculum.

Of the respondents, (15.9%) indicated that the recommendation to drop the core learning area of Technology was the right thing to do. This response could possibly be due to teacher overload and lack of resources and teacher training as stated in the Review committee report (Chisholm, 2000:66).

Of the respondents 18.5% were uncertain. This was to be expected given the general uncertainty about Curriculum 2005, its reception and the way that it is unfolding (see section 1.3.1).

Summary for theme 3

The responses to this theme are summarized as follows:
Of the respondents, 86.9% of teachers did not like reading magazines with technological content; 95.5% did not agree that technology is found in all spheres of life; 92.1% did not agree that technology must be applied ethically and responsibly; 98.2% did not agree that learners' positive attitudes towards technology education and technological careers should be encouraged and 79.5% did not agree that teaching technology education is fun. Based on these figures, one can conclude that the general attitudes of teachers towards technology education is negative.

4.6.4 Theme 4: Teachers' working conditions

The theme set out to investigate how teachers' working conditions affected their commitment to the implementation of technology education, and the relationship between teachers' morale and their working conditions. The questions, rating, analysis and interpretation are given below.

Question 10. The technology learning area puts a burden on the already congested school curriculum.

Table 4.19 Question 10 responses (Theme 4)

<table>
<thead>
<tr>
<th></th>
<th>Strongly Agree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>Agree</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>Uncertain</td>
<td></td>
<td>23</td>
</tr>
<tr>
<td>Disagree</td>
<td></td>
<td>82</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td></td>
<td>72</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>229</td>
</tr>
</tbody>
</table>
Reduction of data

- Total Agree: $9.6 + 13.1 = 22.7$
- Total Disagree: $35.8 + 31.5 = 67.3$
- Uncertain: $= 10.0$

Analysis and interpretation

Most of the respondents (67.3%) disagreed with the statement. This could mean that technology education was accommodated well in the school curriculum or it could be because the respondents did not see technology education as something different from the rest of the curriculum due to its integrative nature or because they saw the need for technology education in the curriculum.

However, 22.7% of the respondents agreed with the statement. This could mean that these respondents perceived the curriculum as already overloaded and the inclusion of technology education as making matters worse (Chisholm, 2000:20).

Some of the respondents (10%) were uncertain. These teachers were perhaps not affected by the removal or reinstatement of technology education in the curriculum as it did not change their working conditions.

**Question 31.** If I was to be given a package, I would leave the education system.
Table 4.20 Question 31 responses (Theme 4)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>50</td>
<td>22.1</td>
</tr>
<tr>
<td>Agree</td>
<td>31</td>
<td>13.7</td>
</tr>
<tr>
<td>Uncertain</td>
<td>20</td>
<td>8.9</td>
</tr>
<tr>
<td>Disagree</td>
<td>64</td>
<td>28.3</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>61</td>
<td>27.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>226</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Reduction of data

Total Agree : 22.1 + 13.7 = 35.8
Uncertain : 8.9
Total Disagree: 28.3 + 27 = 55.3

Analysis and interpretation

Most of the respondents (55.3%) disagreed with the statement. This could mean that these teachers were happy with the Department and appreciated their working conditions. This could also mean that these teachers are happy with the challenges that are brought about by the new education dispensation. The prospect of receiving a severance package could not change their attitudes towards the Department or the Education system. From the demographic data (section 4.4 most respondents are not in the retirement age group (More than 84.8% are in the age group 31 to 50). Teachers in this age bracket may not have accumulated enough days to earn a good remuneration package. This could also influence the teachers’ response for this question.
However, 35.8% of the respondents agreed with the statement. Dissatisfaction with the Department and the working conditions especially after the introduction of the outcomes-based education paradigm could have influenced this response. However, there is a possibility that teachers who are over 50 years old and have a lot of accumulated days for a better package and may choose to leave the Department with the option of a package.

**Question 32.** The lack of resources inhibits the proper implementation of technology education.

**Table 4.21 Question 32 responses (Theme 4)**

<table>
<thead>
<tr>
<th></th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>18</td>
<td>8.0</td>
</tr>
<tr>
<td>Agree</td>
<td>31</td>
<td>13.7</td>
</tr>
<tr>
<td>Uncertain</td>
<td>7</td>
<td>3.0</td>
</tr>
<tr>
<td>Disagree</td>
<td>59</td>
<td>26.0</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>112</td>
<td>49.3</td>
</tr>
<tr>
<td>Total</td>
<td>227</td>
<td>100</td>
</tr>
</tbody>
</table>

**Reduction of data**

- Total Agree \(= 8.0 + 13.7 = 21.7\)
- Uncertain \(= 3.0\)
- Total Disagree: \(26.0 + 49.3 = 75.3\)

**Analysis and interpretation**

The majority of the respondents (75.3%) disagreed with the statement. From this response, it was concluded that the majority of the teachers believed that the proper
implementation of technology education was not inhibited by lack of resources. The researcher personally interviewed some teachers and implementers who indicated that up to the senior phase in the general education and training band, most of the resources needed could be brought from home by the learners and that in some cases science laboratories were used for technological experiments and designs. Thus the teachers and how they designed materials to achieve the intended learning outcomes were the most necessary resources. However, 21.7% of the respondents indicated that a lack of resources inhibited the proper implementation of technology education.

**Question 33.** There is lack of teacher training for technology education.

**Table 4.22 Question 33 responses (Theme 4)**

<table>
<thead>
<tr>
<th></th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Uncertain</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>1</td>
<td>6</td>
<td>6</td>
<td>79</td>
<td>137</td>
<td>229</td>
</tr>
<tr>
<td>Percentage</td>
<td>0.5</td>
<td>2.6</td>
<td>2.6</td>
<td>34.5</td>
<td>59.8</td>
<td>100</td>
</tr>
</tbody>
</table>

**Reduction of data**

Total Agree : \(0.5 + 2.6 = 3.1\)

Uncertain : \[= 2.6\]

Total Disagree: \(34.5 + 59.8 = 94.3\)
Analysis and interpretation

The vast majority of respondents (94.3%) disagreed with the statement.

According to the Review Committee report (Chisholm, 2000:66), the vast majority of South African schools that offer the general education and training band do not have teachers who have any education or training in Technology or Economic and Management Sciences. Ankiewicz (1995:4) also expressed concern over the shortage of technological expertise in South Africa.

However, the majority of the respondents in this study indicated that there is ongoing teacher training. The majority of teachers have to be trained for outcomes-based education because outcomes-based education together with technology education are still new to South Africa.

**Question 37.** Teaching technology education is demanding.

Table 4.23 Question 37 responses (Theme 4)

<table>
<thead>
<tr>
<th>Response</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td>Agree</td>
<td>42</td>
<td>18.8</td>
</tr>
<tr>
<td>Uncertain</td>
<td>26</td>
<td>11.6</td>
</tr>
<tr>
<td>Disagree</td>
<td>109</td>
<td>48.7</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>46</td>
<td>20.5</td>
</tr>
<tr>
<td>Total</td>
<td>224</td>
<td>100</td>
</tr>
</tbody>
</table>
Reduction of data

- Total Agree: $0.4 + 18.8 = 19.2$
- Uncertain: $= 11.6$
- Total Disagree: $48.7 + 20.5 = 69.2$

Analysis and interpretation

Most of the respondents (69.2%) disagreed with the statement which indicated that they did not perceive teaching technology education as demanding.

However, 19.2% of the respondents agreed with the statement. This could be attributed to the fact that technology education is a new learning area and some teachers are battling to understand it (see section 1.3.1).

Question 43. For the amount of work needed to implement the outcomes-based education, teachers feel that they are underpaid.

Table 4.24 Question 43 responses (Theme 4)

<table>
<thead>
<tr>
<th></th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Uncertain</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>9</td>
<td>24</td>
<td>24</td>
<td>73</td>
<td>98</td>
<td>228</td>
</tr>
<tr>
<td></td>
<td>4.0</td>
<td>10.5</td>
<td>10.5</td>
<td>32.0</td>
<td>43.0</td>
<td>100</td>
</tr>
</tbody>
</table>
Reduction of data

Total Agree : $4.0 + 10.5 = 14.5$

Uncertain : $= 10.5$

Total Disagree: $32.0 + 43.0 = 75.0$

Analysis and interpretation

Most of the teachers (75.0%) indicated that their salary was commensurate with the work required of them. Although 14.5% of the respondents agreed with the statement and 10.5% were uncertain, it was concluded that salary was not a motivational factor in the implementation of technology education.

Question 44. Workshops and crash courses on technology education are sufficient to be able to teach technology education for the intermediate phase.

Table 4.25 Question 44 responses (Theme 4)

| Strongly Agree | 9 | 3.9 |
| Agree | 30 | 13.2 |
| Uncertain | 15 | 6.6 |
| Disagree | 83 | 36.4 |
| Strongly Disagree | 91 | 39.9 |
| Total | 228 | 100 |
Reduction of data

Total Agree : $3.9 + 13.2 = 17.1$

Uncertain : $ = 6.6$

Total Disagree: $36.4 + 39.9 = 76.3$

Analysis and interpretation

Most of the respondents (76.3%) indicated that short courses and workshops were not sufficient to equip teachers to understand and implement technology education. The researcher’s interview with some of the respondents and implementers indicated that the few workshops and crash courses lacked the depth and breadth to equip the teachers and left them still confused about what technology education really is. From this, it was concluded that more and thorough teacher training was required in technology education. The urgency of this was also emphasized on SABC 1: “Two Way” in April 2001, when it was stated that it might be necessary for the Education Department to close all schools for at least a year and undertake proper teacher training. This statement, though impractical and absurd, nevertheless made it clear that workshops and crash courses are insufficient to train teachers for the implementation of Curriculum 2005.

Summary for theme 4

The great majority of the teachers indicated that the technology learning area was not a burden to Curriculum 2005 and did not increase workload. They were satisfied with the salary they received for the job they were doing. The respondents were satisfied that teacher training, especially for technology education was taking place, but strongly
emphasised that workshops and crash courses were not sufficient to equip teachers to implement Curriculum 2005. A lack of resources was generally not seen as a problem.

In conclusion, the respondents were satisfied with their working conditions.

4.6.5 Theme 5: Technology education’s relationship to Mathematics and Science

The purpose of the theme was to determine teachers’ attitudes towards the relationship between Technology and Mathematics and Science. If teachers had a negative attitude towards Mathematics and Science, they might also have the same attitude towards technology education. A negative attitude towards Mathematics and Science and, consequently Technology Education would hamper the implementation of technology education.

Question 23. Only learners who have previously taken science should enrol for technology education.

Table 4.26 Question 23 responses (Theme 5)

<table>
<thead>
<tr>
<th></th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Uncertain</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>14</td>
<td>13</td>
<td>107</td>
<td>90</td>
<td>228</td>
</tr>
<tr>
<td></td>
<td>1.8</td>
<td>6.1</td>
<td>5.7</td>
<td>46.9</td>
<td>39.5</td>
<td>100</td>
</tr>
</tbody>
</table>
Reduction of data

- Total Agree : \(1.8 + 6.1 = 7.9\)
- Uncertain : \(= 5.7\)
- Total Disagree: \(46.9 + 39.5 = 86.4\)

Analysis and interpretation

The majority of the respondents (86.4\%) disagreed with the statement, which indicated that science was not a pre-requisite to technology education.

Daugherty et al (2000:1) pointed out that learners need not have previously enrolled for science before taking technology education because learners' science achievement can be improved through technology education.

**Question 39.** Integration across the learning areas is easily achieved through technology education.

**Table 4.27 Question 39 responses (Theme 5)**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>10</td>
<td>4.4</td>
</tr>
<tr>
<td>Agree</td>
<td>16</td>
<td>7.1</td>
</tr>
<tr>
<td>Uncertain</td>
<td>33</td>
<td>14.7</td>
</tr>
<tr>
<td>Disagree</td>
<td>124</td>
<td>55.1</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>42</td>
<td>18.7</td>
</tr>
<tr>
<td>Total</td>
<td>225</td>
<td>100</td>
</tr>
</tbody>
</table>
Reduction of data

- Total Agree: $4.4 + 7.1 = 11.5$
- Uncertain: $14.7 = 14.7$
- Total Disagree: $55.1 + 18.7 = 73.8$

Analysis and interpretation

Of the respondents 73.8% disagreed with the statement.

According to Daugherty & Wicklein (2000:1), technology education has a role of providing “interdisciplinary” settings for the application of mathematical and scientific concepts. Furthermore, efforts to integrate technology education into the school curriculum will be unsuccessful until there is a clear understanding of the purpose of technology education by all members of technology education, mathematics and science learning area (Daugherty & Wicklein, 2000:2). The researcher believes that integration across learning areas will be achieved through technology education. The negative response to this statement by the majority of the respondents (73.8%) could indicate that they were not aware of “the new emphasis being placed on presenting mathematics and science in a technological framework” (Daugherty & Wicklein, 2000:1).

The minority of the respondents (11.5%) agreed with the statement that integration between learning areas can be achieved through technology education. This response could be due to the respondents’ technological literacy. Technologically literate teachers will be able to use their critical and creative thinking skills to link the technology education curriculum with other learning areas especially mathematics and science.
Of the respondents, 14.7% were uncertain. This could be interpreted as lack of knowledge of the integrative power of technology education.

Summary for theme 5

The respondents were aware that science (and mathematics) is not a prerequisite to take technology education at school. However, they appeared not to understand the depth of the relationship between Science, Mathematics and Technology in achieving the outcomes. This was indicated by their lack of knowledge of the integrative nature of technology education with specific reference to mathematics and science.

4.6.6 Theme 6: Technology education’s relationship to other learning areas

Technology education is part of Curriculum 2005 and the outcomes-based education paradigm. The cross-curricular nature of Technology Education makes it suitable for integration with learning areas other than Mathematics and Science. The questions, response rates, analysis and interpretation follow.

