FACTORS INFLUENCING COLLEGE STUDENTS' ATTITUDES TOWARD TECHNOLOGY

by

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ABSTRACT

The present study assessed the views of students on school-related determinants with respect to liking or disliking technology. In determining students' views, two self-report instruments, the Classroom Learning Environment Survey (CLES) and Attitudes Toward Science Scale (ATSS) were used. Also, an interview schedule was arranged with a selected group. Participants were 200 first years registered for Diplomas in Primary -, Secondary -, and Technology Education. Results indicated a positive relationship between attitudes towards technology and each of teacher characteristics, student characteristics and the classroom environment. Regression analysis showed that attitudes toward technology were predicted by the three study variables. On the other hand, no statistically significant gender differences were established. Recommendations and suggestions for further research are also advanced.

DECLARATION

I declare that **FACTORS INFLUENCING COLLEGE STUDENTS' ATTITUDE 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 DATE

(Kalanda Kasongo Paulin)

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CHAPTER 1

ORIENTATION TO THE STUDY

1.1 Introduction

From home to the workplace, technological tools have become a part of our day-to-day life. In many circles, computer literacy and technological competence are perceived as essential skills. Thus, schools have responded to this need for technological competence by enhancing their course offerings to include classes in technology. Also, as technology has become part of our daily lives, the need for good and proper training has become extremely essential. Because of this increase in need, demands have also been placed on schools to educate students and make them "technologically literate." However, prior to educating youths, efforts must be committed to preparing teachers who can tie together the educational possibilities of using technological tools in the classroom. This is important because as House (1988) argues “Futurists tell us that the twenty-first century world will be characterised above all else, by exponential growth and ever accelerating change, by a society built on information technology … by connectedness within the world community, and by a myriads of new realities and new problems only vaguely imagined today. The children we educate for life in that world will need new coping skills if they are to live as productive citizens” (p. 634).

Furthermore, De Klerk Wolters (quoted by Kurt, Becker, & Somchai 2002:1) indicated that learning the concepts of technology is necessary and should be required for all students. Nevertheless, accelerated changes of the last decade in technology have brought discipline, curriculum and philosophical changes.

In this paper we confine ourselves to a consideration of information and communication technology. This is in essence a sub-set of the total field of technology. How important then is technology in Lesotho?

At this point, it is important to provide the context within which the research was completed. Lesotho is a landlocked country within the geographical area of the republic of South Africa. It gained independence from Britain in 1966. Its present population is about two million with a per capita income of approximately US$500, which is approximately R3 150.00. It is a constitutional monarchy with a democratic form of government. It has a relatively high literacy rate and the government emphasises the strategic importance of education in the socio-economic development of the country.

The Lesotho College of Education was established in 1975 as the National Teacher Training College (NTTC). This public college replaced three denominational teachers' colleges, run by the Roman Catholic Church, the Lesotho Evangelical Church and the Anglican Church of Lesotho. UNESCO assisted in the initial planning of the institution. Pre-service and in-service programmes were developed for primary school teaching while only a pre-service programme was developed for secondary school teaching. By 1990 offerings were in the Primary, Secondary and In-service Divisions. In the 1990s the College provided programmes leading to certificates which were later replaced by diplomas for a similar duration of study.

In the course of its development the College received considerable guidance and assistance from the National University of Lesotho (NUL). It still has a close relationship with NUL, while also developing necessary and relevant links with other

institutions of higher learning in the region and internationally. On 31st July 2002 the College was granted autonomy and renamed the Lesotho College of Education (LCE). The autonomy allowed the College to determine its own programmes, to strategically plan its future and to manage its own resources. As a public institution, it is financed by a subvention from the Government of Lesotho. The primary mission of the College is to produce competent teachers who are also able to offer necessary services in the community for the school system of Lesotho. As in most of the developing countries, the teaching of technology in Lesotho is way behind the technological changes taking place in the developed world. It is behind in spite of government's reform efforts in the development of learning activities in science and technology. Such reforms included the introduction of Technology as a subject offered at the College.

The need for offerings in Technology has been supported by researchers such as House (1988:634) who have 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 programs must incorporate new knowledge that is more meaningful to students and must integrate science and technology

Moreover, to help students appreciate the nature of technology, Kurt, Becker, & Somchai, (2002) refer to Cross & McCormick who indicated that students at primary, secondary and College levels need to learn to solve technological problems in creative ways. It is therefore evident that understanding of technology is just as important for students in Lesotho as it is for students in other countries. In addition, it has been indicated, "… 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" (Chrita, 2001: 1).

What is evident then, is the fact that students are graduate 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, analyse and exchange information quickly and accurately. In view of all 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. Mikulski (2001:1) confirms this when she argued:

> Even with dot-coms now dot-bombing, there still is a great need for technology workers. In fact, in practically every field technology literacy is needed. Manufacturing in my own State has gone from smokestack to cyberstack. We must have people with the skills who are ready.

Technologically literate persons will hopefully display adequate knowledge and competent use that will help them to successfully accomplish various tasks. He/she will think critically about technological issues and acts accordingly.

It could be assumed at this point that if students act positively toward a subject, for example, technology, then they will have more of an interest in that subject (Krathwohl, Bloom, & Masia, quoted by Boser, & Palmer, 1998:1). Thus, 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 (Bame, Dugger, de Vries & McBee, 1993: 40-48). Consequently, de Klerk and Wolters (1989) suggested that it is important to take into account students' interests, opinions, and needs when developing a technological curriculum. It is equally important for an effective teaching of

technology that teachers have an understanding of students' knowledge of, and attitudes toward technology (Kurt, Becker, & Somchai, 2002:1).

Additionally, 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 utilise this. 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 a subject are more likely to actively engage in learning during and after instruction (Popham, 1994). When a student dislikes Technology, his attitude is reflected in actions resulting in limited engagement with technology. So in a sense, the attitudes affect subsequent actions. It is acknowledged in the present study that there are many other factors that influence student's attitudes toward technology.

The aim of the present study is to gain a deeper understanding of the way in which factors such as the classroom environment, teachers, students, and students' attitude toward technology play a role in how students view technology in a College of Education, in the Kingdom of Lesotho. It is almost impossible to develop technological skills when factors related to students' attitudes toward technology are not identified as a mater of urgency, and feasible strategies and intervention programmes organised. Such strategies might help in addressing the problem and hopefully encourage students in adopting meaningful and positive attitudes toward technology. This is a view also expressed by Oosthuizen (1994) when she stressed the need for teachers to have an understanding of their students' knowledge and feelings about the subjects they teach

In the present study, the researcher explored the attitudes of teacher college students toward learning technology. Attitude in this study is defined as "negative or positive emotional relationship with or predisposition toward an object, an institution or person" (Le Roux 1994: 06). This definition explains the fact that attitude has to do with people's emotions and how this influences their behaviour. This suggests that attitudes determine individuals' experiences and reaction to life.

This chapter provides more information on the background to the study. Definitions of terms and concepts used will be explained as well as the motivation for the study. Finally, an overview of the research methodology to be used in the present study is explained.

1.2 Motivation for the study

Future leaders of Lesotho and any other country for that matter are those who are still at school today. They can either still be in high schools or at tertiary level. The information that they have learned as students and everything that they are learning now will to a large extent determine what kind of adults they will be in the future. This makes it important that the information or knowledge they gain (formal or informal) should help shape them into productive individuals in their country. To shape individuals to be productive future citizens, it is important to ensure that learning environments at school, teaching styles and the learning methods be the kind that promote and nurture understanding geared toward productive individuals. Furthermore, research (e.g., Crawley and Kobella, (1994); Chiappetta, & Russell, (1982) has indicated the importance of positive students' attitudes which form a basis for good understanding and therefore citizenry.

Other studies (Chambers 1981, Chambers & Pettman 1986) have investigated the importance of technological literacy on the development of positive attitude of students. They have shown that technological literacy is a critical factor in the formation of attitudes.

This study was aimed at examining different facets within the teaching and learning of technology in Lesotho. This is an area that has been researched however there are certain aspects that research has not attended yet. For example, Kurt (2002) and Boser (1998) have provided an overview of many aspects of attitudes toward technology including a review of instrumentation. It is still unclear how the school environment affects the development of students' attitudes toward technology. As a result of this, the researcher believes that it is important to investigate and identify factors that influence first year students' attitudes toward technology subject.

Motivation for the present study was therefore (a) to assess whether the perceptions of first year college students toward school played any role in their attitudes toward technology (b) to establish the extent to which the school influenced attitudes toward Technology. Findings from this investigation should provide a good understanding of what is taking place within the Lesotho classroom-learning environment, among teachers, and students with respect to attitudes toward technology.

The present study was structured to investigate, from the point of view of each student, the most important school-related determinants of liking or disliking technology. The particular value of the present study is that it should identify and categorise different perceptions and outcomes from different students. This should provide the education

department in general and teachers in particular, with important information that could help improve the quality of the teaching and learning of technology education in Lesotho. A further advantage for the teaching profession is that the results may serve as baseline information and a resource for the assessment of technology practice in Lesotho. Understanding in this context being "the thinking process by which one reasons from the facts to tentative conclusions regarding their meaning" (Sheafor, Horejsi, & Horejsi, 1997: 134).

1.3 Goal of the study

The main goal of the present study was to explore the attitudes of first year college students toward technology; also, to establish the factors that influence such attitudes and to determine whether gender difference affects students' attitude toward technology or not.

