THE RELATIONSHIP BETWEEN THE ATTITUDE OF SECONDARY SCHOOL MATHEMATICS EDUCATORS TOWARDS SCHOOL AND THE ACHIEVEMENT OF THEIR LEARNERS

by

DAVID MWIRIA

Submitted in fulfillment of the requirements for the degree of

MASTER OF EDUCATION

in the subject

DIDACTICS

at the

UNIVERSITY OF SOUTH AFRICA

SUPERVISOR: PROF. S. M. MELLET

JUNE 2006

Declaration

Student number: 3126-320-8.

I declare that **THE RELATIONSHIP BETWEEN THE ATTITUDE OF SECONDARY SCHOOL MATHEMATICS EDUCATORS TOWARDS SCHOOL AND THE ACHIEVEMENT OF THEIR LEARNERS** 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.

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SIGNATURE DATE

(MR D. MWIRIA)

Acknowledgements

I would like to extend my thanks and appreciation to the following people:

- My supervisor, Professor S. M. Mellet who gave me the valued opportunity to work with him for his patience, interest, guidance and motivation.
- Members of the UNISA Computer Section for the excellent service they have done on statistical analysis of data.
- Mr. Dyarvane W. the mathematics subject advisor for urging educators in his area to participate without fear.
- All Grade 12 mathematics educators who responded to the questionnaire, without their participation this research would not have been possible.
- Mr. David Levey for correcting grammar and language of the dissertation.
- My wife Catherine for her tireless support and encouragement.
- The loving son Deogratius and daughters Donantus and Dinah for their patience and support during my study.
- All my colleagues and well wishers.
- Above all I wish to express my sincere gratitude to the Almighty God for strengthening and helping me achieve my goal.

Summary

This research investigates the relationship between the attitude of senior secondary mathematics educators towards school and the achievement of their learners. A literature study examined research into the relationships between an educator's attitude towards his or her school management team, colleagues, learners, parents, the subject of mathematics and the factors influencing mathematics achievement. An empirical investigation used a quantitative research design to collect data from selected senior secondary schools in the Eastern Cape Province of South Africa. A questionnaire was used to gather data and a statistical data analysis was conducted to calculate frequencies and test hypotheses. Findings indicated the existence of a relationship between educators' attitudes towards school and the achievement of their learners. It was therefore recommended that school managers should be very sensitive to the climate prevailing in their schools in order to encourage mathematics educators and thus, indirectly, learners in this vital subject.

Key terms:

Mathematics achievement; Confidence in mathematics; Educator-colleague relationship; Educator-learner relationship; Home support; School management team; Importance of mathematics; State of schools; Effective educator; Teaching methods; Learning mathematics.

List of acronyms

- ACH: Achievement
- COLL: Colleagues
- LEAR: Learners
- MAT: Mathematics
- PAR: Parents
- SMT: School Management Team
- TOTAL: School in its Totality

TABLE OF CONTENTS .....PAGE

Chapter 1: Introductory orientation and statement of the problem

Chapter 2: Educators' attitudes towards school

Chapter 3: Factors influencing mathematics achievement

Chapter 5: conclusions, implications for educationists and Recommendations

List of tables

CHAPTER ONE

INTRODUCTORY ORIENTATION AND STATEMENT OF THE PROBLEM

1.1 INTRODUCTION

1.1.1 Orientation

This study arose as a result of the great concern over poor mathematics achievements in schools and focused upon the mathematics educators / teachers* who have to steer their learners to success. The discipline of mathematics was considered as a key subject within and outside the school. The study has targeted the educator's attitude towards the subject of mathematics and also towards the school as a whole. Clearly the attitude of the mathematics educator was and always has been an important factor affecting the learner's achievement in mathematics and this was the focus of the study.

*****The researcher uses the term educator throughout the dissertation to refer to teachers in school.

Many research studies revealed that the role of the educator was crucial in any approach to the teaching and learning of mathematics and that a positive attitude towards this subject and a belief in what was being done was essential.

The point was well emphasized by Moses (in Orton and Frobisher 1996:34): that it is the educator who establishes a classroom climate conducive to spontaneous productive enquiry.

The creation of a classroom climate, which was conducive to learning, seemed to be much influenced by the mathematics educators' attitude towards school in general. It was this attitude that presumably affected their learners' achievement, the topic of this study.

1.1.2 The Value of the investigation

The parties interested in education stand to benefit from this study as it relates to the local situation. The author felt that this investigation addressed the fears expressed by Clements and Ellerton (1996:3) that owing to the shortage of local experts and researchers, it was a common practice for developing countries to rely too heavily on imported ideas and knowledge. More often than not the results turned out to be disappointing probably because the ideas and knowledge

developed in different contexts were not suited to the needs of developing countries. The present research also sought to address the observation by Hughes and Howie (1998:2) that with the advent of the twenty first Century, the demand for mathematical, scientific and technological understanding and expertise was greater than before. Consequently, countries around the world have been searching for methods of making teaching and learning in these areas more effective in their various school education systems.

It was important to balance research in urban and rural areas in order to highlight the plight of the marginalized rural schools. This study may help to pave the way for improving mathematics performance in schools, particularly in rural senior secondary schools.

1.1.3 The importance of mathematics

The importance of mathematics in all sectors of life is indubitable. At the school level, mathematics holds the pivotal position. A learner's grasp and command of mathematics may prove a precursor for improving performance in other subjects. Swanepoel (in Budhal 1993:4) also acknowledged the supremacy of mathematics when he stated that today all fields of knowledge are dependent upon

mathematics. Probably no other subject has a more universal application.

Griffin (in Nel 1990:71) likewise agreed with the peculiarity of mathematics when he concluded that every subject can be challenging, but there are few subjects, which cause so much anxiety and frustration as mathematics and therefore one must realize the needs of the individual in the classroom situation. Basically this was one of the main reasons why the present author saw the necessity to investigate whether the attitude of the mathematics educators towards school did correlate with the achievement of their learners.

Outside the school, the importance of mathematics becomes even more pronounced. Researchers like Gavosto, Steven and William (1999:2), Moyana (1996:4), Robitaille and Garden (1989:3) shared a similar view about mathematics, as being fundamental to the study of the physical sciences and engineering of all kinds. Mathematics is increasingly used in medicine and in biological sciences, in geography and economics, in business and management studies. It is essential to the operation of industry and commerce both in the office and workshop.