Question 17. More time is needed for the facilitation (teaching) of the technology learning area than for other learning areas.
Table 4.28 Question 17 responses (Theme 6)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>15</td>
<td>6.6</td>
</tr>
<tr>
<td>Agree</td>
<td>94</td>
<td>41.2</td>
</tr>
<tr>
<td>Uncertain</td>
<td>22</td>
<td>9.6</td>
</tr>
<tr>
<td>Disagree</td>
<td>63</td>
<td>29.4</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>30</td>
<td>13.2</td>
</tr>
<tr>
<td>Total</td>
<td>224</td>
<td>100</td>
</tr>
</tbody>
</table>

Reduction of data

- Total Agree : $6.6 + 41.2 = 47.8$
- Uncertain : $14.7 = 9.6$
- Total Disagree: $29.4 + 13.2 = 42.6$

Analysis and interpretation

The respondents were divided (47.8% agree and 42.6% disagree) on the time needed to teach technology education as a separate learning area in comparison to other learning areas. This was understandable as some teachers were not responsible for teaching other learning areas from which they could make the required comparison. Through interviews, the researcher established that in some schools the technology learning area lagged behind the other learning areas because it is not given the same priority.

Question 18. The technical terms used in technology education are confusing.
Table 4.29 Question 18 responses (Theme 6)

<table>
<thead>
<tr>
<th></th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>11</td>
<td>4.9</td>
</tr>
<tr>
<td>Agree</td>
<td>33</td>
<td>14.5</td>
</tr>
<tr>
<td>Uncertain</td>
<td>26</td>
<td>11.5</td>
</tr>
<tr>
<td>Disagree</td>
<td>109</td>
<td>48.0</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>48</td>
<td>21.1</td>
</tr>
<tr>
<td>Total</td>
<td>227</td>
<td>100</td>
</tr>
</tbody>
</table>

Reduction of data

- Total Agree : $4.9 + 14.5 = 19.4$
- Uncertain : $= 11.5$
- Total Disagree: $48.0 + 21.1 = 69.1$

Analysis and interpretation

Of the respondents, 69.1% disagreed with the statement, thus indicating their acceptance of and satisfaction with the terms used; 19.4% agreed with the statement and 11.5% were uncertain.


From the responses, the researcher concluded that the terms that the teachers had a problem with were not specific to technology education per se, but also apply to the policy stipulations for Curriculum 2005 as a whole. Hence, according to the majority of
the respondents, the terms specific to technology education (not policy stipulations for the entire curriculum) are not confusing.

**Question 25**. The introduction of in-service training for technology education concurrently with the in-service training for the outcomes-based education is bad timing.

**Table 4.30 Question 25 responses (Theme 6)**

<table>
<thead>
<tr>
<th></th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Uncertain</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>28</td>
<td>85</td>
<td>54</td>
<td>43</td>
<td>16</td>
<td>226</td>
</tr>
<tr>
<td></td>
<td>12.4</td>
<td>37.6</td>
<td>23.9</td>
<td>19.0</td>
<td>7.1</td>
<td>100</td>
</tr>
</tbody>
</table>

**Reduction of data**

- Total Agree: $12.4 + 37.6 = 50$
- Uncertain: $= 23.9$
- Total Disagree: $19.0 + 7.1 = 26.1$

**Analysis and interpretation**

Only 50% of the respondents agreed with the statement, which indicated that most of the teachers viewed the introduction of in-service training for the technology learning area with in-service training for outcomes-based education as bad timing. This led the researcher to conclude that the teachers did not know the similarity between technology education and the outcomes-based education (see section 2.5.3). In the researcher’s
view, similar things should be treated at the same time. However, the respondents could have been influenced by the Review Committee's recommendation to drop technology education from the curriculum.

Of the respondents, 26.1% indicated that the timing was correct, which was interpreted as a recognition of the similarity between the technology learning area and the other learning areas in the curriculum.

The fact that 23.9% of the respondents were uncertain was interpreted as an indication that the introduction of the in-service training for technology education concurrently with in-service training for outcomes-based education had no bearing on the timing.

**Question 27.** Technology is to be found in all spheres of life.

**Table 4.31 Question 27 responses (Theme 6)**

<table>
<thead>
<tr>
<th></th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Uncertain</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
<td>2</td>
<td>6</td>
<td>96</td>
<td>119</td>
<td>226</td>
</tr>
<tr>
<td></td>
<td>1.3</td>
<td>0.9</td>
<td>2.7</td>
<td>42.4</td>
<td>52.7</td>
<td>100</td>
</tr>
</tbody>
</table>

**Reduction of data**

Total Agree : \(1.3 + 0.9\) = 2.2

Uncertain : \(= 2.7\)

Total Disagree: \(42.4 + 52.7\) = 95.1
Analysis and interpretation

The overwhelming majority of the teachers (95.1%) indicated that technology was restricted to certain spheres of life. According to Daugherty et al (2000:2), there is considerable confusion among teachers over what characteristics exemplify technology education. The researcher found this to be a cause for concern because if teachers do not grasp what technology really is, they will not understand its integrative abilities and its relationship to other learning areas and that it is to be found in all spheres of life.

Question 28. Information technology is part of technology education.

Table 4.32 Question 28 responses (Theme 6)

<table>
<thead>
<tr>
<th></th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>4</td>
<td>1.8</td>
</tr>
<tr>
<td>Agree</td>
<td>4</td>
<td>1.8</td>
</tr>
<tr>
<td>Uncertain</td>
<td>18</td>
<td>8.0</td>
</tr>
<tr>
<td>Disagree</td>
<td>122</td>
<td>54.2</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>77</td>
<td>34.2</td>
</tr>
<tr>
<td>Total</td>
<td>225</td>
<td>100</td>
</tr>
</tbody>
</table>

Reduction of data

- Total Agree: \(1.8 + 1.8 = 3.6\)
- Uncertain: \(= 8.0\)
- Total Disagree: \(54.2 + 34.2 = 88.4\)
Analysis and interpretation

The majority of the respondents (88.4%) disagreed with the statement, which indicated that they were well aware that Information Technology (IT) is not part of technology education. Information technology is a separate learning area (see section 2.4.3). Dyrenfurth (Daugherty et al, 2000:2) maintains that there are often misinterpretations and misrepresentations associated with technology education.

Question 29. When I think of technology I mostly think of computers.

Table 4.33 Question 29 responses (Theme 6)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>50</td>
<td>22.1</td>
</tr>
<tr>
<td>Agree</td>
<td>73</td>
<td>32.3</td>
</tr>
<tr>
<td>Uncertain</td>
<td>8</td>
<td>3.6</td>
</tr>
<tr>
<td>Disagree</td>
<td>71</td>
<td>31.4</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>24</td>
<td>10.6</td>
</tr>
<tr>
<td>Total</td>
<td>226</td>
<td>100</td>
</tr>
</tbody>
</table>

Reduction of data

- Total Agree : $22.1 + 32.3 = 54.4$
- Uncertain : $= 3.6$
- Total Disagree: $31.4 + 10.6 = 42$

Analysis and interpretation

Most of the respondents (54.4%) agreed with the statement. However a substantial
number of respondents (42%) disagreed with the statement.

It was concluded that the respondents who agreed with the statement indicated a lack of knowledge of the core learning area of technology. Boyer (Daugherty, 2000:2) and Solomon, 1993:55) stresses the disturbing trend of equating technology education with computer literacy programs or computers.

Computers, though being technological gadgets, they are by themselves not technology or a representation of the learning area of technology. It was concluded that the 42% respondents who disagreed with the statement holds that kind of thought.

**Question 39.** Integration across the learning areas is easily achieved through technology education.

**Table 4.34 Question 39 responses (Theme 6)**

<table>
<thead>
<tr>
<th></th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>10</td>
<td>4.4</td>
</tr>
<tr>
<td>Agree</td>
<td>16</td>
<td>7.1</td>
</tr>
<tr>
<td>Uncertain</td>
<td>33</td>
<td>14.7</td>
</tr>
<tr>
<td>Disagree</td>
<td>124</td>
<td>55.1</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>42</td>
<td>18.7</td>
</tr>
<tr>
<td>Total</td>
<td>225</td>
<td>100</td>
</tr>
</tbody>
</table>

**Reduction of data**

Total Agree : 4.4 + 7.1 = 11.5

Uncertain : 14.7 = 14.7

Total Disagree: 55.1 + 18.7 = 73.8
Analysis and interpretation

Of the respondents, 73.8% disagreed with the statement; 11.5% agreed and 14.7% were uncertain.

Technology education emphasizes problem solving. Problem solving is necessary in all learning areas whether that be in the humanities (human and social sciences) or in mathematic and mathematical literacy. Thus integration across the learning areas can be achieved through the method of problem solving as done in technology education. Problem solving in technology education is characterized by the so-called “technological process”.

The majority of the respondents (73.8%) do not agree that integration across learning areas can be easily achieved through technology education. This is perhaps because they (teachers) do not know the problem solving nature of technology education.

Of the respondents (11.5%) agree, indicating that they are aware of the integrative nature of technology education which is largely due to its emphasis on problem solving.

The 14.7% respondents who are uncertain have probably been influenced by the Review committee’s attempt to drop technology education from the curriculum.

Summary for theme 6

The majority of the respondents did not seem to understand that there is a relationship between technology education and other learning areas nor that technology education can serve as an ‘interdisciplinary’ setting for other learning areas.
4.6.7 Theme 7: Technology education and the education policies

The implementation of technology education should conform to educational policy stipulations. This theme investigated teachers’ attitudes towards the education policies for technology education and how these affected the implementation of technology education per se. The questions, response rates, analysis and interpretation follow.

Question 14. The seven specific outcomes for the technology learning area are not user friendly.

Table 4.35 Question 14 responses (Theme 7)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>47</td>
<td>21.2</td>
</tr>
<tr>
<td>Agree</td>
<td>80</td>
<td>36.0</td>
</tr>
<tr>
<td>Uncertain</td>
<td>57</td>
<td>25.7</td>
</tr>
<tr>
<td>Disagree</td>
<td>30</td>
<td>13.5</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>8</td>
<td>3.6</td>
</tr>
<tr>
<td>Total</td>
<td>222</td>
<td>100</td>
</tr>
</tbody>
</table>

Reduction of data

- Total Agree: $21.2 + 36.0 = 57.2$
- Uncertain: $= 25.7$
- Total Disagree: $13.5 + 3.6 = 17.1$

Analysis and interpretation

Of the respondents, 17.1% disagreed with the statement, 57.2% agreed and 25.7% were
uncertain.

The majority of the respondents (57.2%) indicated that the seven specific outcomes (learning area outcomes) for the technology learning area as stipulated in the curriculum policy are not user friendly. The unfriendliness could stem from the fact that some teachers feel that they were not consulted in designing these policies (see Question 36 Theme 7). This could also be due to lack of advocacy for the technology learning and Curriculum 2005. Bisseker (1999:37) is mentions that the curriculum is being rushed and not phased in slowly (see section 1.2). That is perhaps why both Bisseker (1999:37) and Garson (2000:37) see problems with the implementation of technology education and Curriculum 2005 (see section 1.3.1).

A significant portion of the respondents (25.7%) cannot tell whether these specific outcomes are user friendly or not. This could perhaps be attributed to the fact that there has been very little teacher training for the implementation of the new approach (Macfarlane & Mona, 1997:2). Jansen (2001:3) also emphasizes the lack of effective teacher development strategies.

However, 17.1% of the respondents disagreed with the statement. The possibility is that these teachers were involved in the formulation of the policies for the new curriculum (Jones, 1998:52).

**Question 16.** The inclusion of the technology learning area in the school curriculum is as a result of political motivation.
Table 4.36 Question 16 responses (Theme 7)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>18</td>
<td>7.9</td>
</tr>
<tr>
<td>Agree</td>
<td>40</td>
<td>17.6</td>
</tr>
<tr>
<td>Uncertain</td>
<td>50</td>
<td>22.0</td>
</tr>
<tr>
<td>Disagree</td>
<td>75</td>
<td>33.1</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>44</td>
<td>19.4</td>
</tr>
<tr>
<td>Total</td>
<td>227</td>
<td>100</td>
</tr>
</tbody>
</table>

Reduction of data

- Total Agree: \(7.9 + 17.6 = 25.5\)
- Uncertain: \(= 22.0\)
- Total Disagree: \(33.1 + 19.4 = 52.5\)

Analysis and interpretation

Of the respondents, 52.4% indicated that the inclusion of the technology learning area in the school curriculum was not the result of political motivation, 25.5% indicated it was the result of political motivation and 22% were uncertain.

According to Pretorius (1998:v), the South African population has a tendency to politicise anything, especially if it has to do with change. In the researcher's view, there is a relation between the introduction of democracy and the paradigm shift in the system of education here in South Africa. This paradigm shift in education was necessary since the old paradigm was not in line with education elsewhere. The researcher furthermore regards the introduction of technology education as a sound move as technology is for the
good of all (for South Africa to be able to compete internationally and to be part of the
global village).

**Question 26.** To be technologically literate implies understanding the policy stipulations
for the implementation of the technology learning area.

**Table 4.37 Question 26 responses (Theme 7)**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>9</td>
<td>4.0</td>
</tr>
<tr>
<td>Agree</td>
<td>32</td>
<td>14.3</td>
</tr>
<tr>
<td>Uncertain</td>
<td>37</td>
<td>16.5</td>
</tr>
<tr>
<td>Disagree</td>
<td>120</td>
<td>53.6</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>26</td>
<td>11.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>224</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

**Reduction of data**

- Total Agree : \(4.0 + 14.3 = 18.3\)
- Uncertain : \(= 16.5\)
- Total Disagree: \(53.6 + 11.6 = 65.2\)

**Analysis and interpretation**

In response to this question, 65.2% of the respondents indicated that technological
literacy does not imply understanding the policy stipulations for the implementation of
the technology learning area; 18.3% agreed with the statement, and 16.5% were
uncertain.
Technological literacy involves the ability to know, use, understand, manage, assess and evaluate technology (see sections 1.9 and 2.6.4). It was therefore concluded that the majority of the respondents did not understand the relationship between technological literacy and policy stipulations. Furthermore, the 18.3% who agreed with the statement had made the connection between technological literacy and knowing and using the policies for the implementation of technology education.