1.4 Research questions

Research generally is intended to help understand or find answers to problems that a researcher may be interested in. In the quest for solutions, the researcher's task is to ask pertinent questions whose aim is to address whatever could be bothering him/her. For the purposes of the present study, the following questions were asked:

- Do classroom learning environment, climate and students' learning style have any influence on technology Attitude?
- Are teacher's personality and behaviour an important school-related determinant of liking or disliking technology, from the point of view of each student?
- Is there statistically significant gender difference with respect to students' attitude toward technology?

1.5 Limitations of the study

The college of education where participants came from has a group of students who are in residence and another who are registered as distance students. A major limitation to this study is that the distance-learning students could not be investigated. This was because of distances that would need to be covered to reach the students. Also, Lesotho has extremely remote locations, which make travelling by car for example extremely difficult. Other limiting factors were outside the scope of this investigation, for example, students' environment outside of school such as family and cultural background. Perhaps, a more encompassing study that would have covered the parents, students, the socio-economic background and issues relating to students' culture would have provided a more meaningful picture. The present study's sample is also a limiting factor in itself in that findings emanating from this investigation can only be attributed to them and not the entire technology education students at the college of education. That notwithstanding, the results will be of value and they can be compared to other research studies (e.g., Haertel, Walberg & Haertel, 1981; Fraser, 1986) that have investigated issues relating to students' attitude and the school environment.

1.6 Overview of the research methods

1.6.1 Research Design

There are several examples of the use of case methodology in the literature. For example, Yin (1993) listed several examples along with appropriate research designs for each case. These include suggestions for a general approach to designing case studies, and recommendations for exploratory, explanatory, and descriptive case studies. The

present study utilised an explanatory case study in order to establish relationships among the variables.

1.6.2 The Research Objectives

The research objectives of this study were:

a. To conduct a literature search on issues pertinent to factors that influence college students' attitude toward technology
b. To develop a data collection instrument
c. To analyse and interpret the collected data
d. To reach conclusions and recommendations based on both the literature and the results of the study.

1.6.3 Data collection method

Students responded to a fusion of two instruments, the Classroom Learning Environment Survey (CLES) and Attitudes Toward Science Scale (ATSS). The former was developed to assess constructive learning environments (Taylor & Fraser, 1991). Although the later at first targeted middle school students, it was adapted for the purposes of the present study. Students were requested to indicate their responses on a five point Likert-type scale. Interviews involving five students were also conducted. A pilot investigation involving a five subjects from the target population was conducted. Students' responses on the pilot study were helpful in effecting changes to the original instrument before it was administered to the study sample.

1.7 Definition of concepts

For concepts to carry any meaning within a study, they need to be defined in a clear, non-ambiguous and agreed upon-way. Concepts can be defined either in a conceptual or operational manner. Here, this process is understood as a "process of defining a concept by a set of other concepts" (Bless and Higson-Smith 1995: 36). The process of defining concepts is essential because it allows for specific contexts to be described and explained in a manner that pertains to the study.

1.7.1 Attitude

Le Roux (1994: 06) defines attitude to be "a positive or negative emotional relationship with or predisposition toward an object, institution or person".

Pointing to yet another definition, Brecker and Wiggins (1991: 137), defined Attitude as "enduring non-verbal features of social and physical world, and they are acquired through experience and exert a directive influence on behaviour".

Both these definitions reveal that, an attitude can be understood as an emotion that has an influence on the behaviour of human beings. People's reactions and responses toward certain things largely depend on how they perceive them. If for example, someone believes that to have technology, as a subject in school is not necessary; they will therefore be more likely to be negative toward any implementation of a technology curriculum in the school.

Therefore, the researcher's operational definition of Attitude is a predisposition to respond to a particular object (technology as a subject) in a generally favourable or unfavourable way.

1.7.2 Factor

Factor is defined by Longmans dictionary of contemporary English as “any of the forces, conditions, influences that act with others to bring about a result”. It is also refered to as “Generally anything that has some causal influence, some effects on a phenomenon. It is therefore an antecedent condition, a cause of something”.

In this study, a factor is taken to mean any element, force, condition or circumstance that has a causal influence or can contribute to the attitude of students toward technology.

1.7.3 Technology

Technology is the technical means people use to improve their surroundings. 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. Johnson (1989:3) defines technology as “the application of knowledge, tools and skills to solve problems and extend human capacity. On the other hand, Larkin (1992:23) defines technology as a “… body of knowledge and actions about applying resources, developing, producing, using, assessing, and extending the human potential, controlling and modifying the environment”.

People use technology to improve their ability to do work. Through technology, people communicate better. Technology allows them to make more and better products. Our buildings are better through the use of technology. We travel in more comfort and speed as a result of technology. Yes, technology is everywhere and can make life better.

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 in the design of standard tools, machines, materials or the process. Thus standardization of design is an essential feature of technology.

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 (and our knowledge of what can be produced). Thus, we can see technological change when our technical knowledge increases.

In the present study technology is generically defined as the information and communication technology tool (the computer) and its applications that students learn about as a subject in their first year at the teacher college.

1.7.4 College

An institution of higher education created to educate and grant degrees or diploma; often a part of a university. It also refers to a complex of buildings in which a college is housed.

Others define it as a school sometimes, but not always a university, offering special instruction in professional or technical subjects. A school on the other hand is "… an institution or building at which children and young people usually under the age of 19

receive education" (Hanks 2002: 421). A building that is divided into classrooms where children are formally taught.

In this context, college refers to the college of education in the kingdom of Lesotho from which first year students participated in the present study.

1.7.5 Student or learner

A student is person who is actively enrolled in an accredited educational institution and who is expected to spend a minimum aggregate of given hours per week in a classroom or similar instructional setting during most of the term of enrolment. A person may remain classified as a student during official interruptions in his/her academic program, such as a semester break or a summer vacation, providing she/he intends to continue student participation in the academic schedule when it resumes.

A learner however is "a pupil or a student who is taught or trained by an educator" (South African Council for Educators 1998: 3).

A learner is someone usually under the age of 19 who is studying at a particular school. Both the learner and students also need to have formally registered with that school and be regarded as learners by the school's regulation, they also abide by the rules and laws of that school. In this study, since the researcher is dealing with an institution of higher learning, the retained definition is that of the student.

1.7.6 Teacher

A teacher is a person with multiple roles in the learning process. His role goes beyond the traditional roles of planning and assessing. He is ultimately responsible for what goes on in the classroom environment. He is expected to effectively balance the

educational needs of his students. The learning methods of students, both at individual and group levels, must be incorporated into the teachers' lessons.

A teacher is expected to change the classroom environment, making it fluid, keeping students engaged, interested and confidently inspired. With all of this a teachers must plan ahead to properly incorporate the learning skills, essential concepts, standards and expectations that students need to internalise.

Teachers need to know where their students are, in the learning process. This is done through informal, formal and authentic assessments. A teacher, at some level, must also be a role model to students and their peers. A teacher needs to have control of the entire learning process even if it appears that he has little control at all.

In an age of rising teaching standards it is essential that a teacher be flexible in his or her approach to learning, receptive to new concepts, and most importantly enthusiastic about learning. His positive attitude toward learning might have a positive impact on student Attitude toward education in general and in the subject in particular.

In this context a teacher is a person who provides students direct classroom teaching, or classroom-type teaching in a non-classroom setting, or educational services directly related to classroom teaching at the Lesotho College of education.

The concepts defined here are some of the key terms forming the basis and therefore addressed in the present study. The following section of this chapter gives a brief overview of the contents of the chapters of the present study.

1.8 Content of the chapters

Chapter 1 Introduction

This chapter focuses mainly on giving a brief background concerning the topic under study. It also gives definitions of the concepts used for the study.

Chapter 2 Literature Review

Chapter two of the study focuses on finding out what other researchers have already found under the topic of study. It therefore provides a theoretical framework on whose basis the present study is premised.

Chapter 3 Research Methodology

Stating the exact research methods followed in conducting a study is important. Therefore, this chapter focuses on the research methodology used in the present study. This included explaining the methods of data collection, sampling techniques, research design, data analysis and interpretation.

Chapter 4 Data Analysis

This chapter will outline the major findings of the present study with respect to the college of education. Also, the findings will be put into context in terms of related published research findings and theory.

Chapter 5 Conclusions and Recommendations

This chapter focuses on conclusions reached on the basis of the findings of the study. Also, recommendations based on these findings and on reviewed literature are offered.

1.9 Conclusion

In this chapter the main focus was on giving an orientation to the present study. This was done for the sole aim of putting the entire study into context and therefore provides a sense of what was done in this dissertation of limited scope. The end or the last chapter of the study should correlate with what has been written in this chapter. Some of the key contents of this chapter are the definitions of the concepts used, the goal and the objectives of the study and a brief explanation of what is in the contents of the following chapters.

Giving attention to aspects such as definitions of the concepts used in the study is important, because concepts are defined and understood differently by people, depending on the context that they are used. Therefore, clarifying the meaning of concepts is important as it prevents others understanding the concepts differently. The goal and objectives of the study were indicated in this chapter as well. The reason for doing this is because having a specific goal and objectives helps when one has to decide on the type of research process or approach to use. The next chapter of the study focuses on a literature review relating to what different authors have written about students' attitudes toward technology and the factors influencing this.

CHAPTER 2

THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1 Introduction

For more than 30 years the investigation of students' attitudes toward studying science and technology has been a substantive feature of the work of the science and technology education research community. Its current importance is accentuated by the growing evidence of a decline in the interest of young people in pursuing scientific and technological careers together with research indicating widespread scientific ignorance in the general public (Durant, Evans, & Thomas, 1989). Also, an increasing recognition of the importance and economic utility of scientific and technological knowledge and its cultural significance can be noticed today.