Mathematics also serves as a communication tool in the modern technological life of the person. The subject in question functions as the basis of the widely used computers. Although computers can be used regardless of one's mathematical leanings or qualifications (some people use computers to surf the Internet while others merely use them as a typewriter for typing), in most cases, it is people with mathematical competence that are able to use computers optimally in other areas like that of computation.

Besides the pragmatic aspects mentioned above, mathematics plays a crucial role in the learner's mental and personality development. Grove and Hauptfleisch (in Nel 1990:1) asserted that mathematics promotes the development of the mental, social, emotional and occupational life of the person. It was therefore important for mathematics educators to aim at developing the learner wholly as a unique person, in the process that may be termed self-actualisation. Nel (1990:1) believed that the main component of self-actualisation was one's self-concept, which could be defined as how one perceives oneself. Better still, Grove and Hauptfleisch believed that the two basic parts of the self- concept were the description of you by yourself and the emotional evaluation of yourself by yourself. The latter was of great importance to the learning of mathematics. The learner's emotions towards mathematics and his

or her achievement in the subject tend to be positively correlated. Tuttle (in Nel 1990:36) referred to self-esteem as the affective dimension of the self-concept and explained it as follows:

'The level of self-esteem is a personal judgment of worthiness that is expressed in the attitudes the individual holds towards himself.'

Bruck and Bodwin (in Nel 1990:11) found that there was a positive relationship between self-concept and educational problems; that is a positive self-concept resulted in better mathematics achievement.

Van den Aardweg and Van den Aardweg (1993:215) stated that self-acceptance, owing to a positive self-concept, should be encouraged as it gives learners the confidence to solve problems.

Bruck and Bodwin as well as Van den Aardweg pointed to the fact that acceptance of the self was necessary for the achievement in mathematics. Every educator should strive to create a climate conducive for learners to develop a positive self-concept. The author, from his extensive teaching experience, concluded that a learner with such a concept developed intrinsic motivation towards mathematics, which was the very requirement for success in this subject. This notion was well supported by Chapman (1987:12) in his statement that when things are going well a positive attitude becomes self-reinforcing and

easy to maintain. Generally when life becomes tough, learners with a positive self-concept persist much longer than their counterparts with the opposite. This notion was similar to the theory of High Expectancy and success for it stated that the more you expect (positive attitude) from a situation, the more success you could achieve (Chapman 1987:13).

The globe needs quality scientists, in considerable quantity. The market place for mathematics is changing too. As a result, the rules about what and how mathematics is to be taught are also changing. Larger numbers of learners in mathematics must be reached; and the rural learners must be the targets.

In view of the importance of mathematics, it was essential that mathematics educators should be offered the opportunity to devise ways of making intellectual excitement in the subject come naturally, since it cannot be forced upon their learners.

1.1.4 Achievement in mathematics

The dismal level of achievement in mathematics and the subsequent performance in matric has been commented upon in many quarters like the Department of Education, the media and the general public.

Comparing them with other countries, South Africa's problems in mathematics and science are highlighted. A report by Pretorius (2000: 17), 'Asmal wants R2bn for mathematics', reacted to the Third International Mathematics and Science Study which revealed that the learners of 37 countries outperformed South African learners. In a 1995 study involving 41 countries, South African learners were bottom of the list as well.

The report on the South Africans' dismal performance also attracted the attention of Hughes et al (1998:59) who commented on the Eastern Cape Province in particular that there appeared to have been serious inadequacies in the learning and teaching of science and mathematics, which was pervasive throughout learners' school careers. At high school and tertiary levels, the new entrants were in most cases found to be inadequately well prepared. Many learners could not sufficiently handle mathematics skills such as application, analysis, synthesis and evaluation. This incapability in mathematics was a point echoed by Mullis (1991:1), who commented that the mathematical skills of South African learners were generally insufficient to cope with either on the job demand for problem solving or college expectations of mathematics literacy.

Poor mathematics performance was also highlighted by Malone, Atweh and Northfield (1998:174): low achievement in test scores was reported to be linked to the inferior quality of science and mathematics education.

The implications of mathematics achievements were also felt in the economic world. According to Hughes et al (1998:1) there was a growing consensus that achievement in mathematics and science were symptomatic of the quality of education and training and a good yardstick of a country's potential to be economically competitive, which therefore implied that for the South African economy to be globally competitive, the government must develop a strategy for improving the poor performance in mathematics. If Hughes and Howie's conclusion was to be accepted then for Black Economic Empowerment to be effective, the South African government ought to address the appalling mathematics achievements in the Black community as a priority.

1.2 The educator and the school

Because educators are key figures in improving mathematics learning, it was necessary to acquire information about not only their knowledge of mathematics and mathematics pedagogy but also the relationship between their attitude towards school and their learners' achievement.

Talton and Simpson (in Manganye 1994:39) regarded the educator as the mediator of the effects of the learning environment and a main agent for a learner's change in attitude. Thus the educator was seen as the pivot of any mathematics programme.

Ogude and Bohlmann (1998:178) emphasized the plight of the educator in the school. Reporting on the sixth annual meeting of the Southern African Association for Research in Mathematics and Science Education, they stated that the broader culture of the school often prevented educators from being able to implement what they believe to be 'good' teaching practice.

Effective teaching was also influenced by the school climate. A satisfactory school climate induced educators to produce more and better results. In support of this view Gall and Borg (1997:64) asserted that there was some research evidence that satisfied educators were more productive than dissatisfied ones. The following relationships were important in pedagogical circles:

1.2.1 The relationship between the educator and the principal and / or school management team (SMT)

As was discussed in chapter two, before the advent of democracy in 1994 the administration and governance of most schools in South Africa were placed solely upon the shoulders of the principal (Ellis and Allan 2005: 57). After 1994, however, the principal was to be assisted by other members of staff (Deputy Principal, Heads of Division, and senior educators in some circumstances), forming the School Management Team (SMT). In this study, the principal and the SMT were used interchangeably.