It was also concluded that the 16.5% who were uncertain were technologically illiterate or did not know or understand the policy stipulations for the implementation of technology education.

**Question 30.** The education standards have deteriorated since the introduction of the outcomes-based education and the technology learning area.

**Table 4.38 Question 30 responses (Theme 7)**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>13</td>
<td>5.8</td>
</tr>
<tr>
<td>Agree</td>
<td>32</td>
<td>14.3</td>
</tr>
<tr>
<td>Uncertain</td>
<td>50</td>
<td>22.3</td>
</tr>
<tr>
<td>Disagree</td>
<td>69</td>
<td>30.8</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>60</td>
<td>26.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>224</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

**Reduction of data**

- Total Agree : $5.8 + 14.3 = 20.1$
- Uncertain : $= 22.3$
- Total Disagree: $30.8 + 26.8 = 57.6$
Analysis and interpretation

Of the respondents, 57.6% disagreed with the statement, 20.1% agreed and 22.3% were uncertain.

According to Claasen (1998) outcomes-based education is too behaviouristic “in that teaching will largely become responses to desired stimuli”. Pretorius (1998:v) stated that the outcomes-based approach represents a new paradigm in education and is well suited to afford the redress programme as envisaged by the new government.

It was concluded that 57.6% of the respondents are in line with Pretorius’ (1998:v) belief that outcomes-based education is relevant and will not lower education standards.

No conclusion was reached over why 20.1% of the respondents agreed that the education standards had deteriorated since the introduction of outcomes-based education or why 22.3% were uncertain.

Question 34. Technology must be applied ethically and responsibly.

Table 4.39 Question 34 responses (Theme 7)

<table>
<thead>
<tr>
<th></th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Uncertain</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
<td>7</td>
<td>8</td>
<td>93</td>
<td>115</td>
<td>226</td>
</tr>
<tr>
<td></td>
<td>1.3</td>
<td>3.1</td>
<td>3.5</td>
<td>41.2</td>
<td>50.9</td>
<td>100</td>
</tr>
</tbody>
</table>
Reduction of data

- Total Agree : $1.3 + 3.1 = 4.4$
- Uncertain : $= 3.5$
- Total Disagree: $41.2 + 50.9 = 92.1$

Analysis and interpretation

The vast majority of the respondents (92.1%) disagreed with the statement, which indicated that they did not understand the policy stipulation for technology education as reflected in the specific outcomes for the technology learning area. Specific outcome (2) for the learning area of technology education specifies the need to “apply a range of technological knowledge and skills ethically and responsibly”. This is important in workshops and laboratories where the safety of the learners must be considered. This is also important in the application of technology in all spheres of life where, according to critical outcome (6), responsibility towards the environment and the health of others must be considered.

**Question 36.** Teachers are not consulted in policy making for the outcomes based education.
Table 4.40 Question 36 responses (Theme 7)

<table>
<thead>
<tr>
<th></th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Uncertain</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8</td>
<td>25</td>
<td>20</td>
<td>69</td>
<td>103</td>
</tr>
<tr>
<td></td>
<td>3.5</td>
<td>11.1</td>
<td>8.9</td>
<td>30.7</td>
<td>45.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>225</td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Reduction of data

- Total Agree : $3.5 + 11.1 = 14.6$
- Uncertain : $8.9$
- Total Disagree: $30.7 + 45.8 = 76.5$

Analysis and interpretation

Of the respondents, 76.5% disagreed and 14.6% agreed with the statement.

The White Paper on Education and Training (Department of Education, 1994:12) stipulates that “the principle of democratic governance should increasingly be reflected in every level of the system by the involvement in consultation and appropriate forms of decision-making of elected representatives of the main stakeholders, interest groups and role players”.

It was therefore concluded from the responses that there had been consultation with the teachers in the development of education policies, but that there were some 14.7% who felt that they were not consulted in the formulation of policies.
Question 45. Although it was reinstated, the proposal to drop technology education as a learning area from the curriculum by the Review Committee on Curriculum 2005 was appropriate.

Table 4.41 Question 45 responses (Theme 7)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>11</td>
<td>4.9</td>
</tr>
<tr>
<td>Agree</td>
<td>25</td>
<td>11.0</td>
</tr>
<tr>
<td>Uncertain</td>
<td>42</td>
<td>18.5</td>
</tr>
<tr>
<td>Disagree</td>
<td>82</td>
<td>36.1</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>67</td>
<td>29.5</td>
</tr>
<tr>
<td>Total</td>
<td>227</td>
<td>100</td>
</tr>
</tbody>
</table>

Reduction of data

- Total Agree : 4.9 + 11.0 = 15.9
- Uncertain : = 18.5
- Total Disagree: 36.1 + 29.5 = 65.6

Analysis and interpretation

Of the respondents, 65.6% disagreed with the statement, 15.9% agreed and 18.5% were uncertain.

The majority (65.6%) of the respondents feel that the attempt to drop technology education from the curriculum was not appropriate. This could be due to the feeling that hasty decisions have been made before teachers could be fully consulted.
Of the respondents (15.8%) feel that the attempt to drop the technology learning area from the curriculum was appropriate. It can be concluded that this are the teachers who do not see the value of technology education in the curriculum (see question 39 theme 3). Further, it can be concluded that these are teachers who feel that both technology education and the economic and management sciences core learning area are overloading the curriculum. Overloading the curriculum will probably affect teachers’ working conditions negatively (see theme 4).

Of the respondents (18.5%) are uncertain. These are probably those teachers who may not be aware of the Review committee’s recommendations.

**Summary for theme 7**

The teachers had been consulted in policy formulation on outcomes-based education, including the technology learning area. The majority of the respondents indicated that the standard of education had not deteriorated since the inception of the new education system and the seven specific outcomes for technology education were user friendly.

**4.6.8 Theme 8: Didactics and assessment**

The teaching, learning and assessment of technology education has to conform to policy requirements. This theme investigated discrepancies in the didactics and assessment of technology education and the teachers’ attitudes towards these.

**Question 10.** The technology learning area puts a burden on an already congested school curriculum.
Table 4.42 Question 10 responses (Theme 8)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>22</td>
<td>9.6</td>
</tr>
<tr>
<td>Agree</td>
<td>30</td>
<td>13.1</td>
</tr>
<tr>
<td>Uncertain</td>
<td>23</td>
<td>10.0</td>
</tr>
<tr>
<td>Disagree</td>
<td>82</td>
<td>35.8</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>72</td>
<td>31.5</td>
</tr>
<tr>
<td>Total</td>
<td>229</td>
<td>100</td>
</tr>
</tbody>
</table>

Reduction of data

Total Agree : $9.6 + 13.1 = 22.7$

Uncertain : $= 10.0$

Total Disagree: $35.8 + 31.5 = 67.3$

Analysis and interpretation

Of the respondents, 67.3% disagreed with the statement, 22.7% agreed and 10% were uncertain.

The advent of outcomes-based education and Curriculum 2005 has made imperative new ways of teaching and assessing. But the respondents (67.3%) do not feel overburdened by this. This could mean that the respondents see a continuity between the old paradigm and the new paradigm in education with specific reference towards didactics and assessment in the technology learning area in Curriculum 2005. This could also be reflected as a possibility that didactics and assessment in Curriculum 2005 are not difficult or cumbersome. It is also possible that the respondents are highly motivated
because they identify with this new approach in education in South Africa. The other possibility for the respondents not to perceive technology education as adding to the burden of the already congested curriculum could be because the respondents do not see technology education as something different from the rest of the curriculum due to its integrative nature.

But 22.7% of the respondents disagree. This could mean that the respondents perceived the curriculum as already congested such that the inclusion of the Technology Learning Area in the curriculum will make matters worse.

For the 10.0% that are uncertain, the possibility could be that they may not be aware that the curriculum is already congested. Some teachers at some schools specializes in only one learning area.

**Question 13.** The process followed to make a product is more important than the quality of the final product when teaching the technology learning area.

**Table 4.43 Question 13 responses (Theme 8)**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>12</td>
<td>5.3</td>
</tr>
<tr>
<td>Agree</td>
<td>30</td>
<td>13.1</td>
</tr>
<tr>
<td>Uncertain</td>
<td>30</td>
<td>13.1</td>
</tr>
<tr>
<td>Disagree</td>
<td>100</td>
<td>43.9</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>56</td>
<td>24.6</td>
</tr>
<tr>
<td>Total</td>
<td>228</td>
<td>100</td>
</tr>
</tbody>
</table>
Reduction of data

- Total Agree: \[ 5.3 + 13.1 = 18.4 \]
- Uncertain: \[ = 13.1 \]
- Total Disagree: \[ 43.9 + 24.6 = 68.5 \]

Analysis and interpretation

Of the respondents 68.5% disagreed with the statement, 18.4% agreed and 13.1% were uncertain.

Ankiewicz (1995:1) maintains that technology education can make an important contribution to South African education if the so-called “technological process” is emphasized. This does not mean that the quality of the end-product (aesthetics) should be ignored.

According to the responses, the majority of the respondents (68.5%) regard the quality of the product as more important than the process followed. It was concluded that these respondents held that good quality assumed that the process was also right. In outcomes-based education assessment, both the process and the product are assessed. In the mathematics learning area for example, the total marks allocated to each step in problem solving may add up to more than the marks give to the actual answer alone. It was further concluded that the respondents 13.1% who were uncertain were ignorant of the proposed framework for offering technology education in South Africa.

**Question 14.** The seven specific outcomes for the technology learning area are not user friendly.
Table 4.44 Question 14 responses (Theme 8)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>47</td>
<td>21.2</td>
</tr>
<tr>
<td>Agree</td>
<td>80</td>
<td>36.0</td>
</tr>
<tr>
<td>Uncertain</td>
<td>57</td>
<td>25.7</td>
</tr>
<tr>
<td>Disagree</td>
<td>30</td>
<td>13.5</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>8</td>
<td>3.6</td>
</tr>
<tr>
<td>Total</td>
<td>222</td>
<td>100</td>
</tr>
</tbody>
</table>

Reduction of data

- Total Agree : $21.2 + 36.0 = 57.2$
- Uncertain : $25.7$
- Total Disagree: $13.5 + 3.6 = 17.1$

Analysis and interpretation

Of the respondents, 17.1% disagreed with the statement, 57.2% agreed and 25.7% were uncertain.

The majority of the respondents indicated that the seven specific outcomes (learning area outcomes) for the technology learning area as stipulated in the curriculum policy are not user friendly when it comes to didactics and assessment. Since teachers have to develop lesson activities around these specific outcomes, their job may be made difficult by the lack of resources. This may lead to feelings of negative attitudes towards the implementation of the technology learning area.

Of the respondents, 25.7% cannot tell whether these specific outcomes are user friendly
or not. There has been very little teacher training on didactics and assessment with respect to Curriculum 2005 (Macfarlane & Mona, 1997:2). Jansen (2001:3) emphasized the lack of effective teacher development strategies.

However, 17.1% of the respondents disagreed with the statement. The possibility is that these teachers were involved in the formulation of the policies for the new curriculum (Jones, 1998:52).

**Question 20.** In technology education, the application of theory should receive more attention than the theory per se.

**Table 4.45 Question 20 responses (Theme 8)**

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Uncertain</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>69</td>
<td>32</td>
<td>66</td>
<td>48</td>
<td>227</td>
</tr>
<tr>
<td>5.3</td>
<td>30.4</td>
<td>14.1</td>
<td>29.1</td>
<td>21.1</td>
<td>100</td>
</tr>
</tbody>
</table>

**Reduction of data**

- Total Agree : $5.3 + 30.4 = 35.7$
- Uncertain : $14.1$
- Total Disagree: $29.1 + 21.1 = 50.2$
Analysis and interpretation

Of the respondents 50.2% disagreed with the statement, 35.7% agreed and 14.1% were uncertain.

According to Monau (1997:12), in outcomes-based education, learners “perform” their skills which means that in outcomes-based education the learner is required to do something that will demonstrate that learning has taken place. According to the Technology Learning Area Workshop Committee Report (1996:1), Department of Education (1997b:84 and 2001a:14) the technology education learning area seeks to develop a fundamental understanding of and ability to apply technological knowledge, skills and values. Thus, when learners do problem solving in technology education, they are engaged in the application of the theory. In this study, however, half the respondents indicated that the application of theory should not receive more attention than the theory itself.

It was concluded that the respondents (35.7%) who agreed with the statement were aware that the application of theory in technology education, such as when doing problem solving, was more important that the actual theory because the emphasis is on applying (or performing) the theory.

The researcher also concluded that the respondents (14.1%) who were uncertain held that, depending on the area that was of concern, the theory or its application could be more important.

**Question 21.** I like reading magazines which have a technological content.
Table 4.46 Question 21 responses (Theme 8)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>4</td>
<td>1.7</td>
</tr>
<tr>
<td>Agree</td>
<td>18</td>
<td>7.9</td>
</tr>
<tr>
<td>Uncertain</td>
<td>8</td>
<td>3.5</td>
</tr>
<tr>
<td>Disagree</td>
<td>122</td>
<td>53.3</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>77</td>
<td>33.6</td>
</tr>
<tr>
<td>Total</td>
<td>229</td>
<td>100</td>
</tr>
</tbody>
</table>

Reduction of data

- Total Agree : $1.7 + 7.9 = 9.6$
- Uncertain : $3.5$
- Total Disagree: $53.3 + 33.6 = 86.9$

Analysis and interpretation

The great majority of the respondents (86.9%) disagreed with the statement, thereby indicating that they did not enjoy reading magazines with technological content. This was interpreted as a negative attitude.