The falling numbers choosing to pursue the study of science and technology has become a matter of considerable societal concern and debate amongst researchers (Jenkins, 1994; Lepkowska, 1996). Consequently, the promotion of favourable attitudes toward science and technology and learning technology, is extremely critical and important. However, the concept of an attitude toward science and technology is rather ill-defined, often poorly expressed and not well understood. The present study therefore, offers a review of current knowledge about attitudes toward technology, what influences there are on their formation, and their impact on subject choice. Moreover, it seeks to determine some of the most important factors that influence first year college students' attitude toward technology at the Lesotho College of Education. The following literature review discusses the general overview of the studies on the development of attitudes

toward technology, and the subsequent problems related to attitudes. The discussion of probable factors influencing attitude as discussed by different researchers is also reviewed. These factors are associated with classroom environment, teacher's characteristics as well as student's characteristics. At the end, a summary and hypotheses emanating from the review are presented.

2.2 Overview of attitude development

2.2.1 Attitude definition

According to Anderson (1985) an attitude is a moderately intense emotion that prepares or predisposes an individual to respond consistently in a favourable or unfavourable 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 or a psychological construct comprised of cognitive, affective, and intention components. Attitudes are also defined as strongly held beliefs that reflect people's opinions and feelings and can be sometimes manifested in behaviour. Chambers and Pettman (1986) have shown that both feelings and information are critical factors in the formation of attitudes, and that these are critical components of understanding.

Baron and Byrne, (1994) contend that attitudes shape individuals' perceptions of the world and their social behaviour. Attitudes, behaviour and feelings are found by some researchers (e.g. Christa, 2001) to be linked such that people's attitudes determine their behaviour toward objects and people they meet and influence even the relationships that exist among these with themselves. Frankfort-Nachmias (1992:241) defines attitudes as:

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

Attitudes therefore have, according to Lord (1997:222) three elementary components:

(1) The cognitive component,

(2) The feeling or affective component and,

(3) The actions or behavioural component.

The three are interrelated; they are always present whenever a person holds an attitude.

A more noticeable issue in research into attitudes toward science 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 (e.g., Breakwell & Beardsell, 1992; Oliver & Simpson 1988; Crawley & Black 1992) have incorporated a range of components in their measures of attitudes to science. These include the perceptions of the science students and teachers; anxiety toward science; the value of science; self-esteem; motivation; enjoyment of science; attitudes of peers; attitudes of parents; the nature of the classroom environment; achievement in science; and Fear of failure.

2.2.2 Attitude manifestation

From the foregoing definitions, it appears that attitudes are not quantifiable. They are psychological constructs, and therefore they can only be detected by indirect methods. Attitudes manifest themselves in different ways. Their manifestations are linked to concepts such as perceptions, personality and perceptual selectivity. To show the

existence of a relationship between attitudes and beliefs or perceptions, Crawley and koballa (1994:37) stated:

> *Beliefs that an individual holds about the consequences of engaging in the specific behaviour within subject effect or personal norm, help the person form an attitude toward engaging in the behaviour.*

In an attempt to examine and understand the attitudes of first year college students toward technology, attitude manifestation will be discussed with reference to manifestation concepts, namely: perceptions, personality and perceptual selectivity.

2.2.2.1 Perception

Cognitive psychologists hold 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 percepts, and these percepts are provisional, in the same sense that scientific hypotheses are provisional. As we acquire new information, our percepts shift. Beliefs and perceptions are 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 point of view. It is the filter of any input based on our beliefs.

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. So, 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 will react differently even when they are from the same physical environment. They would not always have the same experiences, hence perceptions.

Attitudes therefore relate to the way we act or react. The way we perform our thinking (perceptions) is what results in our attitudes. Our actions therefore depend on our attitudes.

2.2.2.2 Personality

Personality refers to the characteristic behaviour patterns, emotions, thoughts and attitudes with which individuals consistently react to, in their environment (Morris, 1973). Some characteristics can be so grounded in an individual that they form an individual's personality. For example, a technologically inclined student is expected to demonstrate characteristics such as apprehensiveness, creativity and determination. A study in the UK showed that highly successful students, studying design, were more apprehensive, more experimenting, and more tense than the unsuccessful group who were self-assured and relaxed (Tyers, 1992). In fact, students in particular, display tendencies to engage in various behaviours. These tendencies are what are regarded as personality traits. For example, the tendency to engage in social behaviours is a personality characteristic that is relevant to learning situations. These behaviours (social) are those that are likely to contribute to the well being of others. Technology students are often industrious and cooperative. They generally help their peers and refrain from negative disciplinary actions. Regarding this, Breakwell and Beardsell (1992) have also reported on the importance of the classroom environment as an important factor on students' tendencies to engage in social or antisocial activities. Hence, students are more likely to display unselfish and good social personality traits if their teachers instil these in their classrooms.

2.2.2.3 Perceptual selectivity

The ability to filter sensory experience is called perceptual selectivity. Perceptual selectivity is influenced by both external and internal factors. External factors relate to stimuli and contexts in which people find themselves interacting while internal factors relate to for example, learning, personality and motivation. It involves active engagement with the environment "such that the perceiver constructs it in the most appropriately informative manner" (Oakes, Haslam, & Turner, 1994: 114)

Sometimes, out of necessity perceptual selectivity takes over and individuals see only what they expect and want to see. In a sense the individual pays attention only to a small part of the sensory stimuli and therefore remains uninformed of those things he doesn't expect. To influence technology students' attitudes toward technology, their perceptual selectivity should be manifested. The Perceptual selectivity of technology students can therefore be increased by advocating technology, which means there should be follow-ups, feedback and reports on the situation in schools by the media and other influential sources.

2.2.3 Attitudes towards science and the literature

For some decades now, poor Science and Technology results have been associated more with the cognitive than with the affective domain. A number of research studies (e.g., Simpson & Olivier, 1990; Javanovic & King, 1989) conducted on students' poor performance in Science and Technology, reveals that poor performance in science and technology is not attributable to inherent characteristics of student populations.

Meanwhile, other researches (e. g., Raat & de Vries, 1985; Ornmerod & Duckworth, 1975; de Klerk, 1989: Yager & Penick, 1984) investigating students' perceptions and attitude about Science and Technology, have reported the problem to be a dissatisfying interest in these learning areas among students. What these researchers revealed is the fact that participation in science and technology and achievement factors were influenced by non-cognitive factors. It became necessary therefore to investigate these factors in order to explain why students do or do not enrol in Science and technology courses. Also, to determine why those who eventually register, never obtain good results. Interest in this area of research has resulted in studies that have investigated students' attitudes towards science and technology. As a result, a number of scales were developed to measure the attitudes.

In another sense however, as Taylor (1985) has pointed out:

> *Despite the recognition that Attitude toward science are a significant outcome of science teaching and relevant variable in students' cognitive learning of science, little has been made toward specifying and determining the conditions that affect their dynamics and influence their development.*

This argument was one of the 'driving forces' and motivating factors for the researcher of the present study to investigate students' attitudes toward technology. The difference here was to establish the relationship of the students' attitudes with the school environment, and their teachers. The aim of undertaking such an investigation, the researcher hoped, would be useful for teachers of technology in Lesotho. This is a point also stressed by de Klerk (1989) who has indicated that the effective teaching of technology requires teachers who have a good understanding of students' knowledge of and attitudes toward technology.

2.2.4 Technology and the school

In developing countries, sophisticated Information and Communication Technology (ICT) is on the edge of restructuring the objectives, content, and processes of schooling. This forms part of the broad changes that countries like Lesotho and South Africa are currently undergoing. These changes affect all forms of societal institutions including schools. Given that one of education's goals is to prepare students for more responsibility in their future work places, schools then have the responsibility of changing their policies, practices, and curricula to meet current needs (Tucker & Codding, 1998). When that is taken care of, the challenge of rendering students ready for a better future will be adequately addressed.

In Lesotho as in other parts of the world, pressure from economic, social and the educational sector has placed demands on the use of technology in everyday activities. Related to this, it has been argued that one of the most important ways in which the teaching of science and technology can be improved in South Africa and Lesotho is by "introducing more real life skills into science, such as technical, trade, industrial, commercial, manufacturing, marketing and technological skills" (Moru & Rochford, 1999:145-156). The importance of technology in the curriculum of primary secondary and further education colleges has been strongly advocated by various researchers (e.g., Jenkins, 1994; Johnson, 1989). This has happened even though in most of the developing countries, adequately qualified teachers of technology are still very scarce. Introducing technology in the school curriculum is extremely important because as Dede (2000) outlines:

- Centring the curriculum on ‘authentic’ problems parallel to those adults face in real world settings;
- Involving students in actual communities-of-practice, using advanced tools similar to those in today’s high-tech workplaces;
- Facilitating guided, reflective inquiry through extended projects that inculcate sophisticated concepts and skills and generate complex products;
- Utilising modelling and visualisation as powerful means of bridging between experience and abstraction;
- Enhancing students’ collaborative construction of meaning via different perspectives on shared experiences;
- Including pupils as partners in developing learning experiences and generating knowledge;
- Fostering success for all students through special measures to aid the disabled and the disenfranchised

Realising these capabilities requires a multifaceted implementation process that includes sustained, large-scale, simultaneous innovations in curriculum; pedagogy; assessment; professional development; administration; and organisational structures.