It was necessary for educators to work collaboratively with their principals to create a climate conducive to teaching and learning. Kyle (in Manganye 1994:39) pointed out that the educator and the principal were vital factors in education improvement and that without their help, change could not occur. The principal was found to exert the 'supreme' authority in the running of the school. The Departmental of Education (2000:6) defined the principal as the individual in the school appointed by the Department who is legally authorized to be responsible for the work performance of all personnel. Hoyle (in Kathard 1975:28) suggested that the principal's role embodied the dimensions of initiating structure and considerations. 'Initiating structure' was

concerned with the formal relationships, which the principal had with his or her staff. The principal, according to the Department of Education (2000:8), who is held in high esteem, makes his attitude clear to his staff, criticizes poor work, maintains definite standards of performance, asks staff members to follow regulations, and so forth. 'Considerations' concerned the informal relationships which the principal had with his staff. Kathard (1975:28) concluded that the principal who scored high on this dimension did personal favours for his staff members, listened to their professional problems, put their suggestions into operation, obtained their approval on important issues and so on, which indicated the critical role of the principal in determining the school climate, that could be or could not be conducive to teaching and learning.

1.2.2 The relationship between the educators and the learners (LEAR)

The relationship between educators and their learners was a key factor that had to be underlined and explored. The uniqueness of the discipline of mathematics was elaborated upon in section 1.1.3. It could be that this mental discipline also required a particular educator who suited the likes and dislikes of his or her learners. In support of this claim, Moyana (1996:40) asserted that the personality of the educator influenced the learners' attitude and subsequently their achievement.

The bond or relationship was cemented when educators' and learners' likes were compatible, for example with the learners acceding to being guided by the educator. The nature of this relationship also affected the educators' attitudes towards their schools.

1.2.3 The relationship between the educator and his or her colleagues (COLL)

Experienced educators know that the educator's work depends for its success not only on his or her skill with learners, but to a large extent on the way in which he or she handles his or her relationships with his or her colleagues.

The relationship among educators was important in determining the working conditions and consequently the attitude of educators towards their schools. In his investigation, Chapman (1987:21) found that building and maintaining healthy relationships among superiors and co-workers was the key to success in any organization. A friendly atmosphere with colleagues fostered a contented mind. This was a starting point for the much-fancied cooperative learning discussed in later chapters, as well as for the educator's satisfaction with the school.

1.2.4 The relationship between the educator and his or her confidence in the subject of mathematics (MAT)

In his investigation, Mullis (1991:204) concluded that when males were found to exhibit an advantage in performance, a higher level of confidence generally accompanied this advantage. There was a strong relationship between achievement and confidence in mathematics, which applied to both the educator and the learner. A less-confident educator was inclined to be more anxious and nervous in his or her lesson presentation, while the successful or more confident educator had an adequate self-concept. His or her attitude towards school was likely to be negative for a less-confident educator serving in a renowned well performing school; that same educator was similarly not at ease serving in a school with ample resources like laboratory equipments and computers. Brimer (1985:57) concurred that the extent at which the educator use materials increased with the educator's mathematics education and confidence.

1.2.5 The relationship between the educator and the home support for learners (PAR)

Both Burstein (1992:32) and Mullis (1991:14) conceded that learners' achievement increased significantly when homework was assigned regularly and completed. One reason homework was not completed by

learners was a lack of facilities at home, such as furniture, the lighting system, privacy and so on. Could this affect an educator's attitude towards a school located at the heart of a disadvantaged community! And Mullis (1991:14) also found that learners in homes with resource materials such as newspapers, magazines and books exhibited a higher average mathematics proficiency than those learners with access to fewer resource materials. In this regard Mullis' view was supported by Harbison and Hanushek (1992:195) who found that progress through schooling was directly related to the level of the mother's education, reflecting both parental views on the importance of schooling and the ability of the family to aid the learner with schoolwork.

1.3 Statement of the problem

The persistent disappointing mathematics performance in matric was of great concern. Numerous questions were often raised about the possible sources of the problem.

Poor school attendance was cited as a possible cause. When their investigation was conducted however, Hughes et al (1998:14) reported that the best school attendance figures were witnessed in the years 1995 and 1996 yet poor results were still evident. Matric statistics

continued to show satisfactory or good percentage passes in mathematics for some schools and very poor pass rates for others. It therefore became necessary to investigate the role of educators' attitudes here.

While it was true that in South Africa some schools enjoyed more resources than others, the author believed that with proper organization each school could use even minimal resources to the best advantage and enhance achievement in mathematics. This school of thought, though opposed by researchers like Kalejanja (in Moyana 1996:47) because they concluded that lack of teaching aids militated against mathematics education, was supported by Orton et al (1996:65). In their study, Orton and Frobisher noted that there was a notable increase in recent literature on mathematics education arguing that concrete representations often failed to produce the expected positive outcomes. While Orton and Frobisher made no attempt to suggest possible causes, it was apparent that educators' attitudes towards school and mathematics in particular had an effect on the expected outcomes. As remarked earlier, the author believed the educator's attitude was paramount in determining the outcome and also held the belief that the uncompromising type of administration in many schools was a major contributor to poor results there.

Hence the problem: ‘How did a mathematics educator’s attitude towards school affect his or her learners’ achievement?’

In order to investigate the above, the following sub-problems were identified:

Problem 1

How did the educator relate to his or her principal (SMT)?

Problem 2

How did the educator relate to his or her learners?

Problem 3

How did the educator relate to his or her colleagues?

Problem 4

How did the educator relate to the subject of mathematics?

Problem 5

How did the educator relate to the learner’s home factors?

In the formulation of these problems, the term educator referred to both males and females. Because of the need to address the gender issue, analysis was done on both genders in order to test whether there was a significant difference between their mean attitude towards school.

1.4 Hypotheses

A total of five main hypotheses were formulated. In chapter 4, these main hypotheses were divided into sub- hypotheses and stated in the form of null hypotheses (see 4.4.5) and tested by using appropriate statistical tests for significant difference.

1.4.1 Main hypothesis ONE

There was a significant difference between the mean attitude of male and female educators towards the school management team.

1.4.2 Main hypothesis TWO

There was a significant difference between the mean attitude of male and female educators towards their colleagues.

1.4.3 Main hypothesis THREE

There was a significant difference between the mean attitude of male and female educators towards their learners.

1.4.4 Main hypothesis FOUR

There was a significant difference between the mean attitude of male and female educators towards parent support for learners.

1.4.5 Main hypothesis FIVE

There was a significant difference between the mean attitude of male and female educators towards the subject of mathematics.