The researcher found this a disturbing factor because to teach technology education, teachers must be well read in the subject. The method of didactics and assessment in outcomes-based education and the technology learning area makes imperative for both learners and teachers to do research. The reading of magazines with a technological content will provide the necessary research and latest projects and trends in the technological field. Thus the reading of magazines with technological content may be
one way to affirm the teacher’s knowledge base as far as didactics and assessment are concerned. Specific outcome (3) stresses the need to access, process and use data for technological purposes.

**Question 37.** Teaching technology education is demanding.

**Table 4.47 Question 37 responses (Theme 8)**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td>Agree</td>
<td>42</td>
<td>18.8</td>
</tr>
<tr>
<td>Uncertain</td>
<td>26</td>
<td>11.6</td>
</tr>
<tr>
<td>Disagree</td>
<td>109</td>
<td>48.7</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>46</td>
<td>20.5</td>
</tr>
<tr>
<td>Total</td>
<td>224</td>
<td>100</td>
</tr>
</tbody>
</table>

**Reduction of data**

- Total Agree : $0.4 + 18.8 = 19.2$
- Uncertain : $= 11.6$
- Total Disagree: $48.7 + 20.5 = 69.2$

**Analysis and interpretation**

Most of the respondents (69.2%) disagreed with the statement while 19.2% agreed with it. This indicated that the majority of the respondents did not perceive the teaching of technology education as demanding.

It was concluded that the respondents (19.2%) who agreed with the statement were still
battling to understand technology education.

**Question 38.** By specifying the specific outcomes and the performance indicators in technology education, the initiative of the teacher is stifled.

**Table 4.48 Question 38 responses (Theme 8)**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>15</td>
</tr>
<tr>
<td>Agree</td>
<td>51</td>
</tr>
<tr>
<td>Uncertain</td>
<td>85</td>
</tr>
<tr>
<td>Disagree</td>
<td>62</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>221</strong></td>
</tr>
<tr>
<td></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

**Reduction of data**

- Total Agree : \(6.8 + 23.1 = 29.9\)
- Uncertain : \(38.5 = 38.5\)
- Total Disagree: \(28.0 + 3.6 = 31.6\)

**Analysis and interpretation**

From the data, teachers seemed to have divided opinions on this question as demonstrated by the almost equal split of the responses. The respondents who indicated that critical and creative thinking was not necessary for technology education (see question 12), would accordingly not see any relationship between stifling the teacher's initiative and critical and creative thinking in technology education whether through specifying the outcomes and the performance indicators or not. Of the respondents, 31.6% fall in that
category.

Of the respondents, 38.5% are uncertain. It was concluded that these are the respondents that also are not clear of what critical and creative thinking really entails.

Of the respondents, 29.9% agreed that the specification of the outcomes and the performance indicators would have an impact on the teacher’s initiative. It was concluded that these respondents have made efforts to interpret and apply both the critical and the specific outcomes in relation to the learning area of technology.

**Question 42.** Teachers do not know what the technology learning area really entails.

**Table 4.49 Question 42 responses (Theme 8)**

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>20</th>
<th>8.8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree</td>
<td>51</td>
<td>22.5</td>
</tr>
<tr>
<td>Uncertain</td>
<td>40</td>
<td>17.6</td>
</tr>
<tr>
<td>Disagree</td>
<td>94</td>
<td>41.4</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>22</td>
<td>9.7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>227</td>
<td>100</td>
</tr>
</tbody>
</table>

**Reduction of data**

- Total Agree : \(8.8 + 22.5 = 31.3\)
- Uncertain : \(= 17.6\)
- Total Disagree: \(41.4 + 9.7 = 51.1\)
Analysis and interpretation

Of the respondents, 51.1% disagreed with the statement, 31.3% agreed and 17.6% were uncertain.

It was concluded that the respondents (51.1%) who indicated that they knew what the technology learning area really entails had read the Curriculum 2005 documentation with specific reference to the technology learning area. Department of Education (1997b and 2001a) explain the details of each learning area in the curriculum, including the technology learning area. There are also curriculum facilitators to help teachers to understand what the technology learning area really entails.

Summary for theme 8

The majority of the respondents were of the opinion that the addition of technology learning area has no burden to the school curriculum, that teaching the technology learning area was not demanding and that they understood what technology education really entails. However, some respondents indicated that they did not like reading technological magazines.

In general, the respondents indicated that the product in the technology learning area assessment was more important than the process followed, the application of theory (to produce products) should receive less attention in teaching than the theory itself, the policies are user friendly and that their initiative was not stifled.
4.6.9 Theme 9: Entrepreneurship

Entrepreneurship is considered part of technology education. The theme of entrepreneurship wished to establish whether technology education teachers understand what entrepreneurship is and how it relates to technology education. A paradigm shift in education and in the curriculum specifically imposes the need for teachers to undertake a paradigm shift too.

According to J.B. Say (Drucker, 1994:19) the entrepreneur is a person who ‘shifts economic resources out of an area of lower and into an area of higher productivity and greater yield’; be it in business or in education; be it a business person or a teacher. By studying further to obtain qualifications that are relevant to the outcomes-based education, teachers would be exploiting change and positioning themselves as agents (or entrepreneurs) to shift educational resources out of an area of lower into an area of higher yield and productivity.

Question 19. Given a chance, I will take a course in technology education to improve my qualification.
Table 4.50 Question 19 responses (Theme 9)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>3</td>
<td>1.3</td>
</tr>
<tr>
<td>Agree</td>
<td>7</td>
<td>3.1</td>
</tr>
<tr>
<td>Uncertain</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td>Disagree</td>
<td>58</td>
<td>25.3</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>160</td>
<td>69.9</td>
</tr>
<tr>
<td>Total</td>
<td>229</td>
<td>100</td>
</tr>
</tbody>
</table>

Reduction of data

Total Agree : $1.3 + 3.1 = 4.4$

Uncertain : $= 0.4$

Total Disagree: $25.3 + 69.9 = 95.2$

Analysis and interpretation

The overwhelming majority of the respondents (95.2%) disagreed with this statement, 4.4% agreed and 0.4% were uncertain.

The researcher was deeply disturbed that 95.2% of the respondents were not eager to take a course in technology education to improve their qualification and knowledge should the opportunity present itself.

A paradigm shift in education does not only stop at the curriculum and the system of education but encompasses change in the teachers themselves. This change includes attitudes and teacher qualifications which could manifest themselves as entrepreneurship. By refusing an opportunity to learn, teachers would be contradicting the principle of
lifelong learning as advocated by the new outcomes-based education paradigm.

**Question 27.** Technology is to be found in all spheres of life.

**Table 4.51 Question 27 responses (Theme 9)**

<table>
<thead>
<tr>
<th>Response</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>3</td>
<td>1.3</td>
</tr>
<tr>
<td>Agree</td>
<td>2</td>
<td>0.9</td>
</tr>
<tr>
<td>Uncertain</td>
<td>6</td>
<td>2.6</td>
</tr>
<tr>
<td>Disagree</td>
<td>96</td>
<td>42.5</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>119</td>
<td>52.7</td>
</tr>
<tr>
<td>Total</td>
<td>226</td>
<td>100</td>
</tr>
</tbody>
</table>

**Reduction of data**

- Total Agree : \(1.3 + 0.9\) = 2.2
- Uncertain : \(= 2.6\)
- Total Disagree: \(42.5 + 52.7\) = 95.2

**Analysis and interpretation**

The overwhelming majority of the respondents (95.2%) disagreed with the statement, thereby indicating that they did not know what is actually entailed in technology. The researcher concluded that this explained why they did not want to improve their qualifications in technology education.

It was further concluded that the respondents lacked the ability to see and make meaning of what was around them which is in the researcher’s view the essence of what
innovation and entrepreneurship is all about (Drucker, 1994:16 & 25). The respondents wished to confine technology to certain spheres in life, which is the opposite of what entrepreneurship is about.

Consequently they did not model the concept of entrepreneurship and lifelong learning as discussed in section 4.6.9 and Question 19 theme 9.

**Question 39.** Integration across the learning areas is easily achieved through technology Education.

**Table 4.52 Question 39 responses (Theme 9)**

<table>
<thead>
<tr>
<th>Response</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>10</td>
<td>4.4</td>
</tr>
<tr>
<td>Agree</td>
<td>16</td>
<td>7.1</td>
</tr>
<tr>
<td>Uncertain</td>
<td>33</td>
<td>14.7</td>
</tr>
<tr>
<td>Disagree</td>
<td>124</td>
<td>55.1</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>42</td>
<td>18.7</td>
</tr>
<tr>
<td>Total</td>
<td>225</td>
<td>100</td>
</tr>
</tbody>
</table>

**Reduction of data**

Total Agree : $4.4 + 7.1 = 11.5$

Uncertain : $14.7 = 14.7$

Total Disagree: $55.1 + 18.7 = 73.8$

**Analysis and interpretation**

The majority of the respondents (73.8%) indicated that integration through learning areas
could not be achieved easily through technology education. It was therefore concluded that the respondents were possibly not aware of the integrative nature of technology education and its relationship to other learning areas. Teachers who are entrepreneurs, are able to see opportunities and exploit them. Teachers' innovativeness and entrepreneurship would come handy when they have to integrate technology education with other learning areas such as using the science laboratories for a technological project and vice versa.

Summary for theme 9

The respondents indicated an unwillingness to take an opportunity to improve their qualifications. The majority did not know that technology is in all spheres of life, which stifled their entrepreneurial opportunities. Moreover, they demonstrated that they were unaware of the integrative power of technology education. According to the discussions above, the researcher would want to conclude that the successful implementation of Curriculum 2005 requires teachers who:

- are innovative (critical and creative thinkers) as advocated by critical outcome number (1);
- want to explore education and career opportunities as advocated by critical outcome number (11);
- are willing to develop entrepreneurial opportunities as advocated by critical outcome number (12).
4.7 ANALYSIS OF THE FREQUENCY OF RESPONSES TO THE THEMES

The nine themes relevant to teacher attitudes in the implementation of technology education were analyzed statistically. Table 4.53 presents a summary of the statistical analysis.

Table 4.53 Analysis of the research themes responses

<table>
<thead>
<tr>
<th>Theme</th>
<th>SA</th>
<th>A</th>
<th>U</th>
<th>D</th>
<th>SD</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Critical and creative thinking</td>
<td>2.2</td>
<td>5.2</td>
<td>27.7</td>
<td>60.2</td>
<td>4.8</td>
<td>100</td>
</tr>
<tr>
<td>2. Gender bias</td>
<td>4.3</td>
<td>6.5</td>
<td>73.2</td>
<td>13.4</td>
<td>2.6</td>
<td>100</td>
</tr>
<tr>
<td>3. Culture, values and beliefs</td>
<td>0.4</td>
<td>1.3</td>
<td>11.3</td>
<td>64.9</td>
<td>22.1</td>
<td>100</td>
</tr>
<tr>
<td>4. Working conditions</td>
<td>1.3</td>
<td>0.9</td>
<td>19.5</td>
<td>71.9</td>
<td>6.5</td>
<td>100</td>
</tr>
<tr>
<td>5. Relationship with Mathematics and Science</td>
<td>1.7</td>
<td>4.3</td>
<td>39.6</td>
<td>34.3</td>
<td>20.0</td>
<td>100</td>
</tr>
<tr>
<td>6. Relationship with other Learning Areas</td>
<td>1.3</td>
<td>2.2</td>
<td>47.2</td>
<td>48.5</td>
<td>0.9</td>
<td>100</td>
</tr>
<tr>
<td>7. Education policies</td>
<td>2.2</td>
<td>2.2</td>
<td>45.5</td>
<td>49.4</td>
<td>0.9</td>
<td>100</td>
</tr>
<tr>
<td>8. Didactics and Assessment</td>
<td>0.4</td>
<td>3.9</td>
<td>52.4</td>
<td>43.3</td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td>9. Entrepreneurship</td>
<td>0.9</td>
<td>3.0</td>
<td>7.4</td>
<td>48.1</td>
<td>40.7</td>
<td>100</td>
</tr>
</tbody>
</table>

SA = Strongly agree; A = Agree; U = Uncertain; D = Disagree; SD = Strongly disagree; T = Total percentage responses

All themes were responded to. The response rates for each theme are indicated as percentages in the last column. Statistical deviations in the totals are due to the rounding off of the percentages.

4.8 CROSS-TABULATION OF THE RESEARCH STATEMENTS WITH THE NINE ATTITUDE THEMES

The statistical analysis of the research was done through the cross-tabulation of the research questions with the nine attitude themes for technology education. The chi-
square test was conducted with the assistance of a statistician. The resultant p-value was an indication of any difference between the variables under consideration. A difference indicated a relationship between the cross-tabulated concepts or variables under consideration. However, if there was no difference between the concepts under consideration (i.e. p-value is greater than 0.05) this signified that there was no relationship between the concepts under consideration, namely the research question and the specific attitude theme. The lesser the p-value from the 0.05 numerical value, the more significant the difference. The value of this difference (p-value difference) was used to explain the relevance or cause and effect of the concepts under investigation (Ho or null hypothesis testing if the research had an hypothesis).

### 4.8.1 The effect of Gender on the nine themes

These cross-tabulations aimed to reveal the effect that the Gender of the technology education teachers had on their attitude towards the implementation of technology education with respect to the nine research themes.