2.3 The classroom learning environment

Generally, Classroom learning environment refers to a space or a place where learners/students and teachers interact with each other and use a variety of tools and information resources in pursuit of learning (Wilson, 1996). The nature of the classroom environment and social interactions can make a difference in how students learn and achieve their goals. It has been shown that learning outcomes and students’ attitudes

toward learning were closely linked to the classroom environment (Entwistle and entwistle 1991, 2003). Other studies (Fraser & Rentoul, 1980; Fraser & Fisher, 1983) were conducted to determine the level of importance of classroom environment in the teaching and learning process. They suggested that achievement is improved by working in a preferred classroom environment. They also argued that since an environment has physical, social and psychological dimensions how people relate to each other is the first stage to improving it.

Researchers (e.g., Eklund 1995; Entwistle, 1992) have also reported that the classroom plays an important role in students' cognitive and affective development.

Others on the other hand, have argued that human behaviour is determined by the complex interaction of an individual and his/her environment. Lewin (1936) (quoted by Back and Choi, 2002:1) for example, introduced the formula B=f(P,E) where Human behaviour (B) is a result of two interdependent influences, the person (P) and the environment (E). Moos (1979) quoted by (Back & Choi, 2002) noted that just as it was possible to characterize an individual's personality, environments could also be characterized in terms of personalities. He argued that social environments, like persons, could have qualities such as warmth and supportiveness or rigidity and restriction. A number of instruments for studying classroom environments have been developed over the years. An example of the most frequently used, in primary school environments, is "The Learning Environment Inventory", which became known as the My Class Inventory (Fisher & Fraser, 1981:145-156). Classroom environment in secondary schools have been measured with the modified version of the selfsame instrument (Fraser, Anderson, & Walberg, 1981), or the Classroom Environment Scale (Moos &

Trickett, 1986:93-102). Fraser & Treagust developed the College and University Classroom Environment Inventory to assess the learning environment at higher education level (colleges and universities). The questionnaires for all variety of schools and classroom contexts, have brought about a range of literature on the conceptualisation, evaluation and investigation of student and teacher perceptions on various aspects of the classroom environment (Fraser, 1998; Fraser & Walberg, 1991). Studies of classroom environments have demonstrated that perceived classroom environment can help predict student learning. For example, Haertel, Walberg and Haertel (1981) found that student achievement improved in those classes, which students felt had greater cohesiveness, satisfaction and goal direction and less disorganisation and friction. The increased use of computers in classrooms has led to yet other studies to evaluate the effectiveness of computer-assisted learning (Maor & Fraser, 1996; Teh & Fraser, 1996) and to investigate the association between, computer experience and perceived environment. The present investigation extends the study of computers and learning environments into tertiary education.

2.3.1 The technology classroom and student outcomes

Haertel, Walberg and Haertel (1981) revealed perceptions of the classroom environment as a critical factor in determining student outcomes such as motivation, achievement and satisfaction. In effect they reported a strong relationship between student cognitive and learning outcomes and students' perceptions of the psychosocial characteristics of their classrooms. The authors concluded that increase in cognitive and affective learning outcomes were consistently associated with the classrooms. Furthermore, the most productive environment for learning that affects attitude is one where students feel they

can trust their lecturers and fellow students with their honest opinions. Students' learning is inhibited if they are made to feel guilty. Thus a careful consideration of the ground rules for creating a safe learning environment is needed. Savdie (1995) has suggested a set of rules to help establish trust and these are:

- Speak/write from your own experience: use "I" statements.
- Respect other peoples' sharing: these are confidential, seeing them as gifts.
- Diverse perspectives are good. There are no experts on these matters.
- Questions are good. Aim them at the lecturer, other students, other participants, or at yourself.
- Look out for triggers; these are words or body language that cause an emotion reaction. Acknowledge them when they occur. For example, you can say: I am offended by the use of the words YOU PEOPLE.
- Expect discomfort. Experience the discomfort, and learn from it. Moments of unease are also moments of great learning. Take risks.
- Be aware that others will probably be experiencing feelings similar to yours.
- Be prepared to have your views challenged, and feel free to challenge the views of others.
- Open yourself also to discovering where your own beliefs come from.

On the other hand, Yager and Penick (1984) reported that teachers were viewed by learners as prescriptive; they were the ones choosing topics for students and as a result, very few among students perceived that they had anything to bring in determining the content and the way they were to be taught science. In fact, learners did not have a say in determining the order of science topics covered. Lately, an extensive array of research

(e.g. Bowman, Hodges, Allison, & Wineman, 1999) has been conducted on classroom environment to predict a variety of student affective and cognitive outcomes based on students' perception of classroom learning environments. Clearly, if changes are to occur, attention must be focused on the students' own views and perceptions of the learning environment and its effects on technology attitude; which is an environmental issue.

2.3.2 Atmosphere in a classroom environment

Nowadays, more and more resources and attention are being put on education. The government of Lesotho and society in general are concerned about the quality of education. To encourage a better learning atmosphere (friendliness, satisfaction and supportiveness) in a classroom, some researchers have advocated for rearrangement of sitting in a classroom. Students may be arranged to sit in groups instead of in rows. This will help in encouraging students' interaction with one another. In turn, students may have group discussions much easier. By sitting in groups, then "… the atmosphere in the classroom can be less tense" (Cohen, 1988:1). Moreover, this allows for better communication and interactive skills, which are useful for learners. When such an atmosphere is created, learners can express their own ideas, and learn to brainstorm these with others. Hewson (1996) argues that the climate in a classroom where teaching for conceptual change occurs has several significant features; the teacher is responsible to create the climate. At the same time, he argued that students must respect the ideas of others and listen carefully to them even though they might not agree with them.

For an effective atmosphere in a technology classroom, it is important that students be allowed to express their disagreement and ask for clarification from their peers and their

teachers. To stimulate enjoyment, Telem (1995) argues that schools should utilize Information Technology. In doing this, teachers should to a greater extent in preparing teaching materials utilize videos, animations, graphs, pictures or movies to stimulate students and making sure they pay attention. Such activities also have the advantage of enabling students better understand and have deeper and lasting impressions of what was done in the classroom. The activities also have an inherent entertainment and enjoyment value.

2.4 The teacher

There is no doubt that teachers play a major role in what happens in their classrooms. Teachers provide a leadership or guiding role in the teaching and learning context and therefore are extremely influential. For example, teachers are responsible for the environment and atmosphere that pertains in their classrooms. They in a sense determine the ethos of the classroom and set the standards as to how this is to be accomplished.

2.4.1 Teachers' personality

A number of studies have indicated that the personality and behaviour of the teacher is very important in the formation of students' attitudes (Fontana, 1988; Moore, 1993) The interaction between teachers and students involves a broad range of matters that deal with personalities and methods of instruction. It is a routine to say that everyone is different. However, many beginning teachers discover, often to their disappointment, that there are some students who always seem to have problems. Their overall grades for example, may indicate that they are good students, yet in a particular course they don't seem to do well. In such a case teachers may easily forget about issues relating to students' attitudes and see the problem as merely a situation of poor performance or lack

of motivation on the part of the student. What the teachers may not realize is that the problem may be as a result of differences in personality

Another important aspect very often neglected relates to teacher attitudes. It is important that teachers' attitudes are always positive because when these are, they are implicitly transferred to their students. Such attitudes are useful to students and may for example, help bring interest, enjoyment and fun in teachers' classrooms. No two people have the same gifts, talents, abilities, interests, or emotional makeup. One of the keys to building a good self-image is to allow each student to develop his or her gifts to the fullest, giving each person the same attention and care and yet at the same time bringing out their unique talents. Therefore, depending on the teacher's personality and her awareness of students' differences, students' success may hinge on that.

2.4.2 The teachers' role in supporting learning

A role is essentially a set of expectations imposed on a person by others; in this case it could be parents, society, students or school curriculum. His/her role is also described as "subject specialist, classroom director, as employee and curriculum implementer". In other words, a teacher needs to be in the role of coach, acting as a mentor, assistant and collaborator who, with a blend of empathy, compassion and fun, guides and instructs. The role of a teacher is assumed to be the essential link in the relationship between the teacher's functions and his/her behaviour and attitude. The functions of a teacher include diagnosing, mediating, and facilitating in the classroom. This means that the teacher has to diagnose students' prior knowledge before bringing in new knowledge. As a Facilitator, the teacher has to structure learning in such a way that good learning experiences are brought to the fore. This is done by organizing activities that help

students to actively participate in their own learning. As a mediator, the teacher should help in narrowing the gap between students' views about and real scientific or technological knowledge.

Researchers working on how technology will affect primary, secondary schools, and colleges, argue that there will be enormous changes taking place (Symonds, 2000). The author asserts that the high school will be "High Tech High" in 2018. Furthermore, Bennett (2002) addresses the actual changes that must take place for technology usage to make a difference in curriculum design and start the alteration to High School. Bennett suggests that students would work together collaboratively with teachers and technology. Teachers would be expected to accept changes in their interactions with students and support students as their roles change too. The role of teachers therefore will be that of facilitating and mentoring.

2.4.3 Teaching and learning methods

The emphasis on the teacher involves not only an emphasis on the personal traits of the individual, but also considers the philosophy of education and other matters involving educational psychology and learning principles. The purpose of dealing with different teaching techniques is to acquaint the students with the variety of tools available to them for solving problems related to instruction. The teachers generally set short and long term goals of what is to be achieved in their classrooms. These goals include both cognitive and affective objectives. Furthermore, with new technology and the ever-changing working environment, a teacher will have to deal with the abundant variety of teaching methods and techniques that technology provides.