1.5 Aims of investigation

The principal aim of this investigation was to examine whether the attitude of the mathematics educators towards school was related to the achievement in mathematics of their learners. The study also attempted to address the observation that although the classroom had come under greater scrutiny in recent years as seen in literature study, the school as an organization had not received that much attention. The educator too was given little attention. The records of research showed that effort was concentrated on the learning process and new methods of teaching. The aims, therefore, of this investigation were to:

- Determine the attitude towards school of mathematics male and female educators
- Determine the mathematics achievement of learners
- Determine the relationship between the attitude of secondary school mathematics educators and the achievement of their learners
- Suggest recommendations for improving educators' attitudes towards school and the subject of mathematics.

1.6 Definitions of core concepts

1.6.1 Attitude

The role of attitude in this investigation necessitated its being a core concept. Gordon (1979:110) found that attitude towards mathematics had a positive role to play in the prediction of achievement.

According to Anttonon (1967:6), a proponent of the phenomenological approach, an attitude is a mental and neural state of readiness, organized through experiences, and exerting a directive or dynamic influence upon the individual's response to all objects or situations with which it was associated. Doob, a behaviourist, claimed that attitude is a learned, implicit drive-producing response which is evoked by a variety of stimulus patterns (external or internal) and which mediated subsequent overt behaviour (Anttonon 1967:8).

The common element that appeared in both of these definitions was that they related to the readiness to respond to a given situation.

In this investigation, the attitude of the mathematics educator towards the school was defined as the readiness to respond to a given situation in his or her school. For instance if the school management team allowed a mathematics educator more time for his or her learners, then

educators could respond by translating the opportunity into the betterment of his or her learners' achievement. The educator would try to cover a wider spectrum of the syllabus and at a deeper depth, with increased educator-learner interaction. Learners could then not only know how to apply a topic like differential calculus to daily life but also to analyse, synthesize and evaluate it. Hence the educator aimed at covering an 'attained' curriculum where the understanding of the learner was the major goal.

1.6.2 Achievement

The achievement of the learners is very important to any educator as it supposedly represents his or her teaching outcome. An educator is described as 'good' or 'successful' if his or her learners perform well.

According to Van den Aardweg et al (1993:8) achievement was a product that was measured by means of achievement tests. Van Rensburg, Landman and Bodenstein (1988:305) defined achievement as simply what an individual had learned. Leitner (in Mbatha 2004:17) further defined academic achievement as the learner's level of achievement on a standardized test and examination.

For the working definition of achievement in this study, the author drew ideas from both Van den Aardweg and Van den Aardweg and Van

Rensburg. The author therefore defined achievement in mathematics as being that which had been learnt and proved by testing, expressed as the percentage (%) obtained. Achievement was being used interchangeably with performance.

After attending lesson(s) on trigonometric identities for example, the learner was able to prove he or she had learnt by showing that if $\cos\theta = x$, then $2\cos 3\theta = x^3 - 2x$. This was when the Florida programmer paradigm, as narrated by Guyton and Dangel (2004:101) shifted from the focus on 'I taught it' to 'I know they learnt it because they have demonstrated it'.

In this study mathematics achievement was determined by the average achievement in mathematics during the end of year examination (Matric) of the grade 12 learners in the selected schools.

1.6.3 Relationship

Collins (1993:445) defined relationship as a dependence on something else. According to Van den Aardweg et al (1993:201) relationship denoted a particular mode in which people, things, ideas, self and God were mutually connected.

The notion of dependency and connection was evident to both Collins and Van den Aardweg. Hence relationship, in this study, refers to the connection between the attitude of secondary school mathematics educators and the achievement of their learners. This connection was the basis of hypotheses testing in chapter four.

1.7 Research method

Both a literature study and an empirical investigation were undertaken. The former exposed to the author the findings of earlier researchers. In so doing, the knowledge acquired not only equipped the author for fieldwork but also directed him regarding how his investigation and findings could add to the already existing pool of knowledge and in compiling an attitude questionnaire.

After the literature study the empirical investigation entailed going into the field and conducting a practical investigation with the express aim of gathering data that was used to test the hypotheses.

1.7.1 Sample

High schools and senior secondary schools in some of the districts in Eastern Cape Province were requested to participate in the research study.

1.7.2 Empirical Investigation

Quantitative research, particularly correlation analysis and the analysis of variance approach, was employed. An attitude questionnaire of 50 items regarding the school as a whole was prepared and measured on a 4 point Likert scale. A section concerning the respondents' biographies was also included. This comprised variables like gender, age, education, teaching experience and post held. The aim was to investigate whether the mean attitude towards school in each group in the variable (divider) differed.

The researcher requested the respondents to be honest in their answers. The confidentiality of the identities of both the schools and the respondents was assured.

1.7.3 Hypothesis testing

The stated null hypotheses (see paragraph 4.4.3) was tested by using the Pearson Product Moment Correlation and the inferential statistics (t – test and F – test analysis).

1.8 Structure of the research

Chapter two covered mathematics educators' attitudes towards school in general while chapter three was devoted to the learners'

achievements in mathematics. Both chapters (2 and 3) integrated the researcher's view and the literature study. Chapter four was earmarked for covering methodology, sampling selection, execution and results. Chapter five was set aside for a discussion of conclusions, recommendations and implications.

CHAPTER TWO

EDUCATORS' ATTITUDES TOWARDS SCHOOL

2.1 Introduction

School management and leadership intertwined probably constitute one of the factors that influence educators' attitudes towards school. It is a complicated factor determined by both the environment and the internal school situation. The author acknowledged the view of the Department of Education (2000:4) that there is no one correct way to manage and lead schools. South Africa had many different types of schools and many different school communities and what was right for one school could not be right in every situation for another. It was up to school managers and leaders to choose the best approach. For this reason, this investigation touched on various ways of managing and leading schools but it did not come up with the right one for every situation.

In this chapter, the focus was on the attitude of male and female educators towards school and its components (school management team, colleagues, learners, home support of learners and the subject of mathematics).

2.2 Schools

2.2.1 School ownership

In South Africa one finds either public or independent schools. While independent schools are privately owned, public schools are government owned. The latter were established with state finance to perform a public function in providing education for their learners. It is therefore according to the Department of Education (2000; 11) the responsibility of the state to promulgate legislation to determine in general how such school could be governed and managed.