#### Table 4.54 Cross-tabulation between Gender and the nine research themes

<table>
<thead>
<tr>
<th>Cross-tabulation</th>
<th>Chi-square</th>
<th>p-value</th>
<th>Statistical</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Gender vs Critical and creative thinking</td>
<td>8.525</td>
<td>0.074</td>
<td>No difference</td>
</tr>
<tr>
<td>2. Gender vs Gender bias</td>
<td>6.012</td>
<td>0.198</td>
<td>No difference</td>
</tr>
<tr>
<td>3. Gender vs Culture, values and beliefs</td>
<td>1.897</td>
<td>0.755</td>
<td>No difference</td>
</tr>
<tr>
<td>4. Gender vs Working conditions</td>
<td>6.571</td>
<td>0.160</td>
<td>No difference</td>
</tr>
<tr>
<td>5. Gender vs Relationship to Mathematics and science</td>
<td>1.058</td>
<td>0.901</td>
<td>No difference</td>
</tr>
<tr>
<td>6. Gender vs Relationship to other Learning Areas</td>
<td>3.952</td>
<td>0.413</td>
<td>No difference</td>
</tr>
<tr>
<td>7. Gender vs Education policies</td>
<td>5.271</td>
<td>0.261</td>
<td>No difference</td>
</tr>
<tr>
<td>8. Gender vs Didactics and Assessment</td>
<td>5.586</td>
<td>0.134</td>
<td>No difference</td>
</tr>
<tr>
<td>9. Gender vs Entrepreneurship</td>
<td>4.981</td>
<td>0.289</td>
<td>No difference</td>
</tr>
</tbody>
</table>

From the cross-tabulations (table 4.54), it was clear that a p-value greater than 0.05 was
obtained in all nine themes. This indicated that there was no statistical difference between Gender and each of the nine themes, thus gender had no influence on any of the themes. Consequently, Gender had no influence on the technology teachers’ attitudes towards the implementation of technology education with respect to the nine research themes.

4.8.2 The effect of Mathematics level on the nine research themes

These cross-tabulations aimed to reveal what the effect of the level of mathematics achieved by the technology education teachers had on their attitudes towards the implementation of technology education with respect to the nine research themes.

Table 4.55 Cross-tabulation between mathematics level and the nine themes

<table>
<thead>
<tr>
<th>Cross-tabulation</th>
<th>Chi-square</th>
<th>p-value</th>
<th>Statistical</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Maths vs Critical and creative thinking</td>
<td>16.170</td>
<td>0.184</td>
<td>No difference</td>
</tr>
<tr>
<td>2. Maths vs Gender bias</td>
<td>21.982</td>
<td>0.036</td>
<td>Difference</td>
</tr>
<tr>
<td>3. Maths vs Culture, values and beliefs</td>
<td>13.459</td>
<td>0.337</td>
<td>No difference</td>
</tr>
<tr>
<td>4. Maths vs Working conditions</td>
<td>18.700</td>
<td>0.096</td>
<td>No difference</td>
</tr>
<tr>
<td>5. Maths vs Relationship to Mathematics and science</td>
<td>21.188</td>
<td>0.048</td>
<td>Difference</td>
</tr>
<tr>
<td>6. Maths vs Relationship to other Learning Areas</td>
<td>21.764</td>
<td>0.040</td>
<td>Difference</td>
</tr>
<tr>
<td>7. Maths vs Education policies</td>
<td>12.737</td>
<td>0.388</td>
<td>No difference</td>
</tr>
<tr>
<td>8. Maths vs Didactics and Assessment</td>
<td>25.795</td>
<td>0.002</td>
<td>Difference</td>
</tr>
<tr>
<td>9. Maths vs Entrepreneurship</td>
<td>19.108</td>
<td>0.086</td>
<td>No difference</td>
</tr>
</tbody>
</table>

Four out of nine research themes (viz. 2, 5, 6 and 8) from the above tabulations (table 4.55) revealed that the level of mathematics achieved by the technology education teachers had an influence on their attitudes towards the implementation of technology education.

A very high statistical difference occurred in theme 8 (p-value 0.002) which meant that a high level of mathematics would have a high influence on the Didactics and Assessment
in the implementation of technology education.

4.8.3 The effect of the Science level reached against the nine themes

These tabulations aimed to reveal the effect that the level of science reached by the technology education teachers had on their attitudes towards the implementation of technology education with respect to the nine research themes.

Table 4.56 Cross tabulation between the science level and the nine themes

<table>
<thead>
<tr>
<th>Cross-tabulation</th>
<th>Chi-square</th>
<th>p-value</th>
<th>Statistical</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Science vs Critical and creative thinking</td>
<td>7.998</td>
<td>0.785</td>
<td>No difference</td>
</tr>
<tr>
<td>2. Science vs Gender bias</td>
<td>27.702</td>
<td>0.006</td>
<td>Difference</td>
</tr>
<tr>
<td>3. Science vs Culture, values and beliefs</td>
<td>27.453</td>
<td>0.007</td>
<td>Difference</td>
</tr>
<tr>
<td>4. Science vs Working conditions</td>
<td>23.956</td>
<td>0.021</td>
<td>Difference</td>
</tr>
<tr>
<td>5. Science vs Relationship to Mathematics and science</td>
<td>14.553</td>
<td>0.267</td>
<td>No difference</td>
</tr>
<tr>
<td>6. Science vs Relationship to other Learning Areas</td>
<td>24.803</td>
<td>0.016</td>
<td>Difference</td>
</tr>
<tr>
<td>7. Science vs Education policies</td>
<td>7.990</td>
<td>0.786</td>
<td>No difference</td>
</tr>
<tr>
<td>8. Science vs Didactics and Assessment</td>
<td>19.923</td>
<td>0.018</td>
<td>Difference</td>
</tr>
<tr>
<td>9. Science vs Entrepreneurship</td>
<td>19.206</td>
<td>0.084</td>
<td>No difference</td>
</tr>
</tbody>
</table>

This cross-tabulation revealed that the level of science achieved by the technology teachers had an influence (statistical difference) on five themes (viz. 2, 3, 4, 6 and 8).

A very high statistical difference occurred in theme 2 (p-value 0.006) and theme 3 (p-value 0.007).

4.9 FINDINGS

The empirical study found the following:

- Gender did not influence the teachers' attitudes towards the
implementation of technology education with respect to all nine themes. There was no statistical difference between gender bias and the nine research themes.

- The level of mathematics achieved by the technology education teachers had an influence on four of the research themes (viz. 2, 5, 6 and 8). A strong attitudinal influence was recorded for the theme didactics and assessment.

- The level of science achieved by the technology education teachers had an influence on five of the nine research themes (viz. 2, 3, 4, 6 and 8). A strong attitudinal influence was recorded for the themes gender bias and culture, values and beliefs.

4.10 CONCLUSION

The level of mathematics and science achieved by the technology teachers did have an influence on their attitudes towards the implementation of technology education with respect to six themes: gender bias; relationship with mathematics and science; relationship with other learning areas; didactics and assessment; culture, values and beliefs and the teachers' working conditions. Thus, the level of achievement in mathematics and in science was a definite factor in teacher attitudes towards the implementation of technology education.
4.11 RÉSUMÉ

The empirical study found a positive relationship between mathematics and science level reached by the technology education teacher with respect to certain themes in the research. The themes, questions, response rates, analysis and conclusions were also discussed. Chapter 5 uses the empirical findings to draw up a model to enhance teachers' attitudes towards the implementation of technology education.
CHAPTER 5

Model to enhance teacher attitudes towards technology education and its implementation

5.1 BACKGROUND

This chapter presents the comprehensive model developed for the enhancement of teacher attitudes towards the implementation of technology education. The findings from the empirical study were used to develop the model to act as a corrective device to enhance teacher attitudes in the implementation of the technology learning area in Curriculum 2005. Conway (1994:114) states that good teacher education means “enabling teachers to think about and justify what they are doing as teachers in terms of fundamental beliefs about humans, society, nature, knowledge and ethics”. The model presented here was based on teachers’ attitudes for the purpose of fostering positive attitudes and changing and improving negative ones towards the implementation of technology education.

5.2 WHAT IS A MODEL?

5.2.1 Definition of “model”

There are several types of models. A model of an object is a physical representation (usually smaller than the object it represents) that shows what it looks like or how it works. A model may also be a system that is being used and that people might want to copy in order to achieve similar results. A model of a system or process is a theoretical
description that can help people understand how the system or process works, or how it might work.

In this case, a model consists of a set of assumptions, an organizational framework and a set of rules for manipulating the details of the model. The formulation of the theory involves relating the details of the model to empirical events in the real world. A theory consists of a model and the established general principles organized in terms of the model (Matheson, Bruce & Beauchamp 1978:11). Rasool (2000:62) defines a model as something that is used to clarify relationships in a paradigm in a way that minimises loss of understanding. For the purposes of this study a model was understood broadly as a representation of theory.

5.2.2 Difference between a model and a paradigm shift

A paradigm shift or scientific revolution in the contemporary education context is a departure from the traditional form of education that stressed rote learning to outcomes-based education, which focuses on the outcomes of educational endeavours. Different models can be drawn to explain this paradigm shift. In an attempt to capture and conceptualise the essence of teacher attitudes in the implementation of technology education (as a paradigm shift in education), different models may be designed, representing different approaches or perspectives on the paradigm shift. Each of the models may evoke different responses to the paradigm shift.
5.3 NEED FOR A MODEL

The researcher considered it necessary to develop a model that could be used to overcome the problem of negative teacher attitudes in the implementation of technology education. This model should be as specific as possible because by being too general, it would lose its impact.

5.3.1 The model as part of the solution

Since the model is a representation of the theory in broad terms, it makes interpretation and interpolation of certain aspects possible. A summary of the research findings should be discerned in the model. Furthermore, the model must be able to solve all relevant problems and not introduce any itself. A model that is not well designed may complicate issues and end up being part of the problem and not part of the solution. A good model has to satisfy certain criteria.

5.3.2 Criteria for a good model

A good model can be tested against the following criteria:

- Does the model answer research questions or solve the research problem adequately?
- Is the model simple and understandable?
- Is the model relevant and contemporary to the education ideals?
- Is the model testable?

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Is the model non-politicized?

The researcher was convinced that the model for this research satisfied the above criteria.

5.4 THEMES THAT MAKE UP THE MODEL

The empirical study found that the level of mathematics and science achieved by the technology education teachers had an effect on some of the research themes as indicated below.

Four themes were influenced by the level of mathematics achieved by the technology teacher, namely

- Theme 2: Gender bias
- Theme 5: Relationship to mathematics and science
- Theme 6: Relationship to other learning areas
- Theme 8: Didactics and assessment

Five themes were influenced by the level of science achieved by the technology teacher, namely

- Theme 2: Gender bias
- Theme 3: Culture, values and beliefs
- Theme 4: Teachers’ working conditions
- Theme 6: Relationship to other learning areas
- Theme 8: Didactics and assessment
5.5 RESEARCH QUESTIONS USED IN THE MODEL

The empirical study showed that the following two research questions had an influence on teachers' attitudes towards certain themes:

(b) Does the level of mathematics achieved influence teachers' attitudes towards the implementation of technology education with respect to the nine research themes?

(c) Does the level of science achieved influence teachers' attitudes towards the implementation of technology education with respect to the nine research themes?

These two research questions were used in developing a model for this study.

5.6 RESEARCH QUESTIONS AND THEMES NOT USED IN THE MODEL

The research question (a) "The technology teacher's gender" had no attitudinal influence on all nine themes. Three themes, namely (1) Critical and creative thinking, (7) Education policies and (9) Entrepreneurship also had no influence on any of the research Questions (see figure 5.1 & 5.2). The interrelationship between the three research questions and the nine themes can be depicted as follows:
Fig. 5.1 Interrelationship of the research questions and themes

(A) The nine research themes

(B) The three research questions

(C) Gender: has no influence on the nine research themes

(D) Level of mathematics: has an influence on four themes

(E) Level of science: Has an influence on five themes

(F) Design of a model
5.7 DISCUSSION OF THE THEMES

5.7.1 Factors that affect the level of achievement in mathematics

The level of mathematics achieved by the teacher was affected in some way or another by the following factors:

- **Mathematics phobia.** There is widespread fear of mathematics. Mathe (1997) found that attitudes play a part in the development of mathematics phobia and low achievement in mathematics in Soweto schools.

- **Belief that mathematics is not for girls.** This attitude has discouraged and even prevented girls from taking mathematics at school.

- **Mathematics does not relate to everyday life.** There is a belief that basic numeracy is all one needs to get along in life.

- **Mathematics is related to critical and creative thinking.** Mathematics helps improve thinking skills. It has been said that thinking is to the mind (brain) what exercise is to the body.

5.7.2 Themes that are influenced by the level of mathematics achieved by the technology education teacher

The empirical study found that the level of mathematics achieved had an effect on four of the nine themes namely gender bias, relationship to mathematics and science, relationship to other learning areas, and didactics and assessment as follows:
Theme 2: Gender bias

The chi-square test (statistical difference) between the level of mathematics achieved by the technology teacher and gender bias revealed a p-value of 0.038, which indicated that there was a statistical difference between the two variables. This was an indication that the level of mathematics achieved by the teachers had an influence on their attitude towards gender.

Theme 5: Relationship to mathematics and science

The chi-square test between the level of mathematics achieved by the technology teacher and the relationship of technology education to mathematics and science gave a p-value of 0.048. This indicated a statistical difference, that is a causal relationship. This was an indication that the level of mathematics achieved by the teacher had an influence on the teacher’s understanding of the relationship between technology education and mathematics and science.

Theme 6: Relationship to other learning areas

The chi-square test between the level of mathematics achieved by the technology education teacher and the relationship of technology education to other learning areas gave a p-value of 0.040. This indicated a causal relationship between the mathematics level and other learning areas.
Theme 8: Didactics and assessment

The chi-square test between the level of mathematics achieved by the technology education teacher and didactics and assessment gives a p-value of 0.002 which is extremely high. This indicated a strong causal relationship between the mathematics level and Didactics and assessment.

5.7.3 Factors that affect the attainment of the science level

Science and technology are interrelated (see chapter 2, section 2.5.2.2). Science and technology complement each other. Scientific discoveries are generally used for technological ends. According to the empirical evidence (see section 4.8.3), the level of science achieved by technology education teachers had an influence on their attitude towards the implementation of technology education.

Stagnation, superstition, laziness and a lack of critical and creative thinking kill or stifle an interest in science (Spectrum, 1998:35). By using critical and creative thinking, teachers are able to integrate science laboratories for technology workshops and vice versa.

