

ATTITUDES OF UNIVERSITY OF ZULULAND STUDENTS
TOWARD TECHNOLOGY

by

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Submitted in fulfillment of the requirements for
the degree of

MAGISTER EDUCATIONIS
(MATHS, SCIENCE AND TECHNOLOGY EDUCATION)

TECHNOLOGY EDUCATION

at the

UNIVERSITY OF ZULULAND

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February 2010

ABSTRACT

The study investigated the attitudes of in-service, teacher education students at a South African University. The study is set in a rural context with participants drawn from the University of Zululand, situated on the north coast of KwaZulu-Natal province. Data was collected from 88 teachers, enrolled for a National Professional Diploma in Education (NPDE) in technology education at the University. The study aimed at generating information from respondents in an open, qualitative research framework. The study utilized a confirmatory survey approach and the data collection instrument used for the study was adapted from the “Pupils’ Attitude Towards Technology” (PATT) instrument used successfully in other countries e.g. Netherlands, United States of America and Thailand. The results of the study indicated that, teachers showed a strong conceptual understanding of technology, and they assigned a great level of importance to knowing how technologies work. Similarly, the study’s findings showed that teachers are aware of the positive and negative impact of technology, and that they showed a keen interest in wanting to know more about different technologies. In contrast with their interest, teachers showed a moderate to low level of knowledge and understanding concerning technologies used in their everyday lives.

Teachers also felt that they have some influence when it comes to making decisions about technology, but they have very low confidence in leaders of their communities to make decisions about technology. Teachers were also unanimous in their view that technology must play an important role in the school curriculum, and they placed very high expectations on what they believed a high school learner should know about technology.

DECLARATION

I declare that ATTITUDES OF ZULULAND UNIVERSITY STUDENTS TOWARD 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
(Petrus Jacobus Kok)

.....
Date

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CHAPTER 1

ORIENTATION TO THE STUDY

1.1 Motivation for the study

Although technology has been with us since the earliest humans roamed the earth, technology education has been with us for a relatively short time in global history. It is even a shorter time in the educational history of a democratic South Africa which only emerged in 1994. Prior to 1994 education in South Africa was organized on racial lines with separate schools, universities, teacher colleges and administration systems for each of the four main groups as defined by the apartheid state; namely Black, White, Coloured and Indian. Although the curricula in each of these systems was theoretically equal, the huge difference in state funding made a mockery of the apartheid state's claim of 'separate but equal' treatment of all races. In the resource heavy areas of the curriculum such as science laboratories, home economics and technical subjects such as woodwork, metalwork and technical drawing (which many see as the forerunners of technology education), very little provisioning was made in the black schools (Stevens 2003).

Furthermore, during investigations into potential predictors of the attitudes towards technology, De Klerk Wolters (1989) concluded that boys scored significantly higher on the positive attitude scales than girls did and that the largest differences were on the scales of Interest, School and Career. Boys liked technology more than girls did. De Klerk Wolters (1989) also found that gender could be an important predictor of attitudes towards technology and that the home environment and the pupils' positive self-concept had a positive influence on their attitude towards technology. This study was supported by Kalanda (2005) who concluded that there is a positive relationship between attitudes towards technology and each of teacher characteristics, student characteristics

and the classroom environment. De Klerk Wolters (1989) also indicated that learning the concepts of technology is necessary and should be required for all students.

According to Twyford and Essa-Matti (2000) the acquisition of skills, knowledge, attitudes and values is a process of enculturation, especially when the learner participates in authentic and context dependent activity. It follows that individual construction of technological knowledge occurs predominantly in socially interactive settings, which are shared with members of the learning community, essentially through meanings of context dependant language and actions. Since most “socially interactive settings” in a student’s life happen during school hours, the influence that the school environment and the teachers’ characteristics play in the forming of attitudes towards technology must also be considered.

Volk, Yip and Kau Lo (2003), in their research on *Attitudes of Pupils Toward Technology in Hong Kong*, stated that, technology impacts student’s daily lives and certainly plays an important part in developing student’s positive and negative attitudes toward it and translated into their adult lives. Students’ attitudes and associated experiences also impact their future careers.

Furthermore, Raat and de Vries (1985) investigated the attitudes of middle school students in the Netherlands toward technology in order to develop course materials that could apply technological concepts and practices in a physics curriculum. Their project, titled “*Pupils’ Attitudes Toward Technology*” (PATT) sought to determine student’s attitudes toward technology and their understanding of technological concepts. Raat and de Vries (1985) concluded that: (a) students had only a vague concept of technology, (b) the relationship of technology to physics was very obscure to students and (c) girls are less interested in technology and saw it as less important than boys.

In a study conducted by the Scottish Council for Research in Education, Harlen and Holroyd (1995) stated that, teachers were often unclear about the nature and purposes of technology education. Many teachers had an intuitive grasp of technology derived from the common-sense of everyday experience. However, in the classroom, enjoyable practical construction activities were often assumed to be technology and the importance of using these as a vehicle for developing technological ideas was not always appreciated.

At this point, it is important to provide the context within which the research was undertaken. The University of Zululand was established in 1960 as a constituent college academically affiliated to the University of South Africa. In 1970, the university was granted own status. Since then, the institution has dramatically evolved from a so-called 'bush college' to a fully-fledged university, equal to any of the centres of higher learning in South Africa. In 2002, the University of Zululand (UNIZULU) was designated as the only comprehensive institution of higher learning in the northern part of KwaZulu-Natal province of South Africa. The University experienced an increased intake from other parts of Africa, especially from Namibia, Nigeria, Kenya, Zimbabwe, Botswana, Lesotho and Swaziland. In 2003, as part of a national initiative, the Faculty of Education at the University of Zululand developed a new in-service teacher training program called the National Professional Diploma in Education (NPDE) to upgrade the previously disadvantaged and un-qualified or under-qualified teachers in the learning areas of Mathematics, Science and Technology. The first NPDE was registered in October 2000 and provided access only for currently serving educators in schooling in the General Education and Training (GET) phase. The new revised NPDE was registered by the South African Qualification Authority or SAQA in August 2004. According to the National registration of the NPDE, it is not an initial Teacher Education qualification. The rationale for this qualification is to improve the quality of teaching and learning in the General Education and Training (GET) grades R to 9 and Further Education and Training (FET) grades

10 to 12. (NPDE document) 2004. It is from this group of NPDE teachers, registered at the University of Zululand, that the research sample was selected.

As in most other developing countries, the teaching of technology is way behind the technological changes taking place in the developed world. It is behind in spite of the South African government's reform efforts in education which transformed to an outcomes based education (OBE) approach in 1998. Such reforms included the introduction of Technology as a learning area offered at school (Stevens 2003). In 2003 the Faculty of Education (UNIZULU) started with its first programmes to train teachers in technology. These programmes included the already mentioned NPDE programme as well as an initial teacher training programme known as the Bachelor of Education (B.Ed).

The need for offerings in technology has been supported by researchers such as House, (cited in Kalanda, 2005:2) who pointed out that::

All students, not only tomorrow's scientists and the talented, need a firm grounding in mathematics, science and technology ... that new science programmes must incorporate new knowledge that is meaningful to students and must integrate science and technology

Moreover, to help students appreciate the nature of technology, Kalanda (2005) refers to Cross and McCormick (2002) who indicated that students at primary, secondary and college levels need to learn to solve technological problems in creative ways. In addition to solving problems in the area of technology students should also be able to obtain technological skills as students are graduating into a world that necessitates knowledge of technology skills. This is essential as the ability to manage, organize, analyse and present information using technology as a tool is what will provide students with a competitive edge in the job market" (Christa, 2001: 1).

What was evident then, is the fact that students are graduating into a world where success depends on their ability to use and understand technology, regardless of where they will work or what they will do, it will be necessary to use technology to gather, analyze and exchange information quickly and accurately. In view of this, there is a growing consensus even in the field of education that it is essential for all students at any level to be technologically literate (Kalanda 2005). Bame, Dugger, De Vries and McBee (1993) pointed out that if one of the educational goals of technology were literacy in this area, then students exhibiting a positive attitude toward technology would be more likely to attain the literacy. Bain and Rice (2006) pointed out that the prevalence of technology has increased at a phenomenal pace during the past ten years and has become a large part of most of our lives. The use of technology in future jobs makes it particularly important for both male and female students to develop skills that will help them become technologically literate and prepare them to work in a technological society.

Some of the implications for technology education are that most teacher education programmes still focus on technical skills but this trend is now developing into a new paradigm about values, practices, content, methodologies and capability (Elshof; Williams quoted by Vandeleur 2006). The author further suggests that learners need to explore the tensions between economic factors and issues relating to the values and ethics surrounding technology.

Additionally, as quoted by Kalanda (2005), Popham suggested that attitudes are not only feelings that help prevent access, but also place a limit on student learning. If a person does not like technology, he or she may feel anxious when expected to utilize it. Such a person is unlikely to want to learn and obtain skills or participate in assignments that require the use of technology. On the contrary, students who exhibit a positive attitude toward the subject are more likely to actively engage in learning (Kalanda , 2005).

Oosthuizen (1994) expresses the view that teachers need to have an understanding of their students' knowledge and feelings about the subjects they teach and that it will be almost impossible to develop technological skills when students have a negative attitude towards technology. Hence the motivation of the present study was to gain a deeper understanding of the attitudes of Zululand University students toward technology and to determine if their attitude toward technology has, any bearing, on their passiveness experienced by technology education lecturers during technology education classes. This passiveness experienced by technology education lecturers at the University of Zululand was not measured but was reported by experienced lecturers in the field of technology education.

1.2 Statement of the problem

Little is known about the University of Zululand students' attitudes toward technology as no literature could be found that supported whether any such research was done previously. The apparent state of passiveness of technology education students at UNIZULU as experienced by technology education lecturers in the technology education classes is of great concern to the lectures. Technology education lecturers have reported in different discussion groups that students do not usually ask questions, or want to be involved in discussions in class. These discussion groups was set up at the University of Zululand in the Faculty of Education by the department of Mathematics, Science and Technology Education (MSTE) to discuss issues related to teaching and learning and to improve skills in the instruction of subjects in the department. It was further mentioned that students in the technology education classes are not only passive but there seems to be lack of functional communication between students and lecturers in the technology teaching and learning situation. As quoted by Imenda and Muyangwa (2006) Olivier attributes the general passiveness of students in class to a number of factors. He suggests that passiveness may be caused,

partly by students' upbringing and backgrounds. Tshungu (cited in Imenda & Muyangwa, 2006) also attributes the problem of passiveness to the "black tradition" which often discourages children from asking adults questions, and requires the same children's replies to be formulated in a manner which pleases the questioner. Furthermore, the lack of confidence, the ways in which students are taught, and their lack of competence in the English language, which is used as the medium of instruction from grade six onwards, are identified as additional causes of passiveness (Imenda and Muyangwa 2006).