High Schools enroll learners from Grade 8, but Senior Secondary schools only from Grades 10 to 12. High schools therefore have more time to groom their learners (in fact 5 years of preparation for matric) than their counterparts in the Senior Secondary schools (with 3 years). Since it was evident that the success of educators was measured by their learners' performance, many educators therefore preferred to serve in high schools where the chances of improving on the learners' matric results were greater. Schulze and Steyn (2003:143) found that educators experienced great satisfaction when they were able to help learners achieve positive results. This attitude of most educators wanting to serve in high schools for the reason given above could

possibly change if the public examination in Grade 9 was to be reinstituted or an alternative measure put in place.

In order to achieve a high level of performance, the principal needs to keep in mind the roles, responsibilities and functions that were required of a proficient institution. An observation was that conflict had always to be minimized. Kathard (1975:93) stated that research had shown that high levels of conflict reduce efficiency. The grumbling of educators not only affected their attitudes towards one another and the school in its entirety but also affected their classroom delivery.

2.2.2 Schools before democracy

Many South African schools before the advent of democracy in 1994 were based on top-down management and leadership Ellis et al (2005: 57). The school was structured so that control came from the top that was from the offices of the Department of Education. According to the Department of Education (2000:1) the principal had to manage the school on his or her own although the Department made managerial decisions. The principal therefore was seen to be successful if he or she was a good administrator. In such a context, principals and Heads of Department did not provide any instructional leadership; instead, it was their job mainly to control educators and learners. The fact that

many educators were denied input in school management had serious repercussions. Educators with democratic principles would obviously develop a negative attitude towards such a school. Some educators' creative abilities were even stifled, hence affecting learners' performance especially in sensitive subjects like mathematics.

Most South Africans, especially those who were under the Bantu Education system, received inferior education and became disgruntled. This point was emphasized by Jaworski, Wood and Dawson (1999:78) who pointed out that the debacle of Bantu education left a legacy of overcrowded, under-equipped classes and learners who were denied the opportunity to develop their full potential. In desperation, from 1976 many schools became sites of struggle against apartheid and its polices in education. In many cases, the resources and relationships that made a school an institution of teaching and learning were totally destroyed (Department of Education 2000:1). Consequently, failure to reinstate those resources and relationships was having an adverse effect on the attitude of educators towards schools and the teaching profession as a whole.

2.2.3 Schools after democracy

The new educational system that emerged from a democratic government saw the school as an open, living system and a complex organization. The vision of the Department of Education (2000:11) was that schools were to be organized and coordinated through being:

- Flexible rather than rigid
- Collegial and professional rather than hierarchical and dictatorial
- Cooperative and collaborative rather than individual and separate
- Constructive and developmental rather than punishing and judging.

All the above revolved round a consensus that all schools needed good management and leadership in order to ensure a better quality of education for their learners. The post-apartheid era government however had a greater challenge to shoulder. As noted with the references above, for educators to exhibit a positive attitude towards their profession, the restoration of the destroyed resources and relationships that made a school an institution of teaching and learning is essential. Lack of buildings, teaching facilities and a culture of learning and teaching, among other factors continued not only to affect

the learners' achievements but also the educators' attitudes towards school.

2.2.4 Contemporary schools and their dilemma

The change from the old to the new educational system was not as smooth as desired. Mbatha (2004: 42) observed that some principals easily changed their stance from authoritarianism or changed with difficulty or remained adamant making it not easy to form a school management team or making it effective. In other words, those principals who were used to controlling educators and learners single-handedly battled to accept their so-called co-partners in the school management and administration team. Educators' attitude towards management was turning more brittle as they became more aware of their democratic rights; consequently a positive attitude between both principal and educators towards their institution was vital for improving performance there.

Managers and leaders, who understood their schools as living systems, accepted that change continually occurred, and that it was healthy if the school could learn, adapt and survive. This required every stakeholder in the system to be tolerant and open minded. The need to change was also explained by Ellis and Pennington (2004:32): old

management styles were likened to the lion as predator and new styles to the elephant as one of the most revered and respected mammals on earth. Ellis et al (2004:32) therefore offer the following as pointers to successful leadership:

- Collaboration and co-operation are powerful tools for survival. For the learners to improve their performance all stakeholders in education must have a mutual agreement in the pursuit of their common goal.
- As a school grows, one can also be clever, responsive and innovative. All the stakeholders must learn from their or others' experiences.
- Nurture relationships inside and outside the institution. Managers should maintain a warm climate in and out of the school premises.
- Communication, sharing information and understanding are vital.
- Anticipate changes in one's environment. One must be objective when confronted by a need to change.
- Create value for all stakeholders – make parents, educators, learners, communities feel their worthiness.

2.3 Attitudes and relationships in schools

2.3.1 Variables in the schools

Research by Rudd and Wiseman, Morrison and McIntyre, Taylor, Getzels and Guba (in Kathard 1975:38) indicated that working with learners, relations with colleagues, hours of work and holidays (among other factors) gave educators immense satisfaction but at the same time constituted areas of dissatisfaction, such as low salaries, large classes, poor human relations, attitudes of learners and parents towards education and the status of the profession. In this study, attention was given to the following aspects: relations with colleagues, poor human relations, the attitudes of learners and parents towards education. If these factors caused dissatisfaction to educators, as concluded by the research done by the group above, then this reinforced the belief of the author that they were also responsible for the attitudes and performance in a school.

The author's experience indicated that in a school, educators who work well together characterize a good climate conducive for the creation of a positive attitude towards school. This is when the principal interacts freely and with companionably to his or her staff and the staff feels secure in him or her.

For the purpose of this investigation, the male and female educators' attitude towards school was considered only in terms of these

variables: educator and principal; educator and colleagues; educator and learners; the educator and the subject of mathematics and the educator and the learner's home support.

2.3.2 The relationship between the educator and the School Management Team (SMT)

2.3.2.1 Introduction

The relationship between an educator and the principal (SMT) is very important and has at all times to be healthy. It is this relationship, among others, that bears on and possibly influences an educator's attitude towards school. In turn it is this attitude that is embodied in the classroom by the educator. A positive attitude enables the educator to create a climate conducive to teaching and learning, while a negative attitude produces educators that reluctantly go to the class to teach. Educators with the former attitude often contribute freely (Keeves 1972:61) in staff meetings and are able to cooperate with requests from the management.

2.3.2.2 The symbiotic relationship

According to the Department of Education (2000:14) the principal carried the responsibility to make sure that decisions were taken and tasks were completed. This could happen collaboratively with others, or it could happen by way of delegation, depending on what was appropriate along a continuum that ran from being authoritarian to being democratic. The principal's personal preferences and attitude influences to a great extent the general tone of the school and the relative emphasis on different aspects of socialization and education.