5.7.4 Themes that are influenced by the level of science achieved by the technology education teacher.

The study found that the level of science achieved by teachers had an effect on five of the nine themes, namely gender bias; culture, values and beliefs; working conditions, relationship to other learning areas, and didactics and assessment (see table 4.56).
Theme 2: Gender bias

The chi-square test between the level of science achieved by the technology teacher and gender bias revealed a p-value of 0.006, which is extremely high. This indicated a strong statistical difference between the two variables. This was an indication that the level of science achieved by teachers has an influence on their attitude towards gender.

Theme 3: Culture, values and beliefs

The chi-square test between the level of science achieved by the technology education teacher and culture, values and beliefs gave a p-value of 0.007 that is extremely high. This indicates a strong causal relationship between science level and culture, values and beliefs.

Theme 4: Working conditions

The chi-square test between the level of science achieved by the technology teacher and the teacher’s working conditions gave a p-value of 0.21. This indicates a statistical difference, that is a causal relationship. This is an indication that the level of science achieved by the teachers has an influence on their tolerance/understanding of their working conditions.

Theme 6: Relationship to other learning areas

The chi-square test between the level of science achieved by the technology education teacher and the relationship of technology education to other learning areas gave a p-value of 0.016. This indicates a statistical difference, that is a causal relationship. This is
an indication that the level of science achieved by the teacher has an influence on the teacher’s understanding of the relationship between technology education and other learning areas.

Theme 8: Didactics and assessment

The chi-square test between the level of science achieved by the technology education teacher with didactics and assessment gave a p-value of 0.018. This indicates a strong causal relationship between mathematics level and didactics and assessment.

5.8 DEVELOPMENT OF THE RESEARCH MODEL

A model was designed, based on the empirical findings. The purpose of this model was to provide adequate answers to the research questions or to solve the research problem satisfactorily. The model had to satisfy the criteria set out in section 5.3.2.

5.8.1 Finding common points/ground

The themes used for the research questions were not mutually exclusive, as indicated in table 5.1
Table 5.1: Common themes between the research questions

<table>
<thead>
<tr>
<th>Level of Mathematics</th>
<th>Level of Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theme 2</td>
<td>Theme 2</td>
</tr>
<tr>
<td>Theme 5</td>
<td>Theme 3</td>
</tr>
<tr>
<td>Theme 6</td>
<td>Theme 4</td>
</tr>
<tr>
<td>Theme 8</td>
<td>Theme 6</td>
</tr>
<tr>
<td>(common)</td>
<td>(common)</td>
</tr>
</tbody>
</table>

It is evident from table 5.2 that themes 2, 6 and 8 are common themes. Theme 3 is exclusive to research question (b) (Level of mathematics reached by the technology education teacher) and themes 3 and 4 are exclusive to the research question (c) (Level of science reached by the technology education teacher). This situation can be represented as a Venn diagram.

Figure 5.2 Venn diagram of common themes

```
Level of mathematics       Level of science reached

THEME 5
THEME 6
THEME 8

THEME 2
THEME 3
THEME 4

Common themes (at intersection)
```
Spider web diagrams can be used to elaborate on the relationship of the two research questions and the relevant themes. Primer and Chow's (1992:269) model was adapted to suit the study of teachers attitudes in the implementation of technology education and used.

Figure 5.3 Research questions and themes identification

LEVEL OF MATHEMATICS REACHED BY THE TEACHER

THEME 2

LEVEL OF SCIENCE REACHED BY THE TEACHER

THEME 2

THEME 4

POSITIVE/IMPROVED TEACHER ATTITUDES TOWARDS THE IMPLEMENTATION OF TECHNOLOGY EDUCATION
Themes common to both questions are indicated with the same colour. Uncommon themes have individual separate colours.

5.8.2 Developing the research model

The model for this research consisted of four stages: (1) the input or entry, (2) the field or school, (3) guidelines and finally (4) the output. When stage 2 and 3 are put together, they act as the central processing unit of the model. Figure 5.3 illustrates the model diagrammatically.

Figure 5.4 Research model

STAGE 1

LEVEL OF MATHEMATICS REACHED

LEVEL OF SCIENCE REACHED

RESEARCH QUESTIONS

STAGE 2

TEACHING LEARNING ASSESSMENT CURRICULUM POLICIES

STAGE 3

GUIDELINES FOR POSITIVE ATTITUDES CULTIVATION

HIGH OR LOW MORALE

SUCCESS OR FAILURE TO IMPLEMENT

TECHNOLOGICAL LITERACY

OPEN/CLOSED TO CHANGE

STAGE 4

POSITIVE OR NEGATIVE ATTITUDES

GUIDELINES FOR POSITIVE ATTITUDES

OUTPUT/RESULTS

FIELD/SCHOOL

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5.8.3 **Explanation of the model**

The different stages in the model and their interrelationship are discussed below.

(1) **The input stage**

The level of mathematics and science achieved and the teacher’s gender are input variables. The teacher’s level of mathematics or science can be low or high. However, the assessment of the degree of ‘high’ or ‘low’ level of mathematics or science is outside the scope of this study.

(2) **The field or school situation**

The implementation of the curriculum takes place in the field/school, that is where the teaching, learning and assessment play a major role. How the teachers perform their didactical tasks and the assessment is largely a function of their attitude (e.g. perception, self-esteem, motivation and knowledge, skills and attitudes) and the curriculum. However, the school arena atmosphere and contexts differ from school to school. The empirical study for this research is the natural setting where the implementation of technology education takes place.

(3) **Guidelines**

Specific guidelines are used as milestones to correct negative attitudes and to enhance positive ones towards the implementation of technology education. These guidelines are determined from the empirical evidence within the school or field (i.e. analysis and interpretation of the research themes and how these answer the research questions).
These guidelines are discussed later.

(4) **Output/Results**

The output consists of positive or negative attitudes with respect to the attitude themes and teacher activities tested in stages 2 and 3. The relevant themes are discussed above while teacher activities include teaching, learning, assessment, curriculum implementation, group discussions, compilation of portfolios and implementation of policies. Depending on the processing of these ingredients, the output can be positive or negative attitudes towards the implementation of technology education that may result in high or low teacher morale, success or failure of the implementation of technology education or a high or low level of technological literacy on the teacher.

(5) **The processor**

In essence, stage 2 and 3 perform a duty synonymous with the central processing unit in a computer except that it is done manually. Constant human intervention and judgement are characteristic of this stage. Analysis, assessment, interpretations and evaluations are done here.

**5.8.4 Guidelines from the model**

Guidelines for teacher attitudes towards the implementation of technology education for this model are drawn from two broad categories: teacher's level of achievement of mathematics and teacher's level of achievement of science. Teachers' gender had no influence on any of the themes for this study and was thus not used in drawing up the
Within the two broad categories, there are six themes: Gender bias, Culture, values and beliefs, Teacher's working conditions, Relationship to mathematics and science, Relationship to other learning areas and Didactics and assessment that were used in formulating the guidelines for the enhancement of positive teacher attitudes towards the implementation of technology education and the discouragement of negative ones. These guidelines may be tabulated as follows:

(1) **Improvement of the level of both mathematics and science**

The overall level of mathematics and science should be improved by incorporating mathematics and science into teacher training programmes.

(2) **Gender bias**

Efforts should be made to encourage and enable girls and women to take mathematics and to enter technological careers. Career opportunities for women in mathematics, science and technology must be disseminated in departmental circulars.

Quotas in favour of women in mathematics, science and technological careers should be considered.

(3) **Culture, values and beliefs**

The curriculum must emphasise the importance of culture, values and
beliefs in the implementation of technology education.

(4) **Working conditions**

- The role of the teacher in the implementation of technology education must be emphasized.

- Advocacy campaigns for the implementation of the technology learning area must be undertaken.

- There should be national, provincial and regional support for teachers to implement technology education. Attention should be given to:
  - school infrastructure e.g. building workshops, laboratories and libraries.
  - resources for teaching in the technology classroom/workshop
  - conditions of teaching, such as work overload and large classes.

(5) **Relationship to mathematics and science**

The integration of mathematics and science into the technology education curriculum should be encouraged.

(6) **Relationship with other learning areas**

There must be integration between technology education and other learning areas.
(7) Didactics and assessment

Assessment in technology education must take into account both the process and the finished product (artifact).

There should be no division between theory and practice in the implementation of technology education.

Assessment must be based on well-defined outcomes which shall be understood by both the teacher and the learner.

5.8.5 Recommendations for the model

This model is recommended for the following reasons:

- It answers the research questions and problem adequately.
- It is flexible, allowing for adding and subtracting themes and activities.
- Is transferable to other learning areas. The stages remain the same but the contents of the stages change according to the requirement of the particular learning area.
- The model does not impose or coerce, it merely shows the possible teacher attitudes towards the implementation of technology education due to teacher level of achievement in mathematics and science.
- The model does not propose exclusion on the basis of failure or low
achievement in mathematics and science.

- Care has been taken to eliminate any political contamination as far as possible.

The presentation of the model in stages makes the model easy to understand and implement. In fact this model can even be simplified further to three stages, namely Input, Processor and Output.

5.8.6 Limitations of the model

Any model has limitations. Limitations of the model could be its inability to answer certain aspects of the problem or failure to predict or respond to old or emergent changes. Should that happen, the model would need to be modified or changed. The model for this study has the following limitations:

- The model does not give alternatives as to where teachers who do not conform to the requirements or level of mathematics and science reached should go for assistance.

- It does not have feedback loops from the process stage or from the output stage that will inform the input stage and result in corrective measures, if necessary.

- No pre-testing mechanism for teacher mathematics and science level achievement is built into the model.

- Level of mathematics and science reached could not be reduced to a
testable standard or degree; that is whether academic achievement is a yardstick for this model or not.

However, the model was able to adequately answer the research questions.

5.8.7 Managing the model

Managing the model would include strategies to overcome its limitations and to use the model beneficially. Environmental factors, external and internal to the model have to be taken into consideration. The model should also be operated within safe limits to avoid erratic results. Both the model and the teacher can be explained in terms of Hooke's law of tensile stress and strain. If teachers feel too much stress or unreasonably high bureaucracy because of something inside or outside their work situation, their tolerance may give in. This will result in teachers being defiant. That is when the model will yield untruthful results. However, when too much stress or unreasonable themes are added to the model, or the model is used in a really abnormal field, or the requirement for the achievement of both mathematics and science is unreasonable (too high or too low), then the model will give erratic results. For example, if the level of achievement required for mathematics is a pass in Mathematics III in the B.Sc. degree, then that very requirement will cause negative attitudes among the technology education teachers. However, that is not the level of mathematics envisaged for this model.

5.8.8 Testing the model

The model was tested for validity and reliability, including simulating teachers' biases to suit all conditions of input. Conditions of input used for testing the model fell into the
following categories:

- a teacher who has a high level of achievement in both mathematics and science
- a teacher who has a low level of achievement in both mathematics and science
- a teacher who has a high level of mathematics achievement and a low level of science achievement
- a teacher who has a low level of mathematics achievement and a high level of science achievement

The individual outputs (attitudes) were recorded for each of these input conditions, with the processing stage kept constant. These outputs were expected to conform to the purpose of the model for the model to be valid (i.e. to prove that teachers' level of mathematics and science achievement influenced teachers' attitudes towards the implementation of technology education). The reliability test was conducted by repeating the test performed above and noting whether the same results were obtained. It was assumed that the content and context in which the testing took place remained the same.

5.9 RÉSUMÉ

A model for this research was designed, based on the empirical findings. The operation
of the model was explained, including the management, advantages and limitations of the model. Finally the model was put to the test for its validity and reliability. Chapter 6 summarizes the study, discusses its limitations, and makes recommendations for future study.
CHAPTER 6

Summary, recommendations and conclusion

6.1 INTRODUCTION

Teacher training is a major area of concern in the transformation of education because teachers are integral to the implementation of the curriculum. Thus teacher training must be related to the aims and objectives of the curriculum. But the relationship between well-trained teachers and a relevant curriculum is not sealed until teacher attitudes are taken into consideration. Teacher attitudes have the potential to foil any attempt at implementing a curriculum. For this reason, this study focused on the study of teacher attitudes towards the implementation of technology education.

Certain factors, within the teachers themselves and in their environment, influence their attitudes towards the implementation of Curriculum 2005 with specific reference to technology education. This study presented these factors in nine research themes.

6.2 SUMMARY OF THE STUDY

Chapter 1 presented a background to teacher attitudes and the implementation of technology education. The research problem was put into perspective and formulated, and finally the aim of the study as well as the research methodology were discussed.

Chapter 2 dealt with outcomes-based technology education and its implementation. Technology education’s relationship with mathematics and science was discussed.
Technology and technology education were demystified by clarifying myths about them. Teaching, learning and assessment were also discussed.

Chapter 3 discussed teacher attitudes with reference to the literature review on outcomes-based technology education. The chapter described attitudes, how to detect them and how they feature in technology education teachers’ implementation of technology education. Nine themes specially designed to cover a wide range of teacher attitudes towards the implementation of technology education were also discussed.

Chapter 4 focused on the research methodology as well as data collection and analysis. Data from the questionnaire and interviews were analysed and interpreted, with reference to the research questions and nine research themes. Statistical analysis was used to determine the influence of the nine themes on the research questions. The findings of the empirical study were presented.

Chapter 5 covered the development of a model for the research findings. The empirical study findings were used as inputs to the model. The model was developed to answer the research questions adequately. All the factors that would influence the model were taken into consideration. Once the model was developed, it was tested to find out whether it answered the research questions adequately as envisaged.

The last chapter, chapter 6 presents a summary or overview of the study, discusses its limitations and makes recommendations for further research.
6.3 FINDINGS FROM THE STUDY

The study found that technology education teachers’ level of achievement in mathematics and science had an influence on their attitudes towards the implementation of technology education.