According to Rose, Gallup, Dugger and Starkweather (2004) experts in the field of technology view technology as anything people do to modify the natural world to meet human needs. By that definition, the earliest inhabitants of this planet, whatever means they used to carve out caves, create tools from stones, or gather wood for fires, were using technology. To many, however, the word technology has a newer meaning tied to the modern apparatus, machines and gadgets people have developed (Rose *et al.* 2004) In a poll titled, "What Americans think about Technology," Rose *et al.* (2004), have a keen interest, not only in exploring technology, what it is, what it does, and its impact, but also in the ability people have to design and innovate as well as how people view technology.

Specifically, this study attempted to answer the following research questions about Technology Education students at the University of Zululand:

- What concept of technology do students hold?
- What importance do students assign to being knowledgeable about technology?
- How do students feel about the impact of technology on their daily lives and on the world around them?
- What do students want to know and what do they already know about technology?

- How much do students want to be involved in decision making related to technology?
- What are the students' perceptions on the place of technology in the school curriculum?

1.3 Aims of this study

When formulating the aims of the study the sample will refer to students which are registered for technology education programmes in the National Professional Diploma in Education at the University of Zululand.

The aims of the study are:

- To investigate the conceptual understanding of technology of a sample of NPDE students at the University of Zululand.
- To determine the importance that these students assign to being knowledgeable about technology.
- To explore the students' attitudes with regard to the impact of technology on their daily lives and on the world around them.
- To determine what students think people in general want to know and what they already know about technology.
- To find out these students' views on how they perceive people who make decisions about technology and to what extent they want to be involved in decision making related to technology..
- To determine these students' attitudes toward technology and technology education in the school curriculum.

1.3 Value of the study

The particular value of this study is to determine the attitudes of UNIZULU technology education students toward technology. Technology is part and parcel of our every day lives and how teachers perceive it might have an influence on how they will teach it to their learners. The study could also provide insight into

how the students in the sample experience the impact of technology in their daily lives and on the world around them. The study could provide insight into how up to date these students are when it comes to current global issues where technology could play an ever increasing role like the energy crisis, global warming and the food crisis. This study could also contribute to the understanding of how students at the University of Zululand perceive technology, and what their attitudes are toward technology, compared to other similar studies that have been done elsewhere.

The main benefit of this study is that it might assist university lecturers in technology education courses, to understand how their students perceive technology and what their attitudes are towards technology. This could have significant implications for curriculum design, and teaching and learning strategies employed by lecturers in technology education classes at the University of Zululand.

1.5 Limitations of the study

This study is limited to a sample of University of Zululand students, in the Faculty of Education, enrolled for courses with technology as major subject. The target students are first year students, enrolled for a National Professional Diploma in Education (NPDE), which is a two year part-time course. All of the students come from the rural areas of KwaZulu Natal province and are in-service teachers in the Senior Phase of the school curriculum. Very few of them are currently teaching technology education. The reason for this is that Technology is a relatively new learning area in the South African school curriculum and very few teachers have been trained in this learning area. Most of them have a senior certificate (Grade 12) plus one year initial teacher training (i.e. Primary Teachers Certificate – PTC) as academic qualification. The target students are all, therefore, in their first year of study and it can be assumed that they have no, or very little previous experience of technology education. Generalization to the

whole population of education students could not be possible. Further study needs to take place to see if results could be replicated in universities in other regions of South Africa, or Africa, or other countries.

1.6 Overview of research methodology

This study was aimed at generating information from the respondents within a qualitative research framework. Qualitative research includes the relativist notion that people can have access to different, equally valuable, legitimate and authentic conceptual schemes or world views (Imenda, & Muyangwa, 2006). Accordingly, qualitative research assumes that there are multiple realities which are socially constructed through individual and collective definitions of the situation. In the field of education, qualitative research gained greater acceptance and status from the 1960s onwards. During this time qualitative approaches that emphasized the importance of data in the form of words grew in respectability (Tesch, cited in Imenda & Muyangwa, 2006). These approaches gradually challenged the dominance of the quantitative research paradigm, which was based on experimental designs and seemed preoccupied with the measurement and analysis of variables in terms of quantity or frequency of causal relationships (Imenda & Muyangwa, 2006).

Johnson (cited in Hoepfl, 1997) suggested that technology educators, as educators in other learning areas, engaged in research that probes for deeper understanding rather than examining only the surface features. He noted that qualitative methodologies are powerful tools for enhancing our understanding of teaching and learning and that they have gained increasing acceptance in recent years. Strauss and Corbin (cited in Hoepfl, 1997) claimed that qualitative research methods can be used to better understand any phenomenon about which little is known yet. It can also be used to gain new perspectives on things about which much is already known or to gain more in-depth information that may be difficult to convey quantitatively. Thus qualitative methods are appropriate in

situations where one needs to first identify the variables that might later be tested quantitatively or where the researcher has determined that quantitative measures cannot adequately describe or interpret a situation.

Several writers have identified what they consider to be the prominent characteristics of qualitative research. Hoepfl (1997) listed a synthesis of these characteristics by several authors as follows:

- qualitative research uses the natural setting as the source of data,
- the researcher attempts to observe, describe and interpret settings as they are,
- the researcher acts as the human instrument of data collection,
- qualitative researchers predominantly uses inductive data analysis,
- research reports are descriptive, incorporating expressive language and the presence of voice in the text,
- qualitative research has an interpretive character, aimed at discovering the meaning events have for the individuals who experience them.

Zuga (1994) suggested that technology education researchers should expand the use of a variety of research methods to among others, determine and exploit public attitudes and receptivity to technology and technology education.

The present study utilized a confirmatory survey approach. According to Imenda and Muyangwa (2006), this research approach conforms to the verification as well as enumerative dimensions of scientific research. In the field of education, confirmatory surveys could be used to find out the perceptions of teachers about the community. Furthermore, survey research typically employs questionnaires and interviews in order to determine, *inter alia*, the opinions, attitudes, preferences and perceptions of persons of interest to the researcher.

The data collection instrument used for the present study was adapted for purposes of the present study from the “Pupils’ Attitude Towards Technology” (PATT) instrument used successfully in other countries e.g. Netherlands, United

States of America, Thailand. In order to develop a student's technological literacy, De Klerk Wolters (1989) suggested that it is important to take into account students' interests, opinions, attitudes and needs when developing a technology curriculum. According to De Klerk, the first Pupils' Attitude Towards Technology project was established by Jan Raat and Marc de Vries in 1984 at the University of Technology in Eindhoven in the Netherlands. The main purpose was to establish what attitudes students had toward technology.

The target and accessible population to whom the findings of the present study could be generalized is in-service teachers in the rural areas of KwaZulu-Natal Province. It will be teachers which could be closely associated with the characteristics of the research sample as well as teachers whom have no previous experience of technology education and teachers with little or no previous teacher training. The research sample is 88 teachers, enrolled for a National Professional Diploma in Education (NPDE) in technology education. In terms of the population validity, the sample is representative of the larger target population in that the number of students, at the University of Zululand whom registered for a NPDE qualification was less than two hundred students while the study was conducted. It is also important to note that all of the teachers in the sample of 88 come from schools with little or no teaching and learning resources and no computers. This information was obtained in a survey before the start of the current research study.

1.7 Definition of terms

1.7.1 Attitude

Davies and Brember (quoted by Volk, Wai, & Ting, 2003), mentioned that attitudes can be considered both the determinants and consequences of learning experiences. Learning experience may be influenced by factors such as self-

concept, parents, teachers, environment, socio-economic status, objects, and situations. Furthermore, Le Roux (1994) defines attitude to be a positive or negative emotional relationship with predisposition toward an object, institution, or person.

Volk, *et al* (2003) stated that technology impacts students' daily lives and certainly plays an important part in developing students' positive and negative attitudes toward it. Therefore, the researcher's operational definition of attitude is a predisposition to respond to a particular object (technology) in a generally favourable or unfavourable way.

1.7.2 Technology

Technology is the technical means people use to improve their surroundings (Kalanda, 2005). It is also knowledge of using tools and machines to do tasks efficiently. We use technology to control the world in which we live. Technology involves people using knowledge, tools, and systems to make their lives easier and better. Furthermore, Vohra (as quoted by Ankiewicz, De Swardt, & Stark, 2000:22) defines technology as "the know-how and creative process that may utilize tools, resources and systems to solve problems, to enhance control over the natural and manmade environment in an endeavour to improve the human condition."

People use technology to improve their ability to do work, to communicate better, to make better products, to travel faster and in comfort. Technology is everywhere. In fact, technology has more than one definition. One is the development and application of tools, machines, materials and processes that help to solve human problems. As a human activity, technology predates both science and engineering. It embodies the human knowledge of solving real problems.

The term technology thus often characterizes inventions and gadgets using recently discovered scientific principles and processes. However, even very old inventions such as the wheel exemplify technology. Another definition used by economists sees technology as the current state of our knowledge of how to combine resources to produce desired products. Thus we can see technological change when our technical knowledge increases.

1.7.3 Technology education

De Vries (1996) indicated that during the development of a philosophy for technology education as a discipline, the opinion that technology is applied science, functioned for some time as a paradigm for the philosophy of technology. The author further pointed out that there currently is much opposition against this paradigm. Apart from traditional subjects like industrial arts and craft we do find elements of technology in science education. Wright (cited in De Vries, 1996) suggested that international trends showed that at the heart of technology lied the design process and even though the academic background for the school subject technology is far less than science education, there is a growing discipline “design methodology” as part of the philosophy of technology.

The value of including technology in the curriculum of young children was pointed out by Archer (cited in Stables, 1997) who said that human beings are born with the potential to develop as technologists and that this capacity is something that sets humans apart from other species. However, Browne and Ross (cited in Stables, 1997) explained that as with all aspects of development, creating the right conditions in which the potential can flourish is not necessarily straightforward. The authors indicated that technological capability is dependent on the ability to take action, to intervene in the made world, and to create new or improved products or systems. The children who are given more support to find

out how things work, to make things work, and to create and express themselves, has a better chance for their technological capability to prosper.

Ankiewicz, *et al.* (2000:37) described technology education as “what takes place in the technology classroom; it is the study of how to manage, understand and use technology in all its forms and dimensions.” The authors defined technology education as; “technology education concerns technological knowledge and skills, as well as technological processes, and involves understanding the impact of technology on both the individual and society. It is ultimately designed to promote capability of the learner to perform effectively in the technological environment he or she lives in and to stimulate him or her to contribute towards its improvement” (Ankiewicz, *et al.* 2000:40).