A challenge facing technology teachers involves providing instruction that would help students become efficient users of technology and hopefully aspire to be scientists or and technologists. To accomplish the instruction that would help students is important for teachers to be enthusiastic and use more indirect teaching methods (Anderson, 1991). Research has corroborated this, for example, it was found that ninth grade pupils' interest in technology increased with teachers who were warm and utilized students' intrinsic motivation (Reed, 1968). On the other hand, Fennema and Sherman (1995) found that students of teachers who were well organized, achievement-oriented, and enthusiastic tended to have more positive attitudes. Gibbs (1995) has emphasized the importance of students' involvement and student-centred learning through purposeful activity and intrinsic motivation. He further offers a good summary of this term "student centred" as meaning courses where the emphasis is on (p. 1):

> *Learner activity rather than passivity, and what the student does in order to learn rather than on what the lecturer does in order to teach; students' experience on the course, outside the institution and prior to the course, rather than on knowledge alone ; process and competence, on how students do things, rather than just on content and what they know and, most importantly, where the key decisions about learning are made by the student, or by the student through negotiation with the teacher, rather than solely by the teacher"*.

Teaching by using technology as a problem-solving tool should have a positive influence on students' attitudes. Below is an illustration of some advantages of good teaching practices involving teacher – centred as against student – centred activities and how these impact on student learning.

	Teacher-Centred	**Student-Centred**
i.	Discipline-specific verbal information.	Interdisciplinary information and knowledge.
ii.	Lower order-thinking skills, e.g.,	Higher order thinking skills, e.g., problem-

	recall, identify, and define	solving
iii.	Memorisation of abstract and isolated facts, figures and formulas	Information processing skills, e.g., access, organise, interpret, communicate information

2.5 Student related factors

Numerous studies in the area of Science and Technology (e.g., Anderson, 1991; Wood, 1995) have attributed students' attitudes and perceptions as important explanatory factors to the level of their performance. Research has been conducted to determine how factors pertaining to the student influence attitudes toward science and technology.

A causal relationship has been reported between pupils' exposure to science and technology, the choice of technology, future specialization, perceptions of science and scientists, gender, achievement and attitudes toward science and technology (Perrodin, 1966; Gogolin & Swartz, 1992; Yager & Penick, 1984). Some of these aspects and their relationship with technology have been discussed earlier in the present study. The section on student related factors is grounded in the theoretical perspectives of students' learning styles, self-confidence, gender and enjoyment.

2.5.1 Students' learning styles and motivation

Learning methods affect how effectively students process information, as each student learns differently. With respect to learning styles, it has been reported that (using information acquired to correct misconceptions) students who engaged in meaningful learning performed considerably better and had more positive attitudes than those who were rote learners. This is an important finding because it suggests that teachers need to

help students learn in a manner that would enhance their life-long learning skills. Students are not all alike. Each one sees the world in a way that makes the most sense to him/her. Such individualised perceptions shape what students think, how they make decisions, and how they define what is important. The perceptions also determine students' natural learning strengths, or learning styles. It is vital therefore for teachers to deliberately use a variety of methods to reach individuals.

2.5.2 Student self-confidence

Teaching students a number of "learning-to-learn" skills that help students teach themselves can enhance their self-confidence. Also they can be presented with a wide range of "life skills" that can help them think, communicate, and solve problems better. When students master these skills, they report a rise in self-confidence. An honest relationship among students, and between students and teachers, is critical to get the most out of any learning experience. Studies of the learning process demonstrate that without rapport in the classroom, students never experience respect and trust; however, in an environment with plenty of respect and trust, students develop self-confidence in significant levels.

2.5.3 Gender role

Despite the increasing emphasis on gender equality in our society, students are still conforming to many traditional gender stereotypes. For example, researchers (e.g., Abeles & Porter, 1978; Delzell & Leppla, 1992) have demonstrated that North American children associate gender with technology instruments and that these stereotypes influence their instrument preferences. A number of studies (e.g., Abeles & Porter, 1978; Delzell & Leppla, 1992) have reported that adults view some music-

technology instruments as being more feminine (e.g., flute, violin, clarinet, 'cello), and others as being more masculine (saxophone, trumpet, trombone, drum). It has also been noted that young children reproduce these adult stereotypes in their attitude towards technology. Thus girls tend to prefer feminine-related technologies while boys select those that are masculine-related.

Because these stereotypes limit children's opportunities to learn certain instruments, some researchers have attempted to change children's gender-typed preferences by exposing them to positive role models (e.g., Abeles & Porter, 1978). However, Browne and Ross (1991:38) indicated that children as young as three are very conscious of what they use and have a clear idea in their minds about which activities are for boys and which are for girls. The children were asked to sort toys into gender categories, that being which toys were for boys, for girls, and for boys and girls. The result was that the construction toys were classified as boys' toys, and toys such as dolls, felt pens and paper were girls' toys. They found that when they talked to the children about the toys the children responses clearly indicated that they understood gender to be a way of organising people and society. Because the proportion of students in natural, computer, and technological sciences has sunk dramatically in Lesotho, there are now various educational programs to increase the attractiveness of these subject areas.

Other factors associated with the erosion of women in technology are found to be related to the higher education climate.(Bunderson & Christensen, 1995). They include the lack of female role models and the inability of women to be taken seriously as students. Another study by Durndell & Thomson, (1997:1-9) targeting 16-18 year olds in 1995 and comparing to similar groups in 1992, 1989, and 1986, assessed the use of

computers, knowledge about Information Technology and reasons for not studying computing. The study reported that the use of computers in school had risen to a non-gender differentiated high level. However, it reported that domestic use of computers is still highly gender-related, with males holding a higher level of reported use of computers.

In the educational research literature, various factors associated with gender differences have been explored. Students at all levels perceive technology as a male domain with beliefs more pronounced in the adolescent years. Newman, Cooper, and Ruble (1995: 33, 325-351) found that girls were less likely than boys to "claim computers for their own group" (p. 338). Klein (1992:47-56) reported a tendency by females to be unsure of their own abilities to use technology but believed that women were as capab1e as men in their use of computers. Other researchers have also reported experience as contributing to negative attitudes that persist over time (Weil & Rosen, 1995; Gilliland, 1990). They found that boys had significantly more computer exposure at both home and school than girls. This resulted in boys being more likely to participate in technology-related activities. Fennema and Peterson (1985) also indicated that males had more opportunities than females even to pursue technological studies. Conditions outside the classroom gave males greater practice, while in-school experiences also enhanced their chances for independent action. In-school experiences included the nature of contact between the teacher and students, particularly teacher expectations about different groups of students. In addition, other studies have examined gender differences in confidence, computer experience, and perceptions of computers and reported these as male domains. More relevant to the present study, the researcher would therefore expect

to see males with higher confidence levels and with more technological experience than females.

2.5.4 Student enjoyment

Many College practitioners agree that science and technology is important and has a variety of purposes linked both to student aspiration, but also contributing to the all round education of a young person; this would equip them with the evaluative skills and knowledge to make informed decisions in a fast moving, technological world; and to promote responsible and informed citizenship. If science and technology syllabuses are divided into sections, focussing on key modern applied sciences, it will interest, inspire and motivate students to the relevance of science to modern life and the career opportunities available. Practitioners agree on good practice in the teaching of science and technology, this should include a variety of teaching and learning methods, including experimentation and discovery. Findings from the study by Butcher (1969) revealed that apart from pupils' ability and personality, career goals were found to account for much of the variance in pupils' Attitude and their choice of science. Enjoyment of such subject might come from the expectation of a better career in technology.

2.6 Summary

The theoretical framework presented here was aimed at connecting research findings and theory about attitudes toward technology with the investigation carried out in the present study. Research findings and literature indicated the fact that classroom environment, teachers’ and students’ characteristics were related to students’ attitudes toward science and technology. In the present study the aim was to establish whether

such findings would be applicable among teacher college students in Lesotho. In the next chapter research methods followed in collecting, analyzing and presenting the findings are presented.

CHAPTER 3

RESEARCH METHODS

3.1 Introduction

This chapter gives an indication of what was done to achieve the goals of the present study. The purpose was to examine the perceptions of first Year College of education students on factors influencing their attitudes toward technology. In this regard, the chapter (a) describes the research design (b) provides a brief overview of differences between qualitative and quantitative research methods (c) contextualises the statement of the problem and the hypotheses investigated (d) describes sample selection and (e) explains the instruments and how data was analysed.

3.2 Methods

3.2.1 Research design

Research design is the "… specification of the most adequate operations to be performed in order to test a hypothesis under given conditions" (Bless & Higson-Smith, 1995:63). The research design therefore enables the researcher to anticipate what the appropriate research decisions should be so as to maximise the validity of results. It is critical that the choice of research design be appropriate to the subject under investigation (Patton, 1987). In the present study the design was such that quantitative research methods were utilised to test the hypotheses advanced here. A correlational analysis, including a regression analysis was utilised to test for relationships among the study variables, while analysis of variance was used to compare groups. Perhaps it is

appropriate to provide a brief description that will outline the distinction between qualitative and quantitative approaches to research.

3.2.2 Qualitative approaches

Qualitative approaches to research are based on a "world view" which is holistic and has the following beliefs:

- There is no single reality
- Reality based upon perceptions that are different for each person change
- Reality based upon perceptions that are different for each person change over time
- What we know has meaning only within given situation or context

According to Burns & Grove (1993) the reasoning process used in qualitative research involves perceptually putting pieces together to make wholes. From this process meaning is produced. However, because perception varies with the individual, many different meanings are possible. In fact, the character of qualitative research is such that a researcher aims at discovering what events mean for individuals and what interpretations the researcher derives from such events.