Gender had no influence on teacher attitudes towards the implementation of technology education. This was demonstrated statistically by a high alpha value on all nine themes and in the findings of the nine research themes in the data analysis.

Teachers with a low level of achievement in mathematics and science showed negative attitudes towards the implementation of technology education with respect to the following:

- the relationship of technology education to mathematics and science;
- the relationship of technology education to other learning areas;
- how didactics and assessment are done in technology education;
- teachers’ culture, values and beliefs and
- the working conditions under which the teachers have to deliver or implement this very technology education.

6.4 LIMITATIONS OF THE STUDY

According to O’Brien (Gilbert, 1996:13), any research is “theory dependent” and furthermore “pure empirical” research is inconceivable whether that theory is acknowledged or not. At the simplest level theory may merely involve assumptions on
how the world or the phenomenon in question is perceived. This is the main source of limitations in any research. This study faced the following difficulties and limitations:

- Attitudes and perceptions can be influenced by time (history) and physical realities.

- There is an inherent discrepancy between policy and its implementation (theory and practice)

- Implementation calls for interpretation (subjective) and embedded in this interpretation are attitudes that have the potential to distort the policy and/or its implementation if not curbed or controlled.

- Policy interpretation and implementation affects different schools differently.

- Attitudes cannot be measured directly. They are inferred, and subjectivity is embedded in this inference.

- There is a basically negative attitude towards technology education as a result of the Curriculum Review Committee’s proposal to scrap technology education from the curriculum.

- The National Curriculum Statement (NCS) advocates certain principles, values and attitudes.

- The implementation of technology education preceded teacher training.
There has been little, if any, research on the implementation of technology education in South Africa.

People generally resist change whether it is for the good or not.

The questionnaire for this study was written in English. For many of the respondents, English is a second or third language.

Technology Education has its own technical terms that cannot be avoided. This is compounded by the new technical terms associated with outcomes-based education. Many teachers find it difficult to master and explain these terms.

South African technology education teachers in general are technologically illiterate.

6.5 PROPOSED SOLUTION TO THE PROBLEM

A model was developed to solve teachers' negative attitudes towards technology education and its implementation. The model had the technology education teachers' level of achievement in mathematics and science as a priority.

By isolating the causes of negative teacher attitudes towards technology education, this study has contributed significantly to improving its implementation.
6.6 RECOMMENDATIONS FOR FURTHER RESEARCH

It is recommended that improving teachers' level of achievement in both mathematics and science would improve their confidence to offer technology education and hence also improve their overall attitudes towards the implementation of technology education.

Given the paucity of literature and research on technology education in South Africa and the findings of this study, further research in the following topics needs to be undertaken:

- Parents' attitudes towards technology education and technological careers.
- The relationship between mathematics and technology education.
- The relationship between science and technology education.
- The influence of culture, values and beliefs on the implementation of technology education.
- The roles of the technology teacher in the implementation of technology education.
- Teacher training for technology education.
- Didactics and assessment in the implementation of technology education.
- How technology education can be integrated with other learning areas (The ability of technology education to integrate with other learning areas).
- Curriculum development for technology education.
- Technology education and gender.
6.7 CONCLUSION

This study investigated teachers' attitudes towards the implementation of technology education in the hope that the findings can help inform the course and direction of the education dispensation in South Africa. Technology education is vital in today's technologically advanced and competitive global environment. The successful implementation of technology education in Curriculum 2005 requires adequately trained and equipped, positive, confident teachers. In highlighting the problem of negative teacher attitudes towards the implementation of technology education, developing a model to enhance teachers' attitudes and recommending relevant areas for future research, this study aimed to help improve education in South Africa in general and to contribute significantly to the acceptance and implementation of Curriculum 2005.
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APPENDICES
APPENDIX 2.1

CRITICAL/ESSENTIAL OUTCOMES FOR CURRICULUM 2005

Critical outcome 1: Identify and solve problems and make decisions using critical and creative thinking.

Critical outcome 2: Work effectively with others as a member of a team, group, organization and community.

Critical outcome 3: Organize and manage oneself and one's activities responsibly and effectively.

Critical outcome 4: Collect, analyze, organize and critically evaluate information.

Critical outcome 5: Communicate effectively using visual, symbolic and/or language skills in various modes.

Critical outcome 6: Use science and technology effectively and critically showing responsibility toward the environment and the health of others.

Critical outcome 7: Demonstrate an understanding of the world as a set of related systems by recognizing that problem solving contexts do not exist in isolation.

Critical outcome 8: Reflect on and explore a variety of strategies to learn more effectively.
Critical outcome 9: Participate as responsible citizens in the life of local, national and global communities.

Critical outcome 10: Be culturally and aesthetically sensitive across a range of social contexts.

Critical outcome 11: Explore education and career opportunities.

Critical outcome 12: Develop entrepreneurial opportunities.

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APPENDIX 2.2

SPECIFIC AND DEVELOPMENTAL OUTCOMES FOR TECHNOLOGY EDUCATION

Specific outcome 1: to understand and apply the Technological Process to solve problems and satisfy needs and wants.

Specific outcome 2: to apply a range of technological knowledge and skills ethically and responsibly.

Specific outcome 3: to access, process and use data for technological purposes.

Specific outcome 4: to select and evaluate products and systems.

Specific outcome 5: to demonstrate an understanding of how different societies create and adapt technological solutions to particular problems.

Specific outcome 6: to demonstrate an understanding of the impact of technology.

Specific outcome 7: to demonstrate an understanding of how technology might reflect different biases, and create responsible and ethical strategies to address them.

DEVELOPMENTAL OUTCOMES

Developmental outcome 1:
The learner is able to demonstrate an understanding of the inter-
relationships between technology, society and the environment.

**Developmental outcome 2:**

The learner is able to apply technological processes and skills
ethically and responsibly, using relevant knowledge concepts.

**Developmental outcome 3:**

The learner is able to access, process and use information in a variety
of contexts.

***************
APPENDIX 2.3

IMPLEMENTATION SCHEDULE FOR CURRICULUM 2005

<table>
<thead>
<tr>
<th>Year</th>
<th>Grades</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>Orientation and start of training</td>
</tr>
<tr>
<td>1998</td>
<td>Grades 1 &amp; 7</td>
</tr>
<tr>
<td>1999</td>
<td>Grades 2 &amp; 8</td>
</tr>
<tr>
<td>2000</td>
<td>Grades 3 &amp; 9</td>
</tr>
<tr>
<td>2001</td>
<td>Grades 4 &amp; 10</td>
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<tr>
<td>2002</td>
<td>Grades 5 &amp; 11</td>
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<td>2003</td>
<td>Grades 6 &amp; 12</td>
</tr>
<tr>
<td>2004</td>
<td>Making changes</td>
</tr>
<tr>
<td>2005</td>
<td>Full-scale implementation</td>
</tr>
</tbody>
</table>
APPENDIX 3.1

CHARACTERISTICS OF AN ATTITUDE
(with reference to Kiesler (1969:94) and Lord (1997)

1. The goal response: consists of overt behaviours that are the end results of the overt stimulus. The sequence for the goal response is: Overt stimulus → implicit response → overt behaviour.

2. Perception (or attention): certain drives (influences) motivates the individual to attend to the overt stimulus which sets off the entire sequence.

3. Afferent-habit strength: this is the strength of the bond between the overt stimulus and the implicit response.

4. Efferent-habit strength: this is the strength between the implicit response and the overt behaviour.

5. Drive strength: this is the intensity of motivation or the energizing capability of the implicit response.

6. Interaction: the overt response (particular behaviour) is a function of many determinants in addition to the particular implicit response (attitude) under consideration. (The particular behaviour that occurs is a function of the attitude in question as well as all other stimuli, drives, habits and attitudes present in that particular situation.)
7. Attitudes are hard to erode. Once an attitude has been formed, it is hard to undo it. Any attempt at undoing it may easily be construed as an attempt to cover-up. This might fuel or add to the attitude itself.

***************
APPENDIX 3.2

BASIC ASSUMPTIONS OF THE PERCEPTUAL TRADITION

1. There may be a pre-existent reality, but an individual can only know that part which comprises his or her perceptual world, the world of awareness.

2. Perceptions at any given moment exist at countless levels of awareness, from the vaguest to the sharpest.

3. Because people are limited in what they can perceive, they are highly selective in what they choose to perceive.

4. All experiences are phenomenal in character. The fact that two individuals share the same physical environment does not mean that they will have the same experiences.

5. What individuals choose to perceive is determined by past experiences as mediated by present purposes, perceptions and expectations.

6. Individuals tend to perceive only that which is relevant to their purposes and make their choices accordingly.

7. Choices are determined by perceptions, not facts. How a person behaves is a function of his or her perceptual field at the moment of acting.

8. No perception can ever be fully shared or totally communicated because it is embedded in the life of the individual.
9. “Phenomenal absolutism” means that people tend to assume that other observers perceive as they do. If others perceive differently, it is often thought to be because others are mistaken or they lie. (or are stupid)

10. The perceptual field, including the perceived self, is internally organized and personally meaningful. When this organization and meaning are threatened, emotional problems are likely to result.

11. Communication depends on the process of acquiring greater mutual understanding of one another’s phenomenal fields.

12. People not only perceive the world of the present but they also reflect on past experiences and imagine future ones to guide their behaviour.

13. Beliefs can and do create their own social reality. People respond with feelings not to “reality” but to their perceptions of reality.

14. Reality can exist for an individual only when he or she is conscious of it and has some relationship with it.

15. Perceptions are hard to erode and any attempt at trying to erode a perception will be looked upon with skepticism and can often be labeled as a cover-up.

16. Perceiving is reduced to a perception image which appears in the consciousness of the perceiver (Kruger, 1979:98).
17. In perception, the perceiver most often reserves to himself a privileged position.

18. "Perception is inactive. The subject (i.e. the homunculus inside the brain) passively waits for the information or stimuli coming into the brain. Then it has to accept them all" (Kruger, 1979:81).

19. "Perception is receptive. In other words, to observe is to allow stimuli to enter" (Kruger, 1979:81).

20. "Perception is solitary. The homunculus or soul or mind in the brain which performs the observation or, in any case, completes it is alone" (Kruger, 1979:81)

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APPENDIX 3.3

CHARACTERISTICS OF THE PERCEIVER AND THE PERCEIVED
(Luthans, 1986:175)

The Perceiver

- The perceiver’s knowledge of himself/herself makes it easier for him or her to see others accurately. People perceive with reference to themselves (the self) – whether they be a group or an individual.

- The perceiver’s characteristics will affect the characteristics that he or she is likely to see in others.

- The perceiver’s acceptance of himself/herself (self-esteem) will more likely result in favourable acceptance of others.

- Good perception is a culmination of a multiple of skills.

The Perceived

- The status of the perceived influences the perception of the perceiver and vice versa (reciprocity).

- The perceived is usually placed into categories to simplify the perceiver’s perceptual activities. Two common categories used are status and role.

- The perceiver’s visible traits will greatly influence the perceived.

***************

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APPENDIX 3.4

MASLOW'S CHARACTERISTICS OF A SELF-ACTUALIZING PERSON
(Morris, 1973:351)

1. More efficient perception of reality: The self-actualizing person judges persons and events realistically and is better able than others to accept uncertainty and ambiguity. (Realistically oriented).

2. Acceptance of self and others: These people take others for what they are and are not guilty or defensive about themselves.

3. Spontaneity: This quality is shown more in thinking than in action. In fact, the self-actualizing person is frequently quite conventional in behaviour.

4. Problem centering: Self-actualizing people are more concerned with problems than with themselves and are likely to have what they consider important goals.

5. Self-actualizing people need privacy and do not mind being alone.

6. Autonomy: The self-actualizing person is able to be independent of culture and environment.

7. Continued freshness of appreciation, even of often-repeated experiences.

8. Mystic experiences or the oceanic feeling: This feeling which Maslow includes under the heading of “peak experiences,” frequently involves
wonder, awe, a feeling of oneness with the universe and a loss of self.

9. Social interest: This is a feeling of unity with mankind in general.

10. Interpersonal relations: Deep, close relationships with a chosen few characterize the self-actualizing person.

11. Democratic character structure: These people are relatively indifferent to such matters as sex, birth, race, colour and religion in judging individuals.

12. Discrimination between means and ends: The self-actualizing person enjoys activities for themselves, but also appreciates the difference between means and goals.

13. Sense of humour: The self-actualizer's sense of humour is philosophical rather than hostile.

14. Creativeness: The self-actualizer's creativity consists mostly of the ability to generate new ideas, in any field.

Resistance to enculturation: The self-actualizing person is not rebellious, but is generally independent of any given culture. (Resist total conformity to society).

******************

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APPENDIX 3.5

OPTICAL ILLUSION
(Hamachek, 1990:195; Morris, 1973:292)
APPENDIX 3.6

FOURTEEN STEPS TO A POSITIVE ATTITUDE
(Anon)

14 steps to a Positive Attitude

* No one on the face of this earth can make you feel inferior without your permission.

* The most destitute person in the world is the one without a smile.

* You acquire much of the thinking mannerism and characteristics of the people around you.

* You get the best out of others when you give the best of yourself.

* There is no such thing as a "good" memory or a "bad" memory, it is either trained or untrained.

* Criticize the performance, not the performer.

* Opportunity lies in the person and not the job.

* It's not the occupation of the profession that makes you succeed or fail, it's how you see yourself and your occupation.

* Go as far as you can see. When you get there you will always be able to see farther.

* What you get by reaching your destination isn't nearly as important as what you become by reaching the destination.

* If you head towards your goals be prepared to make some slight adjustments in your course.

* If you expect to make it big, you must work towards your objectives every day.

* In order to succeed, you must know what you are doing, like what you are doing and believe in it.

* If you give a man a fish, you feed him for a day. If you teach him to catch fish for himself, you feed him for life.
SECTION A

BIOGRAPHICAL DATA

Instructions:
Cross out (X) one of the given option as shown. For example:

Corporal punishment in school must be re-introduced
Response:

1  NO  2  LATE  3  NEVER

Cross out (3) as shown if you disagree with the statement.