CHAPTER 2

THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1 Introduction

For the past twenty four years, researchers have been investigating students' attitudes and perceptions toward technology in different contexts and countries (Bain, 2006). The first Pupils' Attitude Towards Technology (PATT) project was established by Jan Raat and Marc de Vries in 1984 at the University of Technology in Eindhoven in the Netherlands. The main purpose was to assess what attitudes students, aged 11 to 15, had toward technology (Becker & Maunsaiyat, 2002). It became evident through the PATT research that the students had incomplete and vague concepts of technology. There also appeared to be great differences between boys and girls in their attitudes toward technology. Becker and Maunsaiyat (2002) stated that, based upon the literature from the PATT projects, the researchers of a similar project in Thailand, had decided that they should first make an assessment of the attitudes and understanding of technology among students before a technology curriculum could be successfully developed. They further stated that, teachers, administrators, parents, curriculum developers, and students would all benefit from such an assessment and thus there was a clear rationale for conducting a PATT study in Thailand.

Education in technology is behind the fast technological changes of the last decade (De Klerk Wolters, 1989). According to De Klerk Wolters (1989) in the Netherlands, as in many other countries, technology was introduced as a separate subject to overcome this backlog. He further stated that in order to develop a student's technological literacy, it is important to take into account pupils' interests, opinions and needs when developing technology curricula. It is also important not to rely only on the subject-centered approach derived from

technology experts. Boys' and girls' differences in attitudes toward technology, for example, can put girls at a disadvantage when they choose a career. He further indicates that a "student-centered approach" is characteristic of the international Pupils' Attitude Towards Technology, and compared with studies about pupils' attitude towards science, not much literature is devoted to attitudes toward technology. Furthermore, De Klerk Wolters (1989) indicated that the PATT instrument was developed to be used "internationally" to measure students' attitudes towards technology. Researchers in eleven other countries conducted pilot studies and from these results, an instrument was developed that was proved to be reliable and valid in Western countries. The instrument has since been used in many countries, including, Australia, Canada, Denmark, France, Hungary, India, Italy, Kenya, Mexico, Poland, Great Britain, USA, Sweden, and Zimbabwe.

De Klerk Wolters (1989) further suggested that at the age of 10, pupils already have ideas about technology and it seems that they have already developed attitudes towards technology. De Klerk Wolters (1989) also quote Smail and Kelly whom did extensive study among the age group of ten to twelve year old learners in the United States of America. Smail and Kelly used three instruments to measure the attitudes of learners towards science and technology. The researchers classified the tests as a Science Curiosity Test, a Science Activity Scale and an Image of Science Test. It is not clear however what these tests looked like but it could be the forerunner of the current PATT test which is extensively used by researchers. According to De Klerk Wolters (1989), Smail and Kelly found that at the age of eleven, the attitude towards science and technology of boys and girls differ more greatly than the cognitive differences between boys and girls. The researchers (Smail and Kelly) concluded in their study that boys have a more positive attitude towards technology than girls. Also, boys are more interested in subjects related to physics and girls are more interested in biological subjects.

De Klerk Wolters (1989) also mentioned Moore whom used drawings to develop a technology picture questionnaire to investigate pupil's ideas about technology. De Klerk Wolters (1989) does not show these drawings by Moore but suggested that Moore used drawing methods because young pupils (age not specified) may not have the writing and reading skills needed for written tests. The drawings used by Moore are described as drawings of people who are working with a caption below each drawing explaining what the person is doing. Pupils must then indicate whether the drawing is technical or not. Moore, as cited by De Klerk Wolters (1989) however concluded from the analyses of the drawings that it appears that boys and girls associate technology with "making something" and that the products they drew differed. Boys mainly drew "transportation" and "computers" while girls mainly drew "electrical equipment " in general. Moore, as cited by De Klerk Wolters (1989) further suggested that pupils associated technology with inventing, making and working with electricity.

A further point to consider is that the falling numbers of students choosing to pursue a study of science and technology has become a matter of considerable societal concern and debate amongst researchers (Jenkins, 1994). Consequently, the promotion of favorable attitudes toward science and technology and learning technology is extremely critical and important. The present study, therefore, offers a review of current knowledge about students' perceptions and attitudes toward technology, their conceptual understanding of technology, the importance that they assign to being knowledgeable about technology, how they feel about the impact of technology, how they feel about being involved in decision making regarding technology, and gender differences in attitudes toward technology.

Stables (1997) cited Archer who suggested that human beings are born with the potential to develop as technologists and that this capacity is something that sets us apart from other species. However, Stables (1997) indicated that as with all aspects of human development, creating the right conditions in which the

potential to develop properly can flourish is not necessarily straight forward. Stables (1997) further suggests that technological capability is dependant on the ability to take action, to intervene in the “made” world and to create new or improved products or systems. The author also stated that children who are given the opportunity to find out how things work and to create and express themselves should have a better chance to for their technological capability to prosper.

2.2 Attitude

According to Anderson (as cited by Kalanda, 2005) an attitude is a moderately intense emotion that prepares or predisposes an individual to respond consistently in a favorable or unfavorable manner when confronted with a particular object. It is, therefore, a mental state used by individuals to structure the way they perceive their environment and to guide the way in which they respond. Attitudes are also defined as strongly held beliefs that reflect people’s opinions and feelings and can be manifested in behaviour. Davies and Brember (cited by Volk, Wai, & Ting, 2003) mentioned that attitudes can be considered both the determinants and consequences of learning experiences. Learning experience may be influenced by factors such as self-concept, parents, teachers, environment, socio-economic status, objects, and situations. Le Roux (1994:06) defined attitude as “a positive or negative emotional relationship with a predisposition toward an object, institution, or person.”

Volk, *et al.* (2003) stated that technology impacts students’ daily lives and certainly plays an important part in developing students’ positive and negative attitudes toward it. A more noticeable issue in research into attitudes toward science and technology is that these do not consist of a single unitary construct, but rather a large number of sub - constructs all of which contribute in changing proportions toward an individual’s attitudes toward science and technology. Studies (Breakwell & Beardsell, 1992; Oliver & Simpson 1988; Crawly & Black

1992) have all incorporated a range of components in their measures of attitudes toward science. These included the perceptions of the science students and teachers; anxiety towards science; the value of science; self-esteem; motivation; enjoyment of science; attitudes of peers; attitudes of parents; the nature of the classroom environment; and fear of failure. Similar studies by De Klerk Wolters, 1989; Boser, Palmer & Daugherty, 1998; Becker & Maunsaiyat, 2002; Volk, Yip, & Lo, 2003 on the students' attitudes toward technology also revealed the same components.

According to Tesser (1993) attitude is a hypothetical construct that represents an individual's like or dislike for an item. Attitudes are positive, negative or neutral views of an "attitude object" i.e. a person, behavior or event. People can also be ambivalent towards a target meaning that they simultaneously possess a positive and a negative bias towards the attitude in question. The author further argued that, unlike personality, attitudes are expected to change as a function of experience.

Breckler and Wiggins (1993) pointed out that emotion is a common component in attitude change and that emotion works hand-in-hand with the cognitive process or the way we think about an issue or situation. They defined attitudes as "mental and neural representations, organized through experience, exerting a directive or dynamic influence on behaviour" (1993:209). The authors further explained that in terms of research methodology, the challenge for researchers is measuring emotion and subsequent impacts on attitude.

2.3 Attitudes toward technology

Researchers have for some years investigated the attitudes of pupils, students and people toward technology and their relevance and contributions made towards the current study will be highlighted here. De Klerk Wolters (1989) conducted a study, which involved a random sample of 900 pupils between the

ages of 10 to 12 year old in the Netherlands. His aim was to investigate the potential predictors of the attitudes towards technology. His instrument measured the “Affective and Behavioral” components of the attitude towards technology on the following scales: a) Interest – the extent to which pupils engage in technological activities outside school; b) Role pattern – the extent to which technology as a career or study is equally suitable for boys and girls; c) Consequences – the extent to which pupils think that the effects of technology are negative; d) Difficulty – the perceived difficulty of technology as a school subject or profession; e) School – the extent to which pupils like technology as a school subject; and f) Career – the extent to which pupils like technology as a profession. In addition, De Klerk Wolters also measured the attitude of pupils in the Cognitive component on the following levels: a) Society – technology is directed and controlled by human beings; b) Science – there exists a mutual influence between technology and science; c) Skills – technology has to do with skills; and d) Pillars – matter, energy, and information are pillars of technology. De Klerk Wolters (1989) concluded that compared to girls, boys scored significantly higher on the positive attitude scales and that gender is an important predictor of attitudes towards technology. Most important, however, are individual variables. Pupils with a positive self-concept (pupils who think that they already know quite a lot about technology) had better attitudes than those who do not. The same can be said for ambition; those with a technical ambition appeared to have more positive attitudes towards technology. The variable ‘Home Environment’ had a moderately positive influence on the attitude towards technology. Having played with technical toys and having a variety of tools is more important than having parents with technical professions (De Klerk Wolters, 1989).

In addition, two similar research projects rendered the same results. Becker and Maunsaiyat (2002) investigated Thai students’ attitudes and concepts of technology. They also concluded that the gender of students had a significant effect on all attitude scales and that boys indicated a greater interest in

technology than girls. Similarly, Volk, *et al.* (2003) conducted a study in Hong Kong to determine pupils' attitudes toward technology. They also concluded that there were significant differences in the attitude categories, with boys having significantly more positive attitudes than girls in categories of "interest, role pattern, difficulties, consequence, curriculum, and career aspiration.

The importance of the studies mentioned above is supported by Krathwohl (cited by Boser, Palmer & Daugherty, 1998) who argued that it could be assumed that if students have a tendency to act positively towards a subject, for example, technology, then they would have more of an interest in that subject. Bame, Dugger, de Vries, and McBee (1993) further stated that it is logical for students who have a positive experience in a technology education programme to develop a positive attitude toward technology and to pursue technological careers. Krathwohl further pointed out that these students would, therefore, be more interested in studying technology. As a result students should therefore become more technologically literate. Rose, Gallup, Dugger and Starkweather (2004) implemented a study on how Americans think about technology. The researchers concluded that attitudes toward technology and technological applications are directly related to age. In general younger people assigned greater importance to knowing how technologies worked and felt they had more influence in decisions related to technological applications. Although Rose, *et al.* (2004) did not mention the importance of attitudes between the genders, the authors did indicate that the research provided valuable insight into the attitudes and perspectives people have regarding technology. They suggested that understanding the attitudes of people towards technology is important because the inevitability is that natural processes would see technology playing an ever increasing part in our daily lives.