The role of the educator in the conventional classroom is crucial: he or she attempts to provide, as stated by Klein, Hamilton, Mccaffrey, Stecher, Robyn and Burroughs (2000: 113), the conditions under which learning will occur most successfully for the group of learners in a particular class at a particular time. This role of creating a conducive climate may not be easy to perform, especially for a mathematics educator. According to Visscher (1999:296) educators' behaviour in the classroom was especially influenced by their pedagogical-didactical training and by their level of expertise in the subject being taught. For a sensitive subjects like mathematics, many educators would really need to be well trained in it before achieving any significant improvement in learner performance. Stressing the point, Robitaille et al (1989:39)

claimed that educators exert an important influence on the way in which learners learn mathematics and on their achievements in the subject.

Principals or school managers should recognize the importance of the inclusion of the educators in the school management. Fraser's definition of the school environment should be taken into consideration. From Fraser's perspective (in Manganye 1994:72) the school environment was defined as the sum of the aspects of the classroom environment within the school. This environment was taken to be characterized by a dimension involving the objectives, attitudes and expectations held by the principle actors in the environment: educators and learners. Collaborative school cultures make an important contribution to both the success of school improvement processes and the effectiveness of the school (Campo 1993: 119). This was similar to the view held by Walberg (in Manganye 1994:53) that the personality patterns of the educator, his or her deeds, values and attitudes predict the climate of his or her classes.

The importance of mathematics was briefly considered in section 1.1.2. To say more, mathematics also commanded a special position from a different perspective. According to Nel (1990:129) mathematics is the

only subject where order and previous learning is critical; for example, it is impossible to do long division if you could not multiply nor subtract if you could not add.

Close cooperation and collaboration between the management and the mathematics educator is necessary in order to avert the appalling situation in the performance of the subject. The sensitivity of mathematics was further investigated by Lockheed and Bruns (1990:8) who concluded that at school level, factors like class size, the number of teaching hours for a subject and the school's organizational complexity accounted for nearly two-thirds of the variance in mathematics achievement but only about one-third of the variance in Portuguese achievement. This finding implied that a school management team insensitive to school level factors could adversely affect the attitude of a mathematics educator towards school and hence the achievement of learners in the subject.

2.3.2.3 Teaching load

It is the duty of the principal to allocate responsibilities to educators. Brown (1997: 172) argued that if mathematics was a style of activity rather than a list of content in a curriculum, the task of teaching was not one of delivery but one of initiating learners into specific styles of

activity. Since the mathematics ‘owned’ by the educator, according to Winter and Sweeney (1994:66), is part of him- or herself, his or her task was to be seen in terms of helping learners to build on the mathematics they already had in themselves. Initiating learners into specific styles of activity and helping learners to construct their ‘own’ mathematics required the educator to spend more time with learners; hence the advocacy for more time in a particular class and preferably in a small class.

Investigating why Japanese and Chinese learners outperformed their American counterparts in mathematics and science, Stevenson Harold and Stigler (1992:105) found that one of the reasons was that American learners viewed learning mathematics as a process of rapid insight rather than of lengthy struggle. The implication here was that teaching mathematics was a lengthy process. Our learners of mathematics had therefore to be taught to be patient and inquisitive in order to learn and master mathematical concepts. This required a mathematics educator to spend adequate time with the learners.

Research conducted by Robitaille et al (1989:222) concluded that when a learner needed help and received it, achievement showed relative increase, not decrease. This emphasized the fact that

mathematics educators needed more time to inculcate the subject matter and encourage their learners, besides having a good command of it. In an attempt to improve achievement in mathematics internationally, the educators' role has kept changing. In his literature study, Brown (1997:16) found that this role had changed considerably from being a transmitter of mathematical knowledge to that of an organizer, planner, facilitator, questioner, helper and monitor.

In consequence the educator was to spend more time listening to the learners than the learners to the educator, formulating questions and monitoring tools. Ample time for a mathematics educator to interact with learners was essential yet he or she spent too much time on non-teaching tasks like preparing lessons, correcting work, attending meetings, etcetera.

In this investigation, the literature study has revealed that the teaching of mathematics was changing worldwide and faster than any other subject. This was therefore a consideration that was to be granted to the mathematics educators who had a great deal to keep abreast of. On this score, the principal could probably allocate fewer classes with more periods to the mathematics educators.

2.3.2.4 Teaching time

The violation of teaching time is generally a matter of debate, if not conflict. Before democracy as stated by Winter et al (1994:67) emphasis on such focuses as academics, sporting activities or music was often the prerogative of the principal. Some principals who were very interested in sport, for example, interfered with the government stipulated tuition time and to date many schools are battling to overcome it. The management should always respect the tuition time and possibly create more time for extracurricular activities using Saturdays as an option. According to Sampson (2002: 69) extracurricular activities help to develop leadership and social skills and to strengthen self-esteem, all valuable not only for educational success but for success in life as well. Good as such activities may sound; section 2.3.2.3 showed that educators and especially mathematics educators need more time for their learners. Interference should be very minimal, hence allowing schools to perform their duty as academic institutions. This feeling was affirmed by Seretlo (1973:19) who claimed that the home influence was stronger than that of the school; therefore one way of offsetting any aspects of home influence which may adversely affect the learner's attitude towards mathematics and science was to reinforce the school's influence.

2.3.2.5 Supervision

The Department of Education is under pressure from the general public to improve the matric results particularly in mathematics, where more learners are doing standard than higher-grade papers. Some requirements and needs for teaching mathematics have already been elaborated upon in section 1.2. The principal, who also has to put pressure on the mathematics educators, may find himself or herself in an antagonistic situation.

Orton et al (1996:2) established that when schools are under pressure to succeed, their performance is worse and the success rate lower and what was more there was the likelihood of developing a negative attitude towards what was expected to be done. Pressure made it more difficult for an educator of mathematics at any level to aim to teach for the enjoyment of learning mathematics rather than for final examination success. Krutetskii (in Nel 1990:86) affirmed that success in mathematics depended on the learners' interest, inclination and abilities. Two points were emphasized as aims in teaching mathematics, which were, absurdly, being ignored. These were firstly to ensure appreciation of the subject and secondly to develop those skills in computation for which the learner was ready. The amount of pressure exerted by the principal should be commensurate with the

prevailing working spirit; for example where there is a healthy spirit, pressure on the staff should be minimal.