Please answer all the questions.

1. In which province is your school situated?

   1  MPUMALANGA PROVINCE  2  GAUTENG PROVINCE  3  NORTHERN PROVINCE

2. Your gender:

   1  MALE  2  FEMALE

3. Your approximate age is:

   1  20-30  2  31-40  3  41-50  4  51-60  5  61 and over

4. Your highest academic qualification is

   1  CERTIFICATE  2  DIPLOMA  3  DEGREE  4  HIGHER DEGREE
5. I did Mathematics up to

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6. I did Science up to

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<td>COLLEG</td>
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7. How many teachers are currently involved in teaching the new Technology learning area in your school?

| 1 | ONE      | 2 | 2 - 3    | 3 | 4 - 5 | 4 | OVER 5 |

8. How often did Technology Education implementers visit your school this year?

| 1 | NONE     | 2 | ONC  | 3 | 2 - 4 | 4 | OVER 5 |

SECTION B

In the following statements a five-point scale will be used

Cross out (X) one of the given options

Example:

Corporal punishment must be re-introduced.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree
9. Female teachers should not be involved in facilitating (teaching) technology education.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

10. The technology learning area puts a burden to an already congested school curriculum.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

11. Pupils’ attitude towards technology education is negative.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

12. It is imperative that the technology education facilitator (teacher) should possess critical and creative thinking skills.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

13. The process followed to make a product is more important than the quality of the final product when teaching the Technology learning area.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree
14. The seven specific outcomes for the technology learning area are not user friendly.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

15. Cultural differences play a part in the implementation of technology education.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

16. The inclusion of the Technology learning area in the school curriculum is as a result of political motivation.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

17. More time is needed for the facilitation (teaching) of the Technology learning area than for other learning areas.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

18. The technical terms used in technology education are confusing.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree
19. Given a chance, I would take a course in technology education to improve my qualifications and knowledge.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

20. In technology education the application of theory should receive more attention that the theory per se.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

21. I like reading magazines which have technological content.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

22. Only boys should take technology education at school level.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

23. Only pupils who have previously taken Science should enrol for technology education.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

24. Technology Education should have more to do with thinking than doing.
25. The introduction of in-service training for technology education concurrently with the in-service training for outcomes-based education is bad timing.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

26. To be technologically literate implies understanding the policy stipulations for the implementation of the technology learning area.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

27. Technology is to be found in all spheres of life.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

28. Information technology is part of technology education.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

29. When I think of technology, I mostly think of computers.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree
30. The education standards have deteriorated since the introduction of outcomes-based education and the Technology learning area.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

31. If I was to be given a package, I would leave the education system.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

32. The lack of resources inhibits the proper implementation of Technology Education.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

33. There is a lack of teacher training for Technology Education.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

34. Technology must be applied ethically and responsibly.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

35. Pupils' positive attitude towards technology and technological careers must be encouraged.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree
36. Teachers are not consulted in policy making for the outcomes-based education.
   
   1. Strongly agree
   2. Agree
   3. Uncertain
   4. Disagree
   5. Strongly disagree

37. Teaching technology education is demanding.
   
   1. Strongly agree
   2. Agree
   3. Uncertain
   4. Disagree
   5. Strongly disagree

38. By specifying the specific outcomes and the performance indicators in technology education, the initiative of the teacher is stifled.
   
   1. Strongly agree
   2. Agree
   3. Uncertain
   4. Disagree
   5. Strongly disagree

39. Integration across learning areas is easily achieved through technology education.
   
   1. Strongly agree
   2. Agree
   3. Uncertain
   4. Disagree
   5. Strongly disagree

40. Teaching technology education is fun.
   
   1. Strongly agree
   2. Agree
   3. Uncertain
   4. Disagree
   5. Strongly disagree
41. Teachers' attitude towards the implementation of Technology Education is negative.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

42. Teachers do not know what the Technology learning area really entails.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

43. For the amount of work needed to implement OBE, teachers feel that they are underpaid.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

44. Workshops and crash courses on technology education are sufficient to be able to teach technology education for the intermediate phase.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

45. Although it was reinstated the proposal to drop Technology as a learning area from the curriculum by the Review Committee on Curriculum 2005 was appropriate.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree
APPENDIX 4.2

COVER LETTER TO THE QUESTIONNAIRE

Faculty of Education
Dept of Further Teacher Education

Fakulteit Opvoedkunde
Dept Verdere Onderwyssopleiding

P.O. Box 4239
WITBANK
1035
20 January 2000

TECHNOLOGY LEARNING AREA TEACHERS

Dear Sir or Madam:

I am currently studying for the D.Ed degree in Technology Education within the Department of Further Teacher Education at UNISA.

The thesis for the above-mentioned degree is based on empirical study into “teacher attitudes towards the implementation of Technology Education”. Approval for this research has been obtained from your provincial education department.

A questionnaire has been set to guide this study. You are requested to respond to the questions and statements in this questionnaire. Your objective and honest opinion will be highly appreciated.

HINTS:

- Your response will be treated as anonymous. Please do not write your name or your school’s name on the questionnaire.
- There are no correct or incorrect answers. We merely require your honest opinion.
- Read the instructions carefully
- Answer all questions

Be assured that no individual or school will be identified when reporting the results of this research.

Thank you in advance for your co-operation

Thabo Pudi
APPENDIX 4.3

LETTER TO MPUMALANGA DEPARTMENT OF EDUCATION

Faculty of Education  
Dept of Further Teacher Education

Fakulteit Opvoedkunde  
Dept Verdere Onderwysersopleiding

P.O. Box 4239  
WITBANK  
1035

20 January 2000

The Head of Department  
Department of Education  
MPUMALANGA

Dear Sir/Madam

Re: Permission to conduct research in the province

I am currently studying for the D.Ed degree in Technology Education within the Department of Further Teacher Education at the University of South Africa.

The department of Further Teacher Education and the Institute for Educational Research in the Faculty of Education are committed to teacher training and the successful implementation of curriculum 2005, with specific interest in the Technology Learning Area within Curriculum 2005. This study, with its foundation anchored in the development of teachers and the implementation of the technology learning area, wants to establish “teacher attitudes towards the implementation of the learning area technology.” It is hoped that this study will contribute significantly to the on-going quest to implement Curriculum 2005 and its outcomes-based approach successfully.

It is our wish to conduct the empirical research for this study within the provincial education departments. Schools presently piloting the technology 2005 curriculum are the primary target.

Your approval of this request will be highly appreciated.

Yours faithfully

[Signature]

T.I. Pudi

[Signature]

PROF O. POTGIETER

PO BOX/POSBUS 392, PRETORIA 0003 SOUTH AFRICA/SUID-AFRIKA  
(012) 429-3111 • INT +27+12 429-3111 • FAX/FAKS (012) 429-3221

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APPENDIX 4.4

REPLY FROM MPUMALANGA DEPARTMENT OF EDUCATION

MPUMALANGA PROVINCIAL GOVERNMENT

Private Bag X 251863
MIDDLESBROUGH 1080
RSA

The Galleries,
Corner Jon van Riebeeck and
Vordoom Streets
MIDDLESBROUGH

MPUMALANGA PROVINCIAL GOVERNMENT

DEPARTMENT OF EDUCATION

Liliko leTemjungo
umNyango weFundo
Departement van Onderwys

Reference:

22 FEBRUARY 2000

MR T.I. PUDI
P.O. BOX 4239
WITBANK
1035

Dear Sir

RE: PERMISSION TO CONDUCT RESEARCH IN THE PROVINCE

We as the Mpumalanga Department of Education wishes you all of the best in your studies and research for the DEd degree in Teacher Education.

The Department therefore grants you an unconditional permission to pursue your research programme.

We hope this will be for the best interest of both the educators, learners and the parents within the country and the province.

Yours in education

[Signature]

MARTIN MCHUNU
OFFICE OF THE DEPUTY DIRECTOR-GENERAL

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APPENDIX 4.5

LETTER TO GAUTENG DEPARTMENT OF EDUCATION

Faculty of Education
Dept of Further Teacher Education

UNISA

Fakulteit Opvoedkunde
Dept Verdere Onderwyssopleiding

P.O. Box 4239
WITBANK
1035

20 January 2000

The Head of Department
Department of Education
GAUTENG

Dear Sir/Madam

Re: Permission to conduct research in the province

I am currently studying for the D.Ed degree in Technology Education within the Department of Further Teacher Education at the University of South Africa.

The department of Further Teacher Education and the Institute for Educational Research in the Faculty of Education are committed to teacher training and the successful implementation of curriculum 2005, with specific interest in the Technology Learning Area within Curriculum 2005. This study, with its foundation anchored in the development of teachers and the implementation of the technology learning area, wants to establish “teacher attitudes towards the implementation of the learning area technology.” It is hoped that this study will contribute significantly to the on-going quest to implement Curriculum 2005 and its outcomes-based approach successfully.

It is our wish to conduct the empirical research for this study within the provincial education departments. Schools presently piloting the technology 2005 curriculum are the primary target.

Your approval of this request will be highly appreciated.

Yours faithfully

[Signature]

T.L. Fadi

[Signature]

PROF & POTGIETER
APPENDIX 4.6

LETTER TO NORTHERN PROVINCE DEPARTMENT OF EDUCATION

Faculty of Education
Dept of Further Teacher Education

Fakulteit Opvoedkunde
Dept Verdere Onderwysersopleiding

P.O. Box 4239
WITBANK
1035

20 January 2000

The Head of Department
Department of Education
NORTHERN PROVINCE

Dear Sir/Madam

Re: Permission to conduct research in the province

I am currently studying for the D.Ed degree in Technology Education within the Department of Further Teacher Education at the University of South Africa.

The department of Further Teacher Education and the Institute for Educational Research in the Faculty of Education are committed to teacher training and the successful implementation of curriculum 2005, with specific interest in the Technology Learning Area within Curriculum 2005. This study, with its foundation anchored in the development of teachers and the implementation of the technology learning area, wants to establish "teacher attitudes towards the implementation of the learning area technology." It is hoped that this study will contribute significantly to the on-going quest to implement Curriculum 2005 and its outcomes-based approach successfully.

It is our wish to conduct the empirical research for this study within the provincial education departments. Schools presently piloting the technology 2005 curriculum are the primary target.

Your approval of this request will be highly appreciated.

Yours faithfully

[Signature]

PROF N POTGIETER

PO BOX/POSBUS 392, PRETORIA 0003 SOUTH AFRICA/SUID-AFRIKA  ☎ (012) 429-3111 • INT +27-12 429-3111 • FAX/FAKS (012) 429-3291

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## APPENDIX 4.7

### CORRELATION AMONG THE THEMES

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** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

a. Listwise N=228
APPENDIX 4.8

AGE CATEGORISATION AND RELATIVE BEHAVIOUR
(Adapted from Hamacheck, 1990:41)

Early adulthood (18-35 years)

- Selecting a mate
- Learning to live with a marriage partner
- Starting a family
- Rearing children
- Managing a home
- Getting started in an occupation
- Taking on civic responsibility
- Finding a congenial social group

Middle age (35-60 years)

- Achieving adult, civic, and social responsibility
- Establishing and maintaining an economic standard of living
- Assisting teenage children to become responsible and happy adults
- Developing adult leisure-time activities
- Relating oneself to one’s spouse as a person
- Learning to accept and adjust to the physiological changes of middle age
- Adjusting to aging parents

Later life (60+)

- Adjusting to decreasing physical strength
- Adjusting to retirement and reduced income
- Adjusting to death of spouse
- Establishing an explicit affiliation with one’s age group.
- Meeting social and civic obligations
- Establishing satisfactory living arrangements.
APPENDIX 4.9

INTERVIEW SCHEDULE

1. What is technology education?

2. Outcomes-based education will lower education standards in South Africa.

3. Lack of resources will inhibit the proper implementation of technology education.

4. There is lack of teacher training for technology education and for outcomes-based education.

5. Outcomes-based education is a complicated first world type of education system. It is not suited for the South African situation.

6. Discuss all the good things that you know about outcomes-based education with emphasis on the technology learning area in Curriculum 2005.

7. What are the disadvantages of outcomes-based education and the technology learning area in Curriculum 2005?

8. Most teachers are not motivated to implement technology education.

9. Many people perceive technology education as a male domain.

10. Curriculum 2005 is overloaded.
APPENDIX 7.1

TRAINING TO REPAIR TV’s AND VIDEO’s
Source: Hit Magazine, August 1983 pages 53 & 54

From left: Johannes Dube, Freddy Magongwa, training officer Bob Southall, Aubrey Ramotse and Israel Pudi.

Sampson Mbonani from Soshanguve, Pretoria, was so interested in electronics that he paid a white expert to teach him more about the subject. And he so impressed his tutor that the man recruited Sampson as a TV and video trainee technician for his own company. Now Sampson is among the 19 trainees on a four-year course covering both theory and the practical side of the business at Visionhire Training Centre at Wynberg near Alexandra township.

The group includes the first blacks to follow the Department of Manpower approved syllabus which enables them to sit for the Central Organisation Trade Test (COTT).

Among the others are: Johannes Dube from Sebokeng, Vereeniging who previously worked on the maintenance of measuring instruments; Freddie Magongwa, a former hospital clerk from Mamelodi; Israel Pudi from Tembisa, a former photo-copy maintenance mechanic who wants to design his own TV one day; Albert Maqelepo, from Springs who already holds a radio repairing diploma and Aubrey Rametsi from Dube, Soweto, who says he is enjoying his first job. They are paid during training.

- Youth matriculants, male or female, interested in joining subsequent courses should apply to Mr. H. Connor, Senior Training Officer, Visionhire, P.O. Box 39641, Bramley 2018.

Johannes Dube from the Vereeniging service centre, Israel Pudi of Wynberg and Freddy Magongwa who is based in Pretoria.