De Klerk Wolters (1989) suggested that from the perspective of attitude-formation, it is important to start technology education at an early age. This means that it is appropriate to pay attention to technology in the initial training of

primary school teachers and/or as part of an in-service teacher training programme in order to prepare these teachers to be effective in the technology classroom. De Klerk Wolters (1989) further mentioned that pupils should also be taught a broad concept of technology, because there is a positive relation between having a broad concept of technology and a positive affection towards technology. Boser, Palmer and Daugherty (1998) concluded that, the demonstration of attitudinal changes toward technology might be linked to enhanced technological literacy.

Developing children's technological skills assists in the creation of positive attitudes such as self-esteem and motivation and these attitudes in their turn help establish the conditions in which technological capability can thrive (Stables, 1997). The author, however, warned that attitudes can be both built and destroyed through engagement in technological tasks and so it is important that children work in an environment that is at the same time supportive and challenging.

2.4 Perception

Brecker and Wiggins (cited by Kalanda, 2005) suggested that people's reactions and responses toward certain things largely depended on how they perceived them. If, for example, someone believed that to have technology as a subject in school is not necessary, they could more likely have a negative attitude toward any implementation of a technology curriculum. Furthermore, cognitive psychologists hold the view that, as we move about in the world, we create a model of how the world works. That is, we sense the objective world, but our sensations map to perception, and these perceptions are provisional in the same sense that scientific hypotheses are provisional. As we acquire information, our perception shifts. Beliefs and perceptions are, therefore, not in action. Beliefs are the roots or foundations of our way of thinking. In normal life we do not question

or filter our own beliefs. We take them as they are. They include the values that we have. Perceptions, however, relate to a method or way of thinking or a point of view.

An important aspect of how we perceive objects or people has to do with what we think they are or should be (Morris, 1973). How technology is perceived depends on what students themselves think technology is. Therefore, because people are limited in what they can perceive, they are highly selective in whatever they choose to perceive and that which is relevant to them. In this process of filtering, different people would react differently even when they are from the same physical environment. They would not always have the same experiences, hence perceptions.

Boser, *et al.* (1998) suggested that female and male students perceived some aspects of technology differently. Female students consistently perceived technology to be less interesting than did male students. Females, more than males, perceived technology to be an activity for both boys and girls.

2.5 Gender differences in attitudes and perceptions toward technology

Bain and Rice (2006) stated that several researchers found that attitudes toward technology differ significantly between males and females with males indicating a greater interest and knowledge of technology compared to females. It was further found that female students perceived technology as more difficult and less interesting than their male counterparts. According to Linn (1999) the difference in gender attitudes can be traced back to the placement and use of computers in education where computers were mainly used in research and administrative offices by white females. Females were introduced to computers in word processing and secretarial classes, while males used computers in advanced math classes.

Researchers have also found that the technological environment at home directly impacted on the gender differences in the attitudes and perceptions toward technology (Bame *et al*, 1993; Boser *et al*, 1998). For example more males than females rated both parents' occupations as more technical in nature and males indicated a greater interest in knowledge of technology than females. Bain and Rice (2006) found that gender did affect students' attitudes toward technology. The majority of females did not perceive computers as being difficult for themselves or for other females or for males. However, several males indicated that they were better at using the computer than females. Boser, *et al*. (1998) concluded that females have different perceptions of technology than males and that technology education programs may not be meeting the needs of female students. The profession should strive to develop curriculum materials and activities that meet the interest and technological needs of all students.

2.6 Technology and the school curriculum

Technology as a school subject within the South African curriculum is a relatively newcomer – having been introduced only in 1998 (Engelbrecht, Ankiewicz & de Swardt, 2007). Engelbrecht, *et al*. (2007: 587) further explained that unlike most other subjects in the school curriculum, the determination of the academic boundaries of this learning area is still work-in-progress. They stated this point as follows:

Technology is a whole new learning area, with unique content which is foreign to most teachers. Technology does not have an established academic discipline on which it is based – its academic discipline must still be determined ... Technology education is supposed to cover as many as possible of the themes of technology, namely, structures, systems and control, materials and processing, as well as communication.

Engelbrecht, *et al*. (2007: 587) further expanded on this matter as follows:

Systems and control is divided into mechanical systems, electric and electronic systems, and pneumatic and hydraulic systems. Materials and processing is divided into the processing of food, textiles, and resistant materials. Many teachers do not have the necessary competence (knowledge and skills and instructional methodology) to facilitate technology properly.

The preparations made before the introduction of the Technology curriculum were far from adequate. Engelbrecht, *et al* (2007: 579) made this point as follows:

Teachers were expected to implement technology in schools without being adequately trained in content and / or instructional methodology ... [and] the burden of introducing this subject fell on the shoulders of teachers of ... Home Economics, Woodwork, Metalwork, and Industrial Arts.

In the place of a properly organized curriculum orientation program for teachers, new policy documents were simply dumped on the doorsteps of schools with an instruction to implement the new curriculum which had replaced the old one (Engelbrecht, *et al* 2007: 580). Many of the affected teachers found themselves in a very difficult situation, particularly given that the implementation of the new curriculum “implied a shift from the traditional individualistic approach, where each teacher was responsible for his or her own subject, to a situation where a teacher may not be an expert on all the subject matter to be facilitated in the curriculum” (Engelbrecht, *et al* 2007: 580).

Furthermore, Kalanda (2005) stated that researchers (Jenkins, 1994; Johnson, 1989) stressed the importance of technology in the curriculum for primary, secondary, and further education colleges. Although technology had been introduced in most developing countries, adequately qualified teachers of technology are still very scarce.

Harlen and Holroyd (1995) mentioned some problems and challenges faced by primary teachers in implementing technology as:

- confidence about having the knowledge to develop understanding in pupils of technology was ranked the lowest of all subjects;
- with regard to science and technology teaching, male teachers were more confident than female teachers;
- teachers were often unclear about the nature and purposes of technology education;
- in the classroom, enjoyable practical construction activities were often assumed to be technology with little or no focus on the design process;
- topics and themes that were taught were usually based on the personal decisions of individual teachers rather than on a whole-school policy and
- the most frequently cited problem was equipment and materials.

Related to the inherent value of technology education are the belief systems of people and only a few studies have been conducted to explain and assess the public's attitudes about technology education (Zuga, 1994). This author further explained that more needs to be known about what is valued in technology and how it might be perceived as a necessary part of a child's education. Furthermore, there is little evidence or estimates of what most children and adults might know about technology and what they might be learning from their experiences in technology education classes. Zuga (1994) also mentioned that in an era of accountability, we do not have fundamental information to take to educational decision makers in support of the study of technology education.

2.7 Summary

Technology is whole new learning area with unique content and various people in different countries across the world have done research on the attitudes of people, students and learners toward technology. This research have led to the establishment of a Peoples Attitude Towards Technology or PATT test which is

used, with some adaptations to test the attitudes of people in different countries. The reasons why knowledge of peoples attitudes toward technology is important ranges from the learners at school whom can be supported to attain a better technological literacy through more effective teaching and learning strategies, to the training of teachers with a better understanding and attitude towards technology. It was also clear that an understanding of peoples attitude towards technology can assist curriculum planners of technology and therefore also university lecturers in technology to formulate and structure curricula in such a way that it can have a positive impact on the training of their students. Also, the picture emerging from the above is that there is much to be desired in the manner in which this learning area (technology) came to the implementation stage within the South African school curriculum. Teachers were expected to implement technology in schools without being adequately trained in the content and this in it self could lead to teachers developing a negative attitude towards technology as a school subject. It was also found that in order to develop a positive attitude towards technology, the teaching and learning of technology must start at an early age. Literature also alluded to the fact that there are differences between the attitudes towards technology in different countries and indeed between different age groups and gender. This could be important guidelines to curriculum designers when planning content and activities around technology in order for technology to be experienced as relevant and in context with the geographical area, gender and cultural considerations. It would be of utmost importance for technology education teachers to understand how girls feel about technology and how they perceive it in order to eliminate the possibility of stereotyping technology to girls cannot do technology and it is only for boys. The understanding of the attitudes of technology of learners by a teacher in a technology classroom could therefore be a helpful tool for the technology teacher to design teaching and learning activities where both girls and boys can participate in equally without any stereotypical chains holding them back More research is therefore needed in the perceptions and attitudes of people toward

technology in specific geographical regions and the importance that this has for the effective learning and therefore positive attitudes towards technology.

The next chapter will discuss issues related to the research methodology for this study.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

The purpose of this study was to examine the attitudes of University of Zululand students toward technology. From the review of literature it appears that in order to develop a pupil's or student's technological literacy, it is important to take into account their interests, opinions and needs when developing technology curricula. It is also clear from literature that students with a positive attitude toward technology have a tendency to develop better skills and, therefore, become more technological literate. Boser, Palmer and Daugherty (1998) pointed out that measures of students' attitudes towards technology may provide some insight into the teaching approaches that affect students' attitude toward technology in a positive way. The attitude measure may then be one indicator of effective teaching approaches for technology education.

3.2 Research Questions

Specifically, this investigation sought to answer the following research questions about Technology Education students at the University of Zululand:

- What is the students' concepts of technology?
- What importance do students assign to being knowledgeable about technology?
- How do students feel about the impact of technology on their daily lives and on the world around them?
- What do students want to know and what do they already know about technology?
- How much do students want to be involved in decision making related to technology?

- What are the students' attitudes on the place of technology in the school curriculum?

3.3 Research design

Kumar (2005) stated that the Cross-sectional study design, also known as one-shot or status studies are the most commonly used design in the social sciences. This design is best suited to studies aimed at finding out the prevalence of a phenomenon, situation, problem, **attitude** or issue, by taking a cross-section of the population. He further mentioned that this type of study design is useful in obtaining an overall 'picture' as it stands at the time of the study.

Eisner (cited in Hoepfl, 1997) claimed that there is a paucity of methodological prescriptions for qualitative research because such inquiry places premium on the strengths of the researcher rather than on standardization. Lincoln and Guba (cited in Hoepfl, 1997) provided a fairly detailed outline for the design of naturalistic inquiry which included these general steps below:

- Determine a focus for the inquiry. This should establish a boundary for the study and provide inclusion/exclusion for new information. Boundaries, however, can be altered, and typically they are.
- Determine the fit of the research paradigm to the research focus. The researcher must compare the characteristics of the qualitative paradigm with the goals of the research.
- Determine where and from whom data will be collected.
- Determine what the successive phases of the inquiry would be.
- Determine what additional instrumentation may be used, beyond the researcher as the human instrument.