Any curriculum can be subdivided into three levels: the intended, the implemented and the attained. According to Hughes et al (1998:4) the intended curriculum is the one specified at national level; the implemented is the curriculum interpreted and delivered by the classroom educators; and the attained curriculum is the part of the curriculum learnt by the learners, as demonstrated by their achievement and attitude. Excessive pressure, lack of time and motivation may force the educator to opt for the implemented curriculum that covers more topics, regardless of whether learners achieve or not. In most cases it was the principal with good leadership and management that could guide and inspire the staff in getting things done efficiently and effectively, who would be able to motivate the mathematics educators to aim for the curriculum most beneficial to the learners.

Educators were increasingly being expected to do what they are told; so claimed Clement et al (1996:112). This resulted in the de-skilling of educators. The need for the school managers to change in favour of the regulations and rules of the democratic government was necessary

to avert scenarios like the one above. Mathematics educators needed to take more initiative in their own world of creativity. Clement et al (1996:113) pointed out that educators, who are free to use their initiative, influenced the climate of instruction in their schools far more than their formal role would seem to permit.

In execution of their duties as school managers, it would improve educators' morale if principals complied with the call of Jaworski et al (1999:83) that it is necessary for school leaders to work alongside educators in their classrooms, to face the problems together and find local solutions. This is an invitation to principals to spend more time involving themselves in classroom affairs. The description of good supervision is a reward for creating a positive attitude towards a situation. The high expectancy success theory propounded by Chapman (1987:13) stated that the more you expect (attitude) from a situation, the more success you will achieve. Therefore the more the educators are motivated, the greater the expected output.

2.3.3 The relationship between the educators and their learners (LEAR)

2.3.3.1 Introduction

The bond between educators and their learners is very important. It determines not only their attitudes towards one another but also has a bearing on the learners' achievement. If educators enjoy a warm relationship with their learners, they become likely to exhibit a positive attitude towards school. Such educators enjoy associating with their learners. Many of them, as concluded by Rathvon (1999: 74), did not dodge lessons and even organized extra classes without being requested to do so by the school management. The attendance at such classes by both educators and learners, according to Ward (2004:67), significantly increased learners' performance.

2.3.3.2 Educators' personality

Every class and indeed every learner desires a quality educator. The good educator respects all learners and accepts them positively and unconditionally. Such a reception could avert the racial tension in many of South Africa's schools and so enhance the attitudes of whites serving in black schools and vice versa.

A combined study by Will, Newman and Schwager (in Moyana 1996:78) established that at all grades a sense of personal relatedness with the educator is important in determining learners' willingness to

seek help from him or her. That is a vital requirement for proper learning and teaching to take place.

The learners' attitude towards school and schooling can affect the educators' attitude as well, but a good educator's personality can correct the learners' adverse attitude. It is this positive personality that possibly addressed the fears of Smith (1974:1) who proclaimed that the learner's attitude towards the educator affects what he learns, what he or she remembers, and what he does. This implied that a learner's achievement depended on his or her relationship with the educator. Hence the evaluation of the learner's attitudes; his feelings for and against things, assumed a fundamental role in the educator guiding the learner. Fontana and Haladyna (in Manganye 1994:39) concluded that although no research findings existed to demonstrate the actual determinants of learners' attitudes towards school the possibility that the educator was the most powerful factor in developing such attitudes could not be underestimated.

2.3.3.3 Educators' authority

The educator's authority may determine his or her attitude towards learners and the school at large. The educator whose authority is not accepted by learners is likely to dislike both the learners and the

school. Such an educator may be lacking confidence in the execution of his or her duties. Prinsloo, Vorster and Sibaya (1996:53) stated that any assertion of authority begins in the classroom. An educator who is well versed in his or her subject content and has the art of delivering the content would generally find his or her authority emerging automatically; so claimed Rathvon (1999:43). A confident educator therefore does not impose his or her authority upon learners; rather, an authoritative relationship is established only after the learner willingly accept what the educator say and do.

2.3.4 The relationship between educator and colleagues (COLL)

Educators' attitudes towards school were also affected by the relationship among the teaching community and educators put a high premium on positive staff relationships (Steyn 2002:88). A cooperative atmosphere boosts one's commitment to the school. Tukani (in Schulze et al 2003:146) focused on the role played by colleagues in motivating one another. The findings revealed that motivation was contagious and that eager colleagues significantly influenced educators. Many educators were also positively influenced by teamwork and effective communication. Comparing the young and more experienced educators, Schulze et al (2003:147) concluded that younger educators needed to have their confidence boosted by praise

and assistance while older and more experienced educators wanted to build positive relations with peers in order to create a support base. The school's organizational dynamics, for example openness and harmony among teaching colleagues, affected the performance of the learners. Some schools, which were autocratic, had the tendency to affect educators' attitudes negatively. A healthy relationship between the educator and his/her colleagues benefited the learners. Cooperation among educators especially of the same or related disciplines was not only good for improving their attitude towards school but also for the performance of the learners. Free sharing of ideas on for example teaching methods and subject content was a vital part for academic and social progress (Moyana 1996:45). Moyana almost concurred with Smith (1974:3) that there was little evidence to support the assumption that an educator can use different methods equally well or that different educators are equally capable of teaching by similar methods hence a need for collaboration. Haggarty (1995:18) also acknowledged that educators are different from one another. Diversity therefore, enhanced by cooperation, could positively affect an educator's attitude towards school and create a fertile ground for improving on his or her ability.

Mathematics, with its unique nature as indicated in section 1.1.2, required a scheme of work drawn up in collaboration with educators serving in related disciplines like physical science, geography and economics to help in the application and clarification of the basic concepts. A mathematics educator may for example explain the concepts of scale to geography learners. Their dependency on one another binds educators together and cements their social understanding. The benefit of the idea that two heads are better than one was also highlighted by Gavosto et al (1999:85), who claimed that future employers have discovered that they no longer need human robots but flexible thinkers who can work in teams so as to solve problems with tools appropriate to the task.

2.3.5 The relationship between the educator and the discipline of mathematics (MAT)

It was noted from the outset that possibly a confident educator was one who had a good command of the subject and the art of its delivery. A command of the subject enabled one to welcome questions from learners with ease while the art of delivery made it possible to use more than one teaching style with relative comfort Fisher (1995: 17).