3.2.3 Quantitative approaches

Quantitative approaches to research are concerned with numbers and quantifying available data. The quantified data are used to test hypotheses and identify the strength of patterns observed. Statistical techniques such as Pearson correlation coefficients, regression analysis, the chi-square and many more, are used to provide answers on different questions that a researcher may be seeking solutions to. For example, Pearson

correlation coefficients are computed to establish whether a relationship exists between two or more variables. It should be added here that establishing such a relationship for example does not indicate causality.

3.3 Problem statement

The literature has suggested that the development of positive attitudes among students is a significant outcome of education. Koballa (1992) stated that inculcating positive attitudes and assisting students' growth is an important part of science (Technology) education. On the other hand, the development of the cognitive and psychomotor skills are equally important and may in a number of ways interact with the affective component to mutually influence students' performance. The aim of the present study therefore was to establish whether teachers' and students' characteristics as well as the classroom environment were related to students' attitudes toward technology, at a Lesotho College of Education. In determining this, the objectives were to find answers to the following questions:

1) determine the relationship between students' attitudes toward technology and factors related to the teachers, the classroom environment and students
2) establish which of the factors had an influential role on students' attitudes toward technology
3) find out whether gender differences with respect to attitudes and its relationship with the other variables, existed

3.4 Hypotheses

In order to statistically determine what the situation was with respect to the questions asked in the present study, the following hypotheses were advanced:

a) *There is a statistically significant relationship between students' attitudes toward technology and factors related to Classroom environment*
b) *There is a statistically significant relationship between students' attitudes toward technology and factors related to teacher characteristics*
c) *There is a statistically significant relationship between students' attitudes toward technology and factors related to student characteristics*
d) *There is no statistically significant gender difference with respect to attitudes toward technology and teachers' characteristics, students' characteristics and the classroom environment.*

3.5 Sample

According to Bless and Higson-Smith (1995), sampling is "… a technical device to rationalise the collection of information, to choose in an appropriate way the restricted set of objects, persons and events" (p. 85). For the purposes of the present study, first year students from three programmes were identified as potential members of the study sample. The students were those registered for studies leading to a Diploma in primary education, a Diploma in secondary education and a Diploma in technology education.

A stratified random sample of the students was selected for this study. This sampling technique was used to ensure that every possible characteristic of the students was accounted for. In doing this, (i) equitable gender representativity in each of the programmes was ensured; (ii) selection was also such that representative numbers of students who were high-, medium- and low- performers in tests were included. Using these criteria, the resulting selected sample comprised 200 students.

3.6 Instrumentation

For the purpose of this study, students responded to a combination of two self-report instruments, the Classroom Learning Environment Survey (CLES) and Attitudes Toward Science Scale (ATSS). The CLES was developed to assess constructive learning environments (Taylor & Fraser, 1991). Although the ATSS was originally targeted at middle school students (Misiti, Shrigley, &Hanson, 1991) it was adapted for the purposes of the present study, this was similarly done on the CLES. Students indicated their responses on a five point Likert-type scale, anchored by 1 = Almost Always and 5 = Almost Never (see Appendix A). In modifying the two scales, an example was substituting the word *science* with *technology* for the reason that a great deal of modern technology is science-driven: fundamental scientific breakthroughs often suggest new techniques for getting things done. Examples include laser, magnetic engineering: all are consequences of curiosity-driven scientific research.

All because science and technology work best when they feed each other; for this reason, the researcher substituted the term “Science” with “technology”. The CLES has been reported to comprise three subscales, namely, the Classroom environment, Students’ characteristics, Teachers’ characteristics and attitude toward technology. Each of these had positive and negative items and this was considered in scoring, before data analysis. Table 3.1 shows a typical questions relating to each subscale of the CLES as well as an example from the ATSS.

The qualitative phase involved interviews (see Appendix B) in which five students participated. Interviews were conducted in students’ lecture rooms. This was intended to allow them to feel free in a familiar environment rather than, say, the researcher’s office,

which could be intimidating. Procedures were clearly explained to all the interviewees and they were allowed to ask any questions that may have concerned them. Based on the questions, the researcher assured students that any information provided would only be used for research purposes and that such information would not impact on their studies.

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

Scale	Description	Sample Item
Teacher characteristics	The extent to which teacher's characteristics influence students' attitude	The Teacher uses different methods to help every one in class.
Student Characteristics	The extent to which students' characteristics influence students' attitude	Other students pay attention to my ideas
Classroom environment	The extent to which Classroom environment characteristics influence students' attitude	The activities make me interested in Technology
Attitude toward Technology	The extent to which teacher enjoys technology lessons	I enjoy my technology class

3.7 Reliability and validity

Reliability and validity are important aspects that a researcher should address if the results and conclusions of a particular study are to be of any significance. Reliability relates to the extent to which an instrument provides similar results every time it is administered to the same sample at different times. Validity is the strength of conclusions, inferences or propositions. Cook and Campbell (1979) define validity as the "… best available approximation to the truth or falsity of a given inference, proposition or conclusion" (p. 12).

3.7.1 Reliability of the instrument

Research literature lists four forms of reliability; Test-retest, Alternate-form, Split-half and Coefficient of Consistency. In the present study internal consistency reliability was established by computing Cronbach's (1951) alpha. This measure of reliability was consistent with that used by the developers of the questionnaire used in the present study.

3.7.2 Validity of the instrument

Literature shows that the validity of an instrument may be shown through, (i) *Content validity* (ii) *Criterion-Related* and (iii) *Construct validity*. Content validity was accepted *a priori* in the present study because it was adequately reported in its development (Nunnally, 1978). In that study, the authors indicated that Content validity refers to the degree that the instrument covers the content that it is supposed to measure. It also refers to the adequacy of the sampling of the content that should be measured. Therefore, content validity measures the comprehensiveness and represenativeness of the content of a scale.

3.8 Data analysis

As the aim was to establish whether a relationship existed between students' attitudes towards technology with respect to teacher characteristics, student characteristics as well as the classroom environment, correlational analyses were conducted. Correlational studies are those in which an attempt is made to relate two or more variables to each other. In this study, it was understood that establishing relationships between for example, students' attitudes towards technology and the classroom environment did not in any way signify causality of the association. This argument is based on the caution by researchers (e.g. Runyon, Haber, Pittenger & Coleman, 1996) that "… a correlation between variables does not allow us to claim that the values of one variable cause

changes in the values of another variable" (p. 18). Simple linear regression analysis was computed in order to determine which variables predicted students' attitudes towards technology. In this analytical technique, a single variable depends on or is influenced by one or more other variables (Milton, 1992). The present study also investigated whether statistically significant gender differences could be established. In exploring this, one-way analysis of variance (ANOVA) was computed. ANOVA is a technique that permits the researcher to analyse several variables or levels of a variable at once (Runyon, *et. al*., 1996).

3.9 Summary

This chapter presented the research methods followed in the present study. In this respect, the research design including the context in which research is undertaken in terms of qualitative and quantitative methods was explained. The problem statement together with the advanced hypotheses of the present study was presented. The sample together with issues relating to the instrument (e.g. reliability and validity) used in the study were defined. Finally, the methods of data analysis were outlined. The next chapter outlines the analyses of data, presents the findings and aligns these with the hypotheses presented here.

CHAPTER 4

DATA ANALYSIS

4.1 Framework for the analysis

This chapter presents the analysis of data and the findings emanating from the analysis. The purpose of data analysis is to reduce data into an intelligible and interpretable form so that the relations of research problems can be studied tested, and conclusions drawn (De Vos, 1998).The present study was conducted at the Lesotho College of Education in Maseru/ Kingdom of Lesotho. This is the only college of education in the country and has students registered for three different programmes. The programmes are Diploma in Primary Education (DPE), Diploma in secondary Education and (DSE) and Diploma in technology Education (DEPTEC). Random sampling was used to draw a sample from the population of first year students registered in all the programmes.

4.1.1 Sample

Participants in this empirical investigation to determine factors that influence students' attitude toward technology at the Lesotho College of Education were 200. They comprised, 116 (58%) DPE, 72 (36%) DSE and 12 (6%) DEPTEC students. There were 105 (53%) females and 95 (47%) males whose ages ranged between 21 and 35 years (M = 28, SD = 24)

4.2 Results

4.2.1 Instrument Reliability

Researchers, (e.g., Gable, 1986) have recommended that for an instrument to be considered to be internally consistent, scores obtained from its administration should at least have an alpha value of .70. The internal consistency reliability of scores from the present study's scale was found to be .82. Table 4.1 shows the alpha values of scores for the four subscales of the Classroom Learning Environment Survey (CLES) and Attitudes Toward Science Scale (ATSS). These values were comparable to those reported in literature (e.g., Fraser 1989) who reported alpha coefficients of .58 - .81. Also, these values were similar to those of the Test of Science-Related Attitudes (TOSRA), whose range was .61 - .91 (Jegede & Fraser, 1989).

Table 4.1 Coefficient alpha scores of the subscales of the CLES and ATSS scales

Subscale	**α**
Teacher characteristics	.74
Student Characteristics	.74
Classroom environment	.65
Attitude toward technology	.76

4.2.2 Correlational analyses

The initial analysis involved establishing relationships between attitudes towards technology and teacher characteristics, student characteristics as well as the classroom environment. Table 4.2 shows the relationships among these variables. It may be observed from the table that all the variables were moderately positively related with

attitudes to technology ($p < .01$). This suggests that in situations where teacher characteristics, student characteristics and the classroom environment were perceived to be good then students had positive attitudes toward technology.