- Plan data collection and recording modes. This must include how detailed and specific research questions would be and how faithfully data would be produced.
- Plan which data analysis procedures would be used.
- Plan the logistics of data collection including scheduling and budgeting.

Furthermore, Imenda and Muyangwa (2006) mentioned that surveys are typically a broad and general investigation into **attitudes**, interests, values, preferences or opinions of a selected sample of a wider population. In addition, they indicated that the confirmatory survey is the most commonly used approach, usually involving structured interviews or questionnaires intended to verify information, perceptions, opinions or views. The purpose of confirmatory surveys is to assess the extent to which participants (subjects) hold similar beliefs, share specific views and ways of looking at things, possess certain skills, or exhibit comparable behaviour. Moreover, this research approach conforms to the verification as well as the enumerative and analytical dimensions of scientific research. It can also be successfully used in the field of education to find out the perceptions and **attitudes** of teachers, about the involvement of the community in school matters, learners' views of the classroom environment, teachers' opinions and **attitudes** and their perceptions regarding the curriculum, school procedures and resources.

This study aimed at generating information from respondents in an open, qualitative research framework. The study followed a cross-sectional study design with confirmatory survey as the main data collecting method and a questionnaire as the data collecting instrument.

3.4 Research sample

According to Kumar (2006) in qualitative research the issue of sampling has little significance as the main aim of most qualitative inquiries is either to explore or describe the diversity in a situation, phenomenon or issue. Qualitative research does not make an attempt to either quantify or determine the extent of this diversity. The researcher can select even one individual as a sample and describe whatever the aim of the inquiry is. A study based upon the information obtained from one individual, or undertaken to describe one event or situation is perfectly valid. In qualitative research, to explore the diversity, the researcher needs to reach what is known as the *saturation point* in terms of the findings; for example, the researcher goes on interviewing or collecting information as long as new information is being discovered. Patton (cited in Hoepfl, 1997) indicated that in quantitative research, the dominant sampling strategy to be adopted is probability sampling, which would depend on the selection of a random and representative sample from the larger population. The purpose of probability sampling is subsequent generalization of the research findings to the population. By contrast, purposeful sampling is the dominant strategy in qualitative research. Purposeful sampling seeks information-rich cases which can be studied in depth.

The target and accessible population to whom the findings of this study could be generalized are teachers in the rural areas of KwaZulu Natal Province. These teachers would have the same characteristics as the teachers in the sample in that they have little or no previous experience in technology education. They will also have little or no previous teacher training experience with the utmost being one year of teacher training at a recognized institution.. All respondents were enrolled as education students at the University of Zululand. A purposeful research sample of 88 teachers enrolled for a National Professional Diploma in Education (NPDE) in technology education was taken. In terms of the population validity, the sample was representative of the larger target population (students at

the University of Zululand) in that the whole sample had no previous experience in technology education, which could have an influence on the findings.

3.5 Instrumentation

Hoepfl (1997) indicated that the two prevailing forms of data collection associated with qualitative research are interviews and observation. Qualitative interviews may be used either as the primary strategy for data collection or in conjunction with observation and documentation analysis and other techniques. Qualitative interviews utilize open-ended questions that allow for individual variations. An interview guide or schedule is a list of questions or general topics that the researcher wants to explore. Although it is prepared to ensure that basically the same information is obtained from each person, there are no predetermined responses, and in semi-structured interviews the interviewer is free to probe and explore within these predetermined areas.

For the purpose of this study students responded to a questionnaire which was adapted for the purpose of this study from two self-report instruments; firstly a similar survey conducted in the United States of America (USA) Bame, Dugger, De Vries & McBee (1993) and secondly a Pupils' Attitude Towards Technology (PATT) test by Raat & de Vries, (1985) conducted in the Netherlands. The USA survey mentioned here, was conducted by the *Gallup Organization for the International Technology Association* (2004) and aimed to determine the attitudes and perceptions of Americans citizens toward technology. The questions in the USA survey as well as the questions in the PATT test were adapted to suit the South African context in general and the populations context in particular. Questions were adapted and changed in terms of the phrasing and terminology without changing the aim it sought to determine. A pilot study was implemented and it revealed further changes that were needed in understanding the terminology. The pilot study is further discussed under point 3.7.

The questionnaire was administered collectively in a classroom environment in order to ensure a high response rate from respondents. Also, as personal contact with the respondents was possible, the purpose, relevance and importance of the study could be highlighted. Furthermore, any questions or problems with the instrument could be explained immediately to avoid confusion. Respondents had to answer a series of close-ended questions on a four-point scale ranging from very important; somewhat important; not very important; and not at all important.

The instrument used in this study was further divided into two sections, where the first section measured students' attitudes and perceptions of technology over seven different categories which are aligned to the research questions as follows:

- a) What is the students' concept of technology?
- b) What importance do students assign to being knowledgeable about technology?
- c) How do students feel about the impact of technology on their daily lives and on the world around them?
- d) What do students want to know (interests) and what do they already know about technology?
- e) How much do students want to be involved in decision making related to technology?
- f) What are the students' perceptions on the place of technology in the school curriculum?

Table 3.1 Examples of items and their descriptions from the study's instrument

Category	Description	Sample Item
Concept of technology	What is the students' concept of technology?	When you hear the word "technology" what first comes to mind?

Importance of technology	What importance do students assign to being knowledgeable about technology?	How important is it to you to know how different technologies work?
Impact of technology	How do students feel about the impact of technology on their daily lives and on the world around them?	Most environmental problems can be solved using technology.
Knowledge and interest of technology	What do students want to know and what do they already know about technology?	Using a mobile phone (cell phone) while in the rain can cause an electric shock.
Decision making regarding technology	How much do students want to be involved in decision making related to technology?	How much say do you have when SA wants to import genetically modified foods?
Technology in the school curriculum	What are the students' perceptions on the place of technology in the school curriculum?	Do you think a high school learner should or should not understand the relationship between technology, mathematics and science?
Opinions on technology	An explanation of how they think technology can improve the lives of people in South Africa.	Explain how you think technology can improve the lives of people in South Africa.

3.6 Instrument reliability and validity

According to Imenda and Muyangwa (2005) reliability refers to consistency of measure, that is: the extent to which a given instrument provides similar results every time it is administered to the same sample at different times. Validity seeks to ascertain the extent to which a given instrument addresses the idea, trait or construct the researcher wishes to measure.

Research literature lists four forms of reliability: Test – retest, Alternate-forms, Split-half and Coefficient Consistency. In similar studies as mentioned before under 3.5 an overall coefficient of .81 was found on the attitude scale and an overall reliability coefficient of .83 was found for the concept scale. The content validity and reliability of the instruments used in similar studies were considered to be acceptable for use in measuring students' attitudes and concepts of technology. Imenda and Muyangwa (2005) also stated that there is no magic number which constitutes an acceptable reliability coefficient and that a reliability coefficient in the range of .6 to 1 would in most instances suffice.

The instrument used for the current study was an adaptation of the USA study and the instrument could therefore be considered reliable and valid. The adaptation was only to certain language and terminology and was less than 5% of the USA instrument. After a pilot study was implemented it was clear that the context in which the questions were asked had to be changed to make it more appropriate to a South African context. This included changing some terminology and words more appropriate to what South African teachers, and specifically teachers in rural Kwa-Zulu natal province might experience.

3.7 Pilot study

The pilot study conducted for the current research was a preliminary trial of the USA research instrument (2004). It was conducted amongst eight teachers in local schools surrounding the University of Zululand. These teachers were selected from rural schools and care was taken to select them with the same characteristics as the sample group which was used for the study. The intention of the pilot study was to ascertain the appropriateness of the research instrument in addressing the research questions. The pilot study revealed some misunderstandings in the wording of the questions which were then changed and

adapted to suit a local South African context. Table 3.2 shows typical changes which were implemented after the pilot study. The first example shown in table 3.2 indicates that the concept of “bathtub” was foreign the pilot group of teachers. As most teachers come from rural areas it was indicated that they might not know what is meant by a bathtub but rather a bath. To avoid confusion in answering the question the researcher decided to change the structure of the question to something which the target group would be more familiar with. The second example in table 3.2 shows an example of how a concept had to be completely changed to something which local teachers in South Africa and more specifically the rural areas of Kwa-Zulu Natal province would be familiar with. The pilot group revealed that rural teachers would not understand the concept “space exploration” or “satellites” and the concept was the completely adapted to “alternative forms of energy”. As South Africa is currently experiencing a national energy crisis and it affects most peoples lives it can be assumed that most people are aware of the problem and the various ways in which government and private organasations are trying to assist in the saving of energy. The question was therefore adapted to reflect a more familiar concept in the lives of people in rural Kwa-Zulu Natal without changing the meaning of what the question is trying to achieve and that is to determine how much people feel that they are informe about a certain type of advanced technology.

Table 3.2 Examples of the wording of questions adapted for the current study.

Questions from the USA study	Adapted questions for current study
Using a portable phone while in the bathtub creates the possibility of being electrocuted	Using a cell phone while standing in the rain can cause an electric shock.
How informed are you about space exploration and satellites?	How informed are you about alternative forms of energy?

3.8 Data analysis procedures

Bogdan and Biklen (cited in Hoepfl, 1997) defined qualitative data analysis as working with data, organising it, breaking it into manageable units, synthesizing it, searching for patterns, discovering what is important and what is to be learned, and deciding what you will tell others. Qualitative researchers tend to use inductive analysis of data, meaning that the critical themes emerge out of the data (Patton, cited in Hoepfl, 1997).

As the aim of the research was to establish the attitudes of Zululand University students towards technology, and confirmatory survey was used as the research method the data in the first section of the questionnaire was analyzed by setting up a code book. The data in the code book was then analyzed by counting the frequency of responses and reflecting it as a percentage.

The second section of the study entailed the coding of the open-ended question in a process called “open coding.” This was done by selecting one of the questionnaires randomly from the total completed questionnaires and to write down the responses. Themes emerging from the data were then identified and conceptual categories were formed into which the themes were grouped. The goal was to create descriptive, multi-dimensional categories which formed a preliminary framework for analysis. Words or phrases that appeared to be similar were grouped into the same category. This process was then repeated with all the questionnaires until a saturation point was reached. The responses were then examined to ascertain similarities. Two or more similar responses were then combined and given a category name which is descriptive of the responses. The different categories which emerged were then placed in order of importance assigned to it by the number of responses and is represented by a percentage point.

3.9 Summary

The purpose of this study was to examine the attitudes of University of Zululand students toward Technology. An extensive literature review revealed that similar studies have been conducted in other parts of the world including, the United States of America and the Netherlands. The content validity and reliability of the instruments used in both these studies were considered to be acceptable for use in measuring students' attitudes of technology with only minor changes which were implemented after a pilot study was conducted. The target population for this study was teachers in the rural areas of KwaZulu-Natal Province in South Africa. The research sample consisted of 88 teachers enrolled at the University of Zululand as students for a National Professional Diploma in Education (NPDE) in technology education. A pilot study was implemented and revealed some misunderstandings in the wording of the questions which were then changed and adapted to suit a local South African context. The questionnaire was administered collectively in a classroom environment in order to ensure a high response rate from respondents. The data was recorded and analyzed using a code book. The data in the code book was then analyzed by counting the frequency of responses and reflecting it as a percentage.

In the next chapter the findings of this study will be presented and discussed.

CHAPTER 4

FINDINGS AND DISCUSSION

4.1 Introduction

The purpose of this study was to determine the perceptions and attitudes of a sample of Zululand University students toward technology. Using a questionnaire, based on the Pupils' attitude toward technology test by Bame *et al.*(1993), a sample of 88 participants was used to determine the attitudes toward technology. This chapter outlines the results obtained from these measures. The discussion of results will be made as the data is presented.

4.2 Description of participants

The participants in this study were 88 teachers enrolled for a National Professional Diploma in Education (NPDE) in technology education at the Faculty of Education, University of Zululand campus in KwaDlangezwa, KwaZulu Natal Province. The sample comprised, 34 (39%) male students, and 54 (61%) female students. This, in itself, is interesting statistics in that it dispels the common notion that women do not have a disposition towards subjects ordinarily perceived as technical. Perhaps, such stereotyping does not apply to this research sample.

The age range of the participants varied from 26 to 45 years old with the majority (57%) falling into the 30-39 (both male and female put together) year old range. A further 31% fell into the 40+ years old range, while 12% fell into the 20–29 year old range.

The findings also showed that 2% of the respondents (both male and female put together) had indicated to not having a Senior Certificate (grade 12) as their highest academic qualification; 28 (32%) had a Senior Certificate; and 54 (61%)

had a Primary Teachers' Certificate (PTC); while 5% did not indicate their qualifications.

4.3 The students' concept of technology

The data in Table 4.1 indicate that 36% thought first of designing when the word "technology" is mentioned, while the other mentions of significance are, 15% think of computers, 14% think of problem solving and 8% think of cell phones. This is a very interesting result as the US study (2004) indicated that 68% of the respondents first thought of computers when they heard the word "technology" and they attributed their finding to the growing daily exposure of people to computers. The difference in the current study could be attributed to the fact that the study targeted teachers who were enrolled for technology education courses. However, on closer inspection it must be said that the majority of the sample had never before engaged in any technology education activities of any kind and that the course they were enrolled in was their first formal experience of technology education.

A further point to consider is the fact that teachers in South African schools, especially in the deeper rural areas, are not exposed to computers in the same way as in other areas, hence their mention of designing when they first heard "technology". It must also be noted that the experience of the researcher is that most schools, even in the deeper rural areas have received learning area specific policy documents from the Department of Education (DoE) and that in the policy documents for technology education, design is stated as one of the areas of content that learners must achieve.

Table 4.1 Mentions of respondents' concept of technology

When you hear the word "technology," what first comes to mind?	
List of Mentions	% Mentioned
Designing	36
Computers	15
Problem Solving	14
Cell Phones	8
Products	6
Jobs	3
Television	3
Science	2
Machines	2
Electronics	1
Calculators	1
Did not say	9

4.4 The importance assigned to being knowledgeable about technology

As in the PATT USA survey by Bame, *et al.* (1993) a number of questions in the current study delved into the importance the respondents placed on developing and having knowledge of technology. The findings are clear in that respondents reflected the view that being able to understand, assess, and manage technology are highly valued attributes. Similarly, the respondents reflected that they feel it is important to know how various technologies work. This finding is important as it is a clear reflection of the respondents' view that it is important for people to be technologically literate. In addition, they also expressed a strong desire to be able to perform daily tasks related to technology.

The preceding findings are based on responses to three questions from the questionnaire. The questions and responses are reported in Tables 4.2, 4.3, and 4.4. The first question in this series asked respondents to indicate how important they feel it is to develop the ability to understand and use technology. An overwhelming 94% responded that they feel it is very important to develop technological literacy.

Table 4.2 The importance respondents assigned to understand and use technology

In your opinion, how important is it for people at all levels of society, to develop some ability to understand and use technology?	
Importance	% Selecting
Very important	94
Somewhat important	5
Not very important	1
Not at all important	-
Did not say	-

A further question asked the respondents to indicate the extent to which they felt it is important for them to know how various technologies work. Again, an overwhelming 98% of respondents indicated that it is very important and 2% seeing it as somewhat important. None of the respondents felt having this understanding as unimportant.

Table 4.3 The importance respondents assigned to know how different technologies work

How important is it to you to know how different technologies work?	
Importance	% Selecting
Very important	98
Somewhat important	2
Not very important	-
Not at all important	-
Did not say	-

The last question in the series explored the desire of the respondents to understand how technologies work in relation to the types of tasks and decisions people make on a daily basis. In Table 4.4 the first two categories (Very Important and Somewhat Important) are combined and it clearly shows that most respondents want to be able to repair things around the house, use technological literacy to solve problems to practical problems, make decisions about the continued usefulness of products, and even seek answers to technological problems.

Table 4.4 The importance respondents assigned to daily technological activities

How important is it to you, personally, to know how each of the following? Is it very important (VI), somewhat important (SI), not very important (NVI), or not important at all (NIA)?						
	% Importance					
	(1) VI	(2) SI	(3) 1+2	(4) NVI	(5) NIA	(6) 4+5
Knowing whether it is better to repair products or better to throw them away	72	25	97	3	-	3
Diagnosing or finding out why something does not work so it can be fixed	68	26	94	6	-	6
How to program a Video recorder or any other electronic device	58	38	96	2	2	4
Being able to develop solutions to practical technological problems	70	29	99	-	1	1
How to fix a broken light switch or other household appliances	64	34	98	2	-	2
Knowing how different products such as a paper stapler or fax machine works	69	28	97	1	2	3

4.5 The impact of technology

From the findings stated above it is evident that respondents placed a great deal of importance on technological literacy. It will, therefore, be important to see how this translates into how they feel about the effects of technology on their daily lives and the overall impact it has on the world around them. The questions related to these issues are reported in Table 4.5. The respondents also had to make a value judgment on the overall effects of technology. The next series of

questions dealt with why they felt technologies are developed, their feelings about the impact of technology on the environment and associated problems, and the function of design as one of the elements of the technological process.

Seventy percent of respondents either strongly or mostly disagreed with the statement that technology is a small factor in their everyday lives, while 30% either strongly or mostly agreed with this statement. There is no definition or disagreement as to whether the effects of technology can be either good or bad as 84% of respondents agree with this statement and 16% disagree with this statement.

On the statement that diesel cars are safe for the environment, 70% of respondents disagreed and 30% agreed with this statement. The majority of respondents (88%) agreed that technology can solve our environmental problems, while 10% disagreed with this statement and 2% did not answer.

Regarding the linking of design with the development of products, the high level of agreement (91%) is not surprising as most respondents would have had some previous encounter with technology policy documents at school.

Table 4.5 The extent to which respondents agreed or disagreed with the impact of technology

Now, tell me whether you strongly agree (SA), mostly agree (MA), mostly disagree (MD), or strongly disagree (SD) with each of the following statements.							
% Agreement							
	(1) SA	(2) MA	(3) 1+2	(4) MD	(5) SD	(6) 4+5	(7) None
Technology is a small factor in my everyday life	19	11	30	13	57	70	-
The results of the use of technology can be good or bad	58	26	84	5	11	16	-
Diesel cars are safe for the environment	14	16	30	20	50	70	-
Humans often develop new technologies to improve upon previous technologies	72	20	92	2	3	5	3
Most environmental problems can be solved using technology	77	11	88	2	8	10	2
Design is a process that can be used to turn ideas into products	81	10	91	1	7	8	1

4.6 What students want to know and what they know about technology

The responses already mentioned in Tables 4.3 and 4.4 indicated the extent to which the respondents wanted to know about technology. Respondents indicated that they wanted to know how the various technologies worked and that desire translated into being able to do repairs, use technology, and make decisions about the technology needed at home.

Further analyses of what students already knew about technology revealed that 82% of respondents believed that engineering and technology are basically one and the same thing, while 17% believed it is not, and 1% did not answer. Also, 89% of respondents believed science and technology are basically one and the same thing, while 10% did not and 1% did not answer. Given that in South African Schools, science and technology are closely linked learning areas, it is not surprising that students made this decision.

Further findings as reported in Table 4.6, showed that 60% of respondents believed that one cannot get an electric shock when using a cell phone in the rain, while 36% responded incorrectly by saying it was true, and 4% did not answer. Moving on to the medical field, 86% of the respondents incorrectly stated that antibiotics kill viruses as well as bacteria, while only 13% said that it is either probably or absolutely false, and 1% did not answer.

Regarding cyberspace, 75% understood that the Internet and the World Wide Web are the same, while 22% said that it is not, and 3% did not answer. This result is somewhat surprising as the majority of respondents did not have a personal computer at home or at schools where they teach, let alone a connection to the Internet. On the question whether a microwave heats food from the outside to the inside, 66% of respondents answered incorrectly by saying it was true, while 34% answered correctly by saying it was false. A possibility is that most people refer to a microwave as a “microwave-oven” and through experience people know that a convection oven heats food from the outside to the inside, the same way as if one is cooking on an open fire. Clearly, the understanding of this type of technology, lacked in most of the respondents.

Table 4.6 Respondents' knowledge about technology

Please tell me if you think the following statements are absolutely true (AT); probably true (PT), probably false (PF), or absolutely false (AF).							
% Mention							
	(1) AT	(2) PT	(3) 1+2	(4) PF	(5) AF	(6) 4+5	(7) None
Engineering and technology are basically one and the same thing	56	26	82	8	9	17	1
Using a cell phone while in the rain can cause an electric shock	25	11	36	42	18	60	4
Antibiotics kill viruses as well as bacteria	66	20	86	5	8	13	1
Science and technology are basically one and the same thing	57	32	89	5	5	10	1
The Internet and the World Wide Web are the same thing	31	44	75	9	13	22	3
A microwave heats food from the outside to the inside	43	23	66	18	16	34	-

The next series of questions further delved into the respondents' interests about technology, and what they want to know about technology. The results of these findings and the questions respondents had to answer are reported in Table 4.7. The data supported the respondents strong interest in the different areas of technology, but the level of interest is slightly different. The findings show that 91% of respondents are either very interested or somewhat interested in the modification of plants and animals to supply food, while 9% indicated that they were not very interested or not interested at all. This is an interesting result in view of the fact that the world is currently experiencing global food crises, with people all over the globe expressing their concerns over the high cost of food.