Table 4.2 Correlations between attitudes towards technology with teacher characteristics, student characteristics and the classroom environment (N = 200)

Variable	**r**
Teacher characteristics	0,41*
Student Characteristics	0,36*
Classroom environment	0,32*

* $p < .01$

In order to have a better sense of the relationships established here, the factors defining the variables were then checked for their relationships with attitudes towards technology. In doing this, (a) teacher characteristics, defined by methods of teaching, teacher effectiveness and teacher support were correlated with attitudes towards technology. Similarly this was also carried out for (b) student characteristics, defined by student self-confidence, learning styles and student enjoyment (c) classroom environment, defined by satisfaction, friendship and support. Table 4.3 shows the relationship between attitudes towards technology and the factors defining teacher characteristics. The table indicates that attitudes towards technology were positively correlated with these factors although the relationship was weak.

Table 4.3 Correlations between attitudes towards technology with the factors defining teacher characteristics (N = 200)

Variable	r
Method	0.14*
Effectiveness	0.11*
Support	0.11*

* $p < .05$

Table 4.4 shows the relationship between attitudes towards technology and the factors defining student characteristics. Here, attitudes towards technology were found to be positively correlated with these factors although the relationship was weak. This suggests that students following good learning styles have self confidence and who enjoy technology lectures, are likely to have good attitudes toward the subject compared with those who lack these defining factors.

Table 4.4 Correlations between attitudes towards technology with the factors defining student characteristics (N = 200)

Variable	r
Self Confidence	0.11*
Learning style	0.14*
Enjoyment	0.14*

* $p < .05$

Table 4.5 Correlations between attitudes towards technology with the factors defining the classroom environment (N = 200)

Variable	r
Satisfaction	0.17*
Friendship	0.11*
Support	0.18*

* $p < .05$

Classroom environment is a function of how satisfactory, friendly, and supportive the students perceive it to be. Correlation analysis indicated that the relationship between these factors and students' attitudes toward technology was also positive albeit weak (see Table 4.5). These findings suggest that a perceived supportive, friendly, and satisfactory classroom environment is linked to positive attitudes toward technology.

4.2.3 Regression analysis

This analytical technique enables the researcher to examine the relationship between the dependent variable and independent variables. It allows for the determination of the variance between the dependent "attitude toward technology" and independent "classroom environment, teachers' characteristics, and students' characteristics" variables. Also, regression analysis helps the researcher determine the independent variables that are statistically significant predictors of students' attitudes toward technology.

Table 4.6 Relationship between the criterion variable (Attitudes) and the three independent variables (Regression analysis)

Model	Unstandardized Coefficients		Standardized Coefficients	*t*	*p*
	B	Std. Error	Beta		
Constant	.423	.407		1.038	.301
Classroom Environment	.312	.105	.190	2.958	.003
Student Characteristics	.344	.078	.288	4.415	.000
Teach Characteristics	.253	.065	.248	3.874	.000

Table 4.6 shows the regression analyses involving attitudes towards technology as the criterion variable (dependent) and the three independent variables. The table indicates that the three statistically significant predictors accounted for just over a quarter of the variance in attitudes toward technology (R^2 = .27), which was highly significant, $F(3,196) = 23.84$, p=.05. Teacher characteristics (β = .25, p=.05) student characteristics (β = .34, p=.05) and classroom environment (β=.31, p = .05) demonstrated significant effects on the attitudes scores.

The coefficients of the model indicate that the three regressors can be ranked in order to quantify their influence on the dependent, by starting with student characteristics (0.344), Classroom environment (0.312), and then Teachers' characteristics (0.253). Simply put, student characteristics account for 34% variation in their attitude toward technology, while 31% and 25% can be attributed to Classroom environment and teachers characteristics, respectively. Therefore, it can be concluded that if good student

characteristics are harnessed along with favourable classroom environment, this can go a long way in improving students' attitude toward technology. It also goes without saying that teacher characteristics, as a variable cannot be ignored as its effect to student attitude toward technology amounts to 25%. The regression analysis highlights the importance of classroom environment and students' own characteristics in explaining how their attitude toward technology can be improved.

4.2.4 Gender differences

Table 4.7 Gender differences with respect to diploma (group), classroom environment, students' and teachers' characteristics as well as attitudes towards technology

		Sum of Squares	df	Mean Square	F	p
Group	Between Groups	1.13	1	1.13	3.44	.06
	Within Groups	64.87	198	.33		
	Total	66.00	199			
Classroom environment	Between Groups	.06	1	.06	.22	.64
	Within Groups	57.53	198	.29		
	Total	57.59	199			
Student characteristics	Between Groups	2.62	1	2.62	4.91	.03
	Within Groups	105.54	198	.53		
	Total	108.15	199			
Teacher characteristics	Between Groups	.143	1	.14	.19	.66
	Within Groups	148.61	198	.75		
	Total	148.75	199			
Attitudes towards Technology	Between Groups	.30	1	.30	.39	.53
	Within Groups	154.41	198	.78		
	Total	154.72	199			

In the present study, differences among females and males were also investigated. The basis for this analysis was an argument advanced by colleagues to the effect that "males have more positive affinity with, and therefore dominate in situations where technology is involved" (communication with colleagues). In checking for gender differences, One-

way Analysis Of Variance (ANOVA) was computed. The results indicated no statistically significant gender differences among the variables (see Table 4.7). The exception here, was a significant main effect for student characteristics, $F(1, 198) = 4.91$, $p < .05$. The effect size for this difference was a medium .32 (Cohen, 1988). An inspection of the mean scores indicated that males (M =3.69, SD = .64) had lower scores than females (M =3.92, SD = .80). This result, suggests that contrary to colleagues' beliefs, females were different to males with respect to learning styles, self-confidence and the enjoyment of technology lectures. Regarding the other variables, this analysis, suggest that contrary to beliefs by colleagues within the college of education, there were no gender differences.

4.2.5 Interview objectives and significant observations

The purpose of the interviews was to "add on" what had been established from the quantitative study. The following are significant observations gleaned by the researcher. It was observed from the interviews that students' attitudes toward technology were not generally different from what the quantitative study had indicated. In fact, almost all interviewees acknowledged the importance of technology in their day-to-day lives. For example Thabo (a pseudonym) pointed out: "We live in a technology era, even if you don't like it you have to learn about and use it." There did not seem to be differences between females and males about how they saw and related to technology. For example, on the question: do you think males understand and use technology much more than females? Puleng (a pseudonym) retorted, "... not in this 21st century, there is no technology for man and another for woman."

4.3 Conclusion

In this chapter, data collected among 200 college of education students taking studies in technology, indicated positive associations between attitudes towards technology with teacher characteristics, student characteristics and the classroom environment. Regression analysis revealed that the classroom environment, students' and teachers' characteristics were predictors of attitudes toward technology. Based on this finding, it was concluded here, that if good student learning characteristics along with a favourable classroom environment were harnessed, this should go a long way in improving students' attitudes toward technology. While there were no statistically significant gender differences, a surprising finding in this study was the difference with respect to learning styles, self-confidence and the enjoyment of technology lectures. This finding was surprising because all the colleagues, including the researcher had assumed that males would have more positive attitudes, but the results indicated the contrary was true.

CHAPTER 5

SUMMARY, CONCLUSIONS, RECOMMENDATIONS AND SUGGESTIONS OF FUTURE RESEARCH

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. Also, included in this chapter are suggestions that could be used to build on the present study in Lesotho.

5.2 Summary

The purpose was to gain insights on how the classroom environment, the teachers, students and students' attitudes toward technology played a role in the manner in which students viewed technology in Lesotho. Data were collected through a combination of self-report instruments. Particularly, the Classroom Learning Environment Survey (CLES) and Attitudes Toward Science Scale (ATSS) were utilised. Also students were required to provide some biographical information, such as their ages and gender. In analysing the data, correlations among the different study variables, like the classroom environment were explored with respect to attitudes toward technology. Further, variables that predicted students' attitudes towards technology were investigated using

simple linear regression. Finally, gender differences were determined using one-way analysis of variance.

The results indicated that there was a positive relationship between attitudes towards technology and each of teacher characteristics, student characteristics and the classroom environment. Regression analysis showed that attitudes toward technology were predicted by the three study variables. ANOVA indicated no statistically significant gender differences.

5.2 Conclusions

The present study which investigated the factors that influence students' attitude toward technology has never been carried out in Lesotho before. Findings from this empirical study should therefore add an important aspect to the body of knowledge that is already available. Consistent with findings reported in literature, the present study also established positive relationships. Other studies reported however, that students' attitudes toward technology were influenced by other variables, such as students' learning styles. Similarly, with respect to gender differences, the present study's findings were consistent with those reported elsewhere. Such studies have also recommended the need for female role models to help remove gender stereotyping of girls, which may negatively influence their attitudes toward technology. In fact, as in published literature, the present study's findings seem to indicate that all three variables have an influential role on students' attitudes toward technology.

5.3 Recommendations

5.3.1 Recommendations regarding students

Self-confidence develops as a result of students' daily interactions with teachers and peers. Since self-confidence is important for the promotion of a positive attitude, students should be encouraged to develop positive self-confidence. Technology teachers should, at all times, strive to convince all students that technology is meant for them and they can learn and pass it. Such motivation and words of encouragement from teachers can develop positive self-confidence within individuals and thus influencing their attitude toward technology. The same applies for the two other characteristics (Enjoyment and Learning style), which should be encouraged to stimulate students' attitudes.