Further findings showed that 85% of respondents were interested in robotics and manufacturing technologies, while 15% said they were not. Also 87% indicated a strong interest in new methods of construction, while 13% indicated a low level of interest. It must be noted that currently South Africa, especially the poor, are experiencing a housing shortage which could explain this result. Furthermore, 76% of respondents showed a strong interest in alternative sources of energy to supply electricity, while 24% showed little or no interest at all. This finding is somewhat surprising when compared to the other three questions, seeing that South Africa is also currently experiencing a national crisis in the production of electricity, or it could be that respondents felt that there are already existing alternative sources which could supply sufficient electricity.

Table 4.7 Respondents' interest in technology

How much of an interest do you, yourself, have in the following topics? Are you very interested (VI), somewhat interested (SI), not very interested (NVI), or not interested at all (NIA)?							
	% Interest						
	(1) VI	(2) SI	(3) 1+2	(4) NVI	(5) NIA	(6) 4+5	(7) None
The modification of plants and animals to supply food	68	23	91	6	3	9	-
Robotics and manufacturing technologies	43	42	85	13	2	15	-
New methods of constructing buildings and homes	72	15	87	10	3	13	-
Using alternative sources of energy to supply electricity	40	36	76	20	4	24	-

The same questions that were asked about the respondents' interest in technology were repeated to determine how informed they feel they are about these topics. The data reported in Table 4.8 shows the extent to which the respondents felt that they are informed about different technologies. To begin

with, 36% of respondents felt they were very informed, and 41% felt that they were somewhat informed about the modification of plants and animals to supply food, while 18% said that they were not very informed, and 5% said that they were not informed at all. When compared to the other three topics, which had much lower ratings, this result may reinforce the respondents' concerns about the current food shortages and they kept themselves up to date with the current issues concerning food technologies.

Further findings showed that 55% of respondents felt they were not informed about robotics and manufacturing technologies, while 44% felt they were informed, and 1% did not answer. This could be because of the rural areas the respondents came from, where no or little industries are situated. Also, 52% felt they were informed about new construction methods of homes, while 48% felt they were not. Again, 41% felt they were informed about alternative sources of energy to supply electricity, while 59% felt they were not informed.

Table 4.8 The extent to which Respondents felt informed about technology

Now read these topics again and tell me how informed you feel that you are about each? Would you say you are very informed (VI), somewhat informed (SI), not very informed (NVI), or not informed at all (NIA)?							
	% Informed						
	(1) VI	(2) SI	(3) 1+2	(4) NVI	(5) NIA	(6) 4+5	(7) None
The modification of plants and animals to supply food	36	41	77	18	5	23	-
Robotics and manufacturing technologies	24	20	44	27	28	55	1
New methods of constructing buildings and homes	30	22	52	34	14	48	-
Using alternative sources of energy to supply electricity	27	14	41	37	22	59	-

The respondents were almost equally divided regarding the extent to which they felt relatively informed or relatively uninformed on the four topics of technology.

4.7 Decision making related to technology

The current study also sought to determine how much the respondents wanted to be involved in the decisions related to the use of technology, and the extent to which they were willing to leave the decisions in these areas to experts in the field of technology or to the leaders in their communities. The amount of influence that respondents felt they had is reported in Table 4.9 and the confidence that they had in the leaders of their communities to make decisions regarding technology is reported in table 4.10. The findings showed that, 24% of respondents felt they had considerable influence, while 40% felt that they had some influence in where to locate roads in their community, the fuel efficiency of cars, and the development of genetically modified foods. A combined 36% said that they had little or no influence at all. The respondents leaned in the direction that they felt they had some influence in decisions related to the use of technology.

Table 4.9 Respondents' influence on decisions about technology

How much influence do you think people like yourself have on decisions about technological things like, the fuel efficiency of cars, the construction of roads in your community, and genetically modified foods? Would you say a great deal, some, very little, or no influence?	
Amount of Influence	% Selecting
A great deal of Influence	24
Some Influence	40
Very little Influence	26
No influence	10
Did not say	-

Furthermore, respondents were asked to indicate the level of confidence which they had in the leaders of their communities to make decisions about technology. The findings showed that a combined 76% of respondents had little or no confidence in the leaders of their communities to make decisions regarding technology, while a combined 24% had a great deal, or some confidence. The respondents were therefore, not comfortable in the decision-making abilities of the leaders in their communities when it came to technology. However, they felt that they had some influence when it came to these decisions. The way in which they expressed these decisions was not investigated.

Table 4.10 Respondents' confidence in leaders on decisions about technology

Thinking about things such as the fuel efficiency of cars, the construction of roads in your community, and genetically modified foods, how much confidence do you have in the leaders of your community to make the right decisions for your community?	
Level of Confidence	% Selecting
A great deal of confidence	10
Some confidence	14
Very little confidence	32
No confidence	44
Did not say	-

4.8 Technology and education

The final series of questions focused on the students' perceptions of the place of technology in the school curriculum. When asked to respond in terms of a broad definition of technology as, 'technology is to modify our natural world to meet human needs', 93% of respondents said that technology should have been

included in the school curriculum, while 7% said that it should not have been included.

A further ten questions sought to determine the respondents' feelings on the possible focus of what learners at school should know, or should not know, and should be able to do, or not do. The results of these findings are reported in Table 4.11 and they clearly show that a combined 99% of respondents felt that high school learners should have known the relationship between technology, mathematics and science. Also, 100% said that they should have been able to apply technology. However, 99% indicated that they should have understood the role of people in the development of technology, while 98% believed they should have comprehended the effect of technology on society. A further 92% felt they should have understood the relationship between technology and the environment.

Furthermore, a combined 96% said that high school learners should have understood the relationship between technology and the economy, while 98% said that they should have known the advances and innovations in technology; 94% said that they should have had the ability to select and use tools and products, 98% said that they should have been able to evaluate the positive and negative aspects of technology, and 96% felt that they should have known something about how products are designed and manufactured.

Table 4.11 What high school learners should know about technology

Read the following things that a high school learner might or might not know, or might or might not be able to do. Tell me how important it is that they must understand, or must be able to do each. Is it very important (VI), somewhat important (SI), not very important (NVI), or, not important at all (NIA)?							
% Of Importance							
	(1) VI	(2) SI	(3) 1+2	(4) NVI	(5) NIA	(6) 4+5	(7) None
Should they know the relationship between technology, mathematics, and science?	60	39	99	1	-	1	-
Should they have the knowledge and skills to apply technology?	68	32	100	-	-	-	-
Is it necessary for them to understand the role of people in the development and use of technology?	69	30	99	-	1	1	-
Should they understand the overall effect of technology on society?	70	28	98	2	-	2	-
Is it important that they understand the relationship between technology and the environment?	61	36	92	8	-	8	-
Should they understand the relationship between technology and the economy?	65	31	96	4	-	4	-
Should they understand the advances and innovations in technology?	57	41	98	2	-	2	-
Is it necessary for them to have the ability to select and use tools and products?	59	35	94	2	2	4	2
Should they have the ability to evaluate the positive and negative aspects of technology?	60	38	98	2	-	2	-
Is it important that they know something about how products are designed and manufactured?	66	30	96	2	2	4	-

Respondents also had to indicate if they felt that there is a national shortage of qualified people in different areas of technology in South Africa. The findings showed that 93% said that they felt there was a shortage, 3% said there was no shortage, and 4% did not say. On the question of how to address the shortage of qualified people in technology, respondents had to choose between two options. The first option was to bring in qualified people from other countries, and the second option was to take steps through the education system to train people. The results showed that 67% chose the second option, to educate people through the education system, while 30% chose the first option, and 3% remained silent. While the preference was clear, it should not be taken as reflecting a negative view on importing people from other countries.

4.9 The role of technology

In the final question, the respondents had to explain how they thought technology could improve the lives of people in South Africa. Responses varied with the majority of 60% indicating that technology would improve the lives of people by giving them skills to perform jobs and to alleviate poverty. The types of skills mentioned were, the use of tools and equipment, the operation of machines, entrepreneurial skills, the building of houses and solving everyday problems at home. A further 16% indicated that technology would give people access to information and improve the ways in which people can communicate. Also, 3% mentioned that technology can help to conserve our natural heritage and help to protect the environment from pollution. The rest of the responses, mentioned by 2% of the sample, can be divided under more effective transport, better medical treatments, increased farming, and the reduction of crime. These sentiments were aptly captured by one respondent as follows:

Through technology people's standard of living will be higher and South Africa will be at the same levels of other countries. There will be better roads, houses and it will lift the mentality of people.

4.10 Summary

In this chapter, data that was collected from 88 University of Zululand students, registered for part time education courses in technology revealed that with respect to the students' concept of technology, they showed a strong conceptual understanding of technology and described it as designing and problem solving activities. Furthermore, it can be concluded that University of Zululand students assigned a great level of importance to knowing how technologies worked. Similarly, with respect to how students felt about the impact of technology, and the interest they had in different technologies, the present study's findings showed that students were aware of the positive and negative impact of technology, and that they showed a keen interest in wanting to know more about different technologies. In contrast with their interests, students showed a moderate to low level of knowledge concerning technologies used in our everyday lives. Furthermore, students showed a moderate to low level concerning being informed about different technologies.

With respect to decisions being made about technology, the findings revealed that students felt that they had some influence when it came to making decisions about technology. However, how they wanted to execute these decisions were not investigated. Regarding the confidence that students had in the leaders of their communities to make decisions about new technologies, the findings showed that they had a very low confidence. Students however expressed their concerns that the leaders in their communities would undertake a new technological project without consulting people about the relevance, advantages and possible environmental impact.

Students were unanimous in their views that technology must play an important role in the school curriculum. It can also be concluded from current findings that

students placed very high expectations on what they believed a high school learner must know about technology.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter provides a summary of the study, the conclusions with respect to the findings, and lists some recommendations based on the findings reported here. The summary gives a brief account of what was carried out in this investigation. The conclusions are about the connection between the findings of the present study and published literature. In the recommendations, an overview of ideas and suggestions for further research is provided. This study also provides valuable insight into the perceptions and attitudes of the University of Zululand students toward technology. This could be important because the natural processes could see that technology plays an ever increasing part in our daily lives. It could also provide valuable insight to technology education curriculum planners, to align the content with current trends in technology.

5.2 Limitations of the study

This study is limited to the University of Zululand students, in the Faculty of Education, enrolled for courses with technology as a major subject. The target students are first year students, enrolled for a National Professional Diploma in Education (NPDE), which is a two year part-time course. All of the students come from the rural areas of KwaZulu-Natal province and are teachers in the Senior Phase of the school curriculum. Very few of them are currently teaching technology education. The reason for this is that Technology is a relatively new learning area in the South African school curriculum and very few teachers have been trained in this area. Most of them have a senior certificate (Grade 12) plus one year initial teacher training (i.e. Primary Teachers Certificate – PTC) as academic qualification. The target students are all, therefore, in their first year of study and it can be assumed that they have no, or very little previous experience

of technology education. Generalization to the whole population of education students may not be possible. Further study needs to take place to see if results could be replicated in universities in other regions of South Africa, or Africa, or other countries.

5.3 Recommendations

It is necessary that students experience that technology encompass our whole life and that technology is all around them (Zuga, 1994). Students must have a chance to deal with more products of technology and also to produce technology. Furthermore, to increase their technological knowledge and to keep up to date with current technological issues, the Department of education (DoE) should provide additional resources at schools, like a computer centre, connected to the Internet, as well as a properly-equipped technology workroom. Tasks and activities in the technology class should revolve around the current issues and crises that South Africans face e.g. the energy crisis, the food crisis, the water crisis, the crime crisis, pollution, and global warming. There should be no distinction made between the type of activities that boys get and those that girls get in the technology class. Girls should also be given opportunities to work with more complex materials and tools and boys should also be given opportunities to work with needles and textiles.

To increase the confidence that people place in the leaders of our communities to make the right decisions regarding technology, it is recommended that teacher bodies, through the national Department of Education, get a voice and a platform where they can highlight their concerns. In many communities in the deeper rural areas of the country, teachers are the highest educated people, but their voices are not heard. Through the media like local newspapers technology teachers can

communicate with the broader population the issues they feel need attention to improve the quality of people's lives.

5.4 Conclusions

The present study which investigated the perceptions and attitudes of the University of Zululand students toward technology has never been carried out before. Findings from this study should, therefore, add an important aspect to the body of knowledge which is already available. After analysis of the present findings, some interesting results can be reported, some which are consistent with findings reported in other literature, but also some surprising differences.

With respect to the students' concept of technology, the result was somewhat surprising in that it is not consistent with studies reported in literature. The students in the current study showed a strong conceptual understanding of technology as designing and problem solving activities, whereas literature reports that people mainly thought about computers when technology is mentioned, while experts in the field assign a meaning that encompasses everything we do in our daily lives.

Furthermore, it can be concluded that University of Zululand students assign a great level of importance to knowing how technologies work which is consistent with other studies. Similarly, with respect to how students feel about the impact of technology, and the interest they have in different technologies, the present study's findings were consistent with those reported elsewhere and it can be concluded that students are aware of the positive and negative impact of technology, and that they show a keen interest in wanting to know more about different technologies. In contrast with their interests, students showed a

moderate to low level of knowledge concerning technologies used in our everyday lives, which is not consistent with other studies. It can be concluded that other studies were placed in developed countries, hence the greater understanding towards everyday technological processes and products. Furthermore, students showed a moderate to a low level concerning feeling informed about different technologies. This is also not consistent with other studies where people showed a greater level of feeling informed about technology. Again, because of the higher levels of technology in developed countries (i.e. computers, Internet), it can be concluded that students in the current study relied on information from lower level technology to obtain information (i.e. media, books).

With respect to decisions being made about technology, the findings revealed that students feel that they have some influence when it comes to making decisions about technology. However, how they wanted to execute these decisions was not investigated. Regarding the confidence that students had in the leaders of their communities to make decisions about new technologies, the findings showed that they have a very low confidence. Surprisingly, this finding is consistent with other studies which have reported that people would rather leave the important decisions to experts in the field. Students however expressed their concerns that the leaders in their communities would undertake a new technological project without consulting people about the relevance, advantages and possible environmental impact.

Also, consistent with other studies is the issue of the place that technology has in the school curriculum. Students were unanimous in their view that technology must play an important role in the school curriculum. It can also be concluded, from current findings, that students placed very high expectations on what they believe a high school learner should know about technology. This finding is also consistent with other studies which have reported that people believe that the

understandings and abilities needed by learners to meet the challenges of today's world, would come through the building of technological literacy.

Future investigations might include (a) studies to determine the effect of age, and gender, in the attitudes and perceptions of students toward technology; (b) the role of students' prior knowledge on attitudes and perceptions toward technology; (c) the role of Information and Communication technologies (ICT) on students' perceptions and attitudes toward technology.

BIBLIOGRAPHY

- Ankiewicz, P.J., De Swardt, A.E., Stark, R. (2000). Principles, Methods and Techniques of Technology Education. RAUKOG, RAU College for Education and Health.
- Bain, C.D. and Rice, M.L. (2006). The influence of Gender on Attitudes, Perceptions, and Uses of Technology. *Journal of Research on Technology Education*, 39 (2), 119.
- Bame, A.E., Dugger, W.E., De Vries, M., & McBee, J. (1993). Pupils' attitude toward technology –PATT-USA. *Journal of Technology Studies*, 19 (1), 40-48.
- Becker, K.H. and Maunsaiyat, S. (2002). Thai Students' Attitudes and Concepts of Technology. *Journal of Technology Education*, Volume13, 2, 1-12.
- Boser, R.A., Palmer, J.D., Daugherty, M.K. (1998). Students Attitudes Toward Technology in Selected Technology Education Programs. *Journal of Technology Education*. Volume10, 1, 1-43.
- Breakwell, G.M. & Beardsell, S. (1992). Gender, parental and peer influences upon science attitudes and activities. *Public Understanding of Science*, 1 183-197.
- Breckler,S.J. & Wiggins, E.C. (1993). Emotional responses and the affective component of attitude. *Journal of Social Behaviour and Personality*, 8, 281-296.
- Christa, L. (2001). Teacher attitude in computer education. Retrieved May 2008,

from <http://cikgu.net.my/english/classtech.php>

- Crawly, F. E., & Black, C.B. (1992). Causal modeling of secondary science students intentions to enroll in physics. *Journal of Research in Science Teaching*, 29 (585-599).
- Cronbach, L.J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16, 297-334
- De Klerk Wolters, F. (1989). A PATT Study Among 10 to 12 -Year-Old Students in the Netherlands. *Journal of Technology Education*, 1, 1, 1-23.
- De Vries, M.J. (1996). Technology Education: Beyond the “Technology is Applied Science” Paradigm. *Journal of Technology Education*, Volume 8,1, 1-24.
- Engelbrecht W, Ankiewicz P & de Swardt E. (2007). An industry-sponsored, school-focused model for continuing professional development of technology teachers. *South African Journal of Education*, 27579-595.
- Harlen, W. and Holroyd, C. (1995). Primary teachers' understanding of Concepts in Science and Technology. *The Scottish Council for Research in Education*.
- Hoepfl, M.C. (1997). Choosing qualitative research: A Primer for Technology Education Researchers. *Journal of Technology Education*, Volume 9,1, 1-26.
- Imenda, S.N. and Muyangwa, M.M. (2006). Introduction to Research in Educational and Behavioural Sciences. *Publication and Design Services. Tswane Univesity of technology*.
- Jenkins. E.W. (1994). Public understanding of science and science education

for action. *Journal of Curriculum Studies*, 26, 601-612

Kalanda, K. (2005). "Factors Influencing College Students' Attitudes Toward Technology in Lesotho". *Journal of Technology Education*, Volume 20,1.

Kumar, Ranjit. (2005). *Research Methodology*, Second Edition.
SAGE Publications

Kurt, H. Becker and Somchai, Maunsaiyat. (2002). Thai Students' Attitudes and Concepts of Technology, *Journal of Technology Education*, Volume 13,2.

Le Roux, J. (1994). The Black child in crisis. *A socio-education perspective*
Volume 2. Pretoria: J.L. Van Schaik.

Linn, E. (1999). Gender equity and computer technology. *Equity Coalition*,
5, 14-17.

Morris, C.G. (1973). Psychology: An introduction. Englewood cliffs, New Jersey:
Prentice-hall, Inc.

The National Professional Diploma in Education, as registered by SAQA Board
11 August 2004. Retrieved: 2007.

Oliver, J.S. & Simpson, R.D. (1988). Influences of attitude toward science, achievement, motivation, and science self-concept on achievement in science: a longitudinal study. *Science Education*, 72, 143-155.

Oosthuizen, J. (1994). *Aspects of the Educational Law for Educational Management*. Pretoria: Van Schaik.

- Raat, J.H., & de Vries, M. (1985). "What do 13-year old students think about technology? The conception of and attitude toward technology of 13-year old girls and boys." *Eindhoven University of Technology, The Netherlands*. (ERIC Document Reproduction Service No. ED 262 998).
- Rose, L.C., Gallup, A.M., Dugger, W.E., Starkweather, K.N. (2004).
Report by the GALLUP Organization for the International Technology Association.
- Stables, K. (1997). Critical Issues to Consider when Introducing Technology Education into the Curriculum of Young Learners. *Journal of Technology Education*, Volume 8,2, 1-23.
- Stevens, A. (2003). Technology Education in South Africa. Faculty of Education, Grahamstown, Rhodes University.
- Tesser, A. (1993). The importance of heribility in psychological research: The case of attitudes. Retrieved, May 2008, <http://scholar/psycnet.apa.org>
- Twyford, J., & Esa-Matti,J. (2000). The formation of children's Technological Concepts: A study of what it means to do Technology from a child's perspective. *Journal of Technology Education*. Volume 20, 2, 1-34.
- Vandeleur,S. (2006). The Social Shaping of Technology and Implications for the Curriculum. Technology Association of South Africa, Annual Conference.
- Volk, Ken., Wai Ming Yip and Ting Kau Lo. (2003). Hong Kong Pupils' Attitude Toward Technology: The Impact of Design and Technology Programs. *Journal of Technology Education*. Volume15,1, 1-43.

Welty, K. (1998). Journeys and Destinations in Technology Education: Implications for Research. Retrieved, May 2008, <http://www.project2061.org/events/meetings/technology/>.

Zuga, Karen. F. (1994). Thoughts on Technology Education Research. Retrieved, May 2008, <http://www.project2061.org/events/meetings/technology/>.