5.3.2 Recommendations regarding Teachers

Teachers in Lesotho should be encouraged and motivated to further their studies in subjects that they are qualified to teach, particularly in technology. Furthermore, the Ministry of Education should also organise workshops, in-service training and seminars to update teachers on new developments in technology as well in methods of teaching technology.

5.3.2 Recommendations regarding the classroom environment

The classroom environment has been shown to be an important variable in the present study. It is important therefore that college authorities should ensure that a good, friendly, and supportiveness atmosphere is created. Such an environment will help promote growth and development of all students. In addition, creating a good environment will provide space for students to express themselves positively in subjects

involving Technology, Mathematics, Science, Social and Emotional Development, and Approaches to Learning.

5.4 Suggestions for future research

The following suggestions are included with the aim of encouraging and enhancing future research in the area of student attitudes toward technology in Lesotho. The suggestions will hopefully be valuable to the current crop of students, who participated in the present study, to find out the feelings of their future learners when they become teachers themselves. Studies in a determined field, attitudes toward technology in this case, help in making generalizations about variables and participants in that specific area. It was with this thought that the suggestions for future research were included here.

Future investigation should (a) probe further the influence of students' age on their attitude toward technology; (b) probe the influence of different teaching methods on students' attitudes toward technology; (c) explore the influence of students' socio-economic and cultural background and its influence on attitudes toward technology; (d) it is also suggested that future research studies should investigate the role of students' prior knowledge on attitudes toward technology

5.5 Limitation and final thought

A limitation of the present study that hindsight revealed is the fact that a questionnaire as its main data-collecting instrument was not adequate. Perhaps a more balanced approach would have been to include a much more in-depth interview schedule with a large number of participants (focus group); this would help gather a large amount of information in a short period of time and allow the researcher to observe interaction among participants, rather than the individual interviews used in this study. Such an

interview schedule would possibly have provided more insights to complement what this study has determined.

Final thought: The future of College students and of course Lesotho is in the hands of education authorities and students themselves. With good strategies, regular updating of knowledge management systems, commitment, and a sense of responsibility then research will ensure that practitioners can make a difference.

5.6 Key Terms

Attitude, Students, Technology, Environment, College, Factors, Learning Environment, First Year student, Classroom, Teacher, Gender.

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APPENDICES

Appendix A

Control No:	

CLASSROOM LEARNING ENVIRONMENT, TEACHER, STUDENTS AND ATTITUDE SURVEY

STUDENT PERCEPTIONS

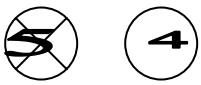
DIRECTIONS

1. This questionnaire asks you to describe your Technology classroom; there are no right or wrong answers. This is not a test. Your opinion is what is wanted.
2. By Technology we mean Information and Communication Technology.
3. Do not write your name. Your answers are confidential and anonymous.
4. On the next few pages you will find 50 sentences. For each sentence, circle one number corresponding to your answer.

For example:

	Almost Always	***Often***	***Sometimes***	***Seldom***	***Almost Never***
In this Technology classroom					
1. The Teacher asks me questions	5	4	3	2	1

1. If you think this teacher Almost Always asks you questions, circle the 5.
2. If you think this teacher Almost Never asks you questions, circle the 1.
3. Or you can choose the number 2, 3 or 4 if this seems like a more accurate answer.
4. If you want to change your answer, cross it out and circle a new number, e.g.:



3 2 1

5. Please provide details in the box below:

a) Program (Group) _____ b) Lecturer Name _____

Your sex (please circle) Male Female

6. Now turn the page and please give an answer for every question.

For the next 27 questions you will answer questions related to The Classroom Environment:

		Almost Always	***Often***	***Sometimes***	***Seldom***	***Almost Never***
In This Technology Classroom:						
1.	I learn about the world outside of school.	5	4	3	2	1
2.	I learn that Technology cannot provide perfect answers.					
3.	It's OK to ask the teacher "why do we have to learn this?"	5	4	3	2	1
4.	I help the teacher to plan what I'm going to learn.	5	4	3	2	1
5.	I look forward to the learning activities.	5	4	3	2	1
6.	New learning starts with problems about the world outside of school.	5	4	3	2	1
7.	I learn how Technology has changed over the years.	5	4	3	2	1
8.	I feel free to question the way I'm being taught.	5	4	3	2	1
9.	I help the teacher decide how well my learning is going.	5	4	3	2	1
10.	The activities are among the most interesting at this school	5	4	3	2	1
11.	I learn how Technology can be part of my out-of-school life.	5	4	3	2	1
12.	I learn how Technology started	5	4	3	2	1
13.	It's OK to complain about activities that are confusing.	5	4	3	2	1
14.	I have a say in deciding the rules for classroom discussion.	5	4	3	2	1

		Almost Always	*Often*	*Sometimes*	*Seldom*	*Almost Never*
15.	The activities make me interested in Technology.	5	4	3	2	1
16.	I get a better understanding of the world outside of school.	5	4	3	2	1
17.	I learn about the different Technology used by people in other cultures.	5	4	3	2	1
18.	It's OK to complain about anything that stops me from learning.	5	4	3	2	1
19.	I have a say in deciding how much time I spend on an activity.	5	4	3	2	1
20.	I enjoy the learning activities.	5	4	3	2	1
21.	I learn interesting things about the world outside of school.	5	4	3	2	1
22.	I learn that Technology is just one of many ways of understanding the world.	5	4	3	2	1
23.	I'm free to express my opinion.	5	4	3	2	1
24.	What I learn has nothing to do with the world outside of school	5	4	3	2	1
25.	I learn that today's Technology is different from the Technology of long ago.	5	4	3	2	1
26.	The learning activities support to my learning	5	4	3	2	1
27.	I have a say in deciding how my learning is assessed and what activities I do	5	4	3	2	1

The following 7 questions deal with Student's Characteristics

		Almost Always	***Often***	***Sometimes***	***Seldom***	***Almost Never***
28.	I enjoy my technology class.	5	4	3	2	1
29.	I talk with other students about how to solve problems.	5	4	3	2	1
30.	I try to make sense of other students' ideas.	5	4	3	2	1
31.	I ask other students to explain their ideas.	5	4	3	2	1
32.	I enjoy technology class activities.	5	4	3	2	1
33.	Other students pay attention to my ideas.	5	4	3	2	1
34.	I think I can contribute to class activities.	5	4	3	2	1

The following 8 questions deal with Teacher's Characteristics

		Almost Always	***Often***	***Sometimes***	***Seldom***	***Almost Never***
35.	The teacher encourages each one pay attention.	5	4	3	2	1
36.	The Teacher is effective in class.	5	4	3	2	1
37.	The teacher uses class activities to stimulate and encourage learning.	5	4	3	2	1
38.	The Teacher explains clearly the rules on proper class.	5	4	3	2	1
39.	The Teacher uses different methods to help every one in class.	5	4	3	2	1
40.	The Teacher does not embarrass students for not knowing the right answer, and helps each one individually to perform well.	5	4	3	2	1
41.	The teacher treats everyone in class equally.	5	4	3	2	1
42.	The teacher makes sure that the work scheduled for the day is accomplished.	5	4	3	2	1

This last set of 8 questions deal with students' attitudes toward Technology

		Almost Always	***Often***	***Sometimes***	***Seldom***	***Almost Never***
43.	I like my technology class	5	4	3	2	1
44.	After Graduating I will get work easily	5	4	3	2	1
45.	I think my class is prestigious	5	4	3	2	1
46.	Technology Classes are interesting	5	4	3	2	1
47.	I would consider my future career in technology to be good	5	4	3	2	1
48.	I enjoy reading technology publications	5	4	3	2	1
49.	I like Technology Program on TV	5	4	3	2	1
50.	I think Technology is an easy subject	5	4	3	2	1

Appendix B

Students' Interview Questionnaire

1. How do you find Technology? Shall we start with what's good about it? *(Issues to prompt on; creativity; what's satisfying/interesting; teacher- student relationships; student-student relationships)*
2. What's bad about it?
   Workload; inflexibility?
3. How do you like to solve Technology problems?
   Collaboratively vs on your own; just going for it/trying it vs carefully planning a strategy?
4. Do you think this is the way most students like to work in technology?
5. Are you generally satisfied with the work and assignments you have to do?
   Innovation/Task Orientation
6. Do you think most students get a fair go with their learning? *Equity*
7. Some people think men have an easier time learning Technology. What do you think?
8. Some people think women have an easier time learning Technology. What do you think?
   Minority status affecting you?
9. What do you think of the way Technology is taught; for instance the mix of lecture and laboratory work?
   (Innovation- "new ideas seldom tried out in class"; "... new & different ways of teaching.."; ..."unusual activities"
10. How would you like to see it taught?
11. Some people think you have to be good at Maths to do technology. How do you feel about this?
12. Is there anything else?
13. *FOR WOMEN:* How do you feel about being the minority gender in your classroom?

Appendix C

Follow-up letter

Kalanda Kasongo
Lesotho College of Education
Faculty of science
Department of Applied sciences

Wednesday, 11 August 2004

Dear Sir or Madam:

Last week you should have received a questionnaire on students' attitude toward technology Project asking for your perceptions. You agreed to participate in the project last week.

If you already have sent back the questionnaire, we thank you for your important help. If you have not yet completed the questionnaire, we kindly ask that you do so as quickly as possible. It is important that we hear back from all who agreed to participate.

If you did not receive your questionnaire, or if you need a replacement questionnaire and return envelope, please call at (58776319 / 22338877). We then can send you what you need as quickly as possible.

Sincerely,

Kalanda Kasongo