Educators' attitudes towards mathematics and the school intertwined had a direct effect on their learners' achievement. Brimer et al (1985:104) found a positive correlation between the flexibility of one's teaching style and the educator's attitude towards mathematics. Visscher (1999:141) stated that an educator's preparedness in the sense of knowledge of subject matter and in the sense of pedagogical knowledge had shown empirically to matter as far as achievement was concerned. In the same view, Guyton et al (2004:167) found many studies that supported the claim that knowledge of the subject matter was an important variable in determining the variance accounted for in predicting educator effectiveness. The more flexible the educator was, the more enjoyment and the better the achievement amongst learners.

While discussing the question of learner motivation, Haggarty (1995:81) emphasized the importance of the style of teaching when he affirmed that the key to motivation was to provide variety in the classroom; if the learners were motivated life would be easier for the educator and this was where style came in. Perhaps educators' lack of style or command of the subject content could be the cause of mathematics being perceived as a boring subject.

2.3.6 The relationship between the educator and the home support for learners (PAR)

It is necessary for the educator to know the background of his or her learners. According to Jantjes (1995: 298) parents are a potent force in the lives of their learners and can play an important role in schools. Baurin (in Monyela 1999: 81) concluded that strong parental support resulted in academic achievement. The background of a learner affected his or her attitudes, perceptions, and in school and out of school activities. Sampson (2002: 48) pointed out that while great differences in people's welfare prevail, educational inequalities will also prevail, because there will be inequalities in the extent to which learners come to schools prepared to take advantage of the opportunities which the school can offer. Husen (1967:254) found that parents with higher socio-economic characteristics do a better job of preparing their learners for school than do parents with lower socio-economic characteristics. Homes should be in position to provide conditions conducive to study. The provision of furniture, a lighting system, a quiet place, and proper nutrition are cases in question. Both Poulsen (1970:7) and Burstein (1992:32) concluded that the learner achievements could improve significantly when homework was assigned regularly and completed. The importance of parent involvement was also affirmed by Guyton et al (2004:15) who argued

that parents had a direct and powerful effect on learner learning, not only through the learning experiences they provide for their learners during earlier years of development, but also by their continuing involvement in school activities and homework assignments. Asked what elementary and secondary educators would change in order to improve the public schools, the respondents cited lack of parental involvement as the second-largest obstacle to school improvement (lack of funding being the first) (Gonzalez 2002:132). Driessen, Smit and Sleegers (2005:509) concluded that parental involvement was an important strategy for the advancement of the quality of education.

The author considered that the attitude of mathematics educators serving in disadvantaged schools could be affected where parents are hardly able to provide basic requirements for their learners. Wevers (in Steyn 2002: 89) concurred that lack of parent commitment was a great concern to educators. It put more pressure on already overloaded educators who not only had to do their job but also in many cases take over the responsibilities of the parents. Overcrowding made it impossible for many homes to offer a quiet place, just as poverty made it impossible to provide furniture, a lighting system, and even proper nutrition. These problems could well affect the attitude of educators towards the learners and school at large. Amidst all these problems

some learners do succeed: a result that baffled Sampson (2002:3) and led him to explore why and how some impoverished black learners, mostly from the same neighborhood, attending the same school system, do well in school and others, exhibiting what on the surface appear to be the same characteristics, do badly.

Hope does exist, however, because according to Noonan (1976:32) there was some evidence that schools could indeed improve the rate of learning for disadvantaged learners. Noonan did not propose how and what the schools could do in this regard but from this discussion it was evident that an educator or school that developed a positive attitude improved upon the rate of learning. Sampson (2002:3) also found that in the family the parents' attitudes and activities related to schooling had the answer to the learner's achievement at school.

2.4 Summary and conclusion

The above discussion showed that there was a complex network of forces behind the formation of an educator's attitude towards school. Lethoko and Maree (2001:316) also concurred that the inputs of the Department of Education, principals, educators, parents, learners and the community were all essential to tackle problems in a school. While one educator could be demoralized by one factor, he or she would find

consolation in the other factors or forces and so continue serving the school. Because these forces or relationships were important they formed the core of the development of the items in the questionnaire used for this study. The following were therefore considered:

The relationship between the educator and the school management team

A harmonious relationship can better the performance of the learners.

The relationship between educators and their learners.

This symbiotic relationship is important to both parties and can retain educators in the school against the odds.

Relationship between the educator and his/her colleagues.

Working together as a team (cooperation versus competition) can bring about harmony at the place of work and bind educators together.

Relationship between the educator and the discipline of mathematics

An educator needs a good command of mathematics in order for him or her to enjoy a full acceptability in the school by the learners.

Relationship between the educator and the learner's home support.

There was an attempt to establish the educator's attitudes towards the learners coming from homes in different income brackets.

In the next chapter, the investigation focused on the factors that could influence the learners' achievement in mathematics.

CHAPTER THREE

FACTORS INFLUENCING MATHEMATICS ACHIEVEMENT

3.1 Introduction

While it is quite true that a strong background in mathematics is critical for many career and job opportunities in today's increasingly technological society, the author applauds the observation by Moyana (1996:4) that technological development cannot be a reality unless factors related to poor mathematics achievement are identified and feasible intervention programmes are sought to remedy the discontinuance of their mathematical education by academically capable learners at secondary schools. Such intervention programmes should be stressed, as recommended by the South African Association for Research in Mathematics and Science Education. In this regard Jaworski et al (1999:79) found that there was much evidence in Africa that a mere increase in education budgets did not, in itself, improve the education of previously deprived groups. Proper planning had to be done with much caution in order to achieve the intended objective. The idea of spending on the educational infrastructure in the form of books and teaching aids for example was certainly attractive but the mechanism to do it without the money being embezzled mattered a great deal.

It was emphasized by Brown (1997: 37) that especially in this era educators have far less control over the evaluation of the effectiveness of their teaching since teaching cannot be called effective unless learners pass their examinations. Learners cannot be forced to learn. According to Fisher (1995:13) educators' educational accomplishment depended heavily on the learner's preparation, motivation, effort and judgment in selection of courses. This implied therefore that since the educator also became an advisor to the learners, there was more to effective teaching than thoroughly knowing the subject matter, writing clearly on the board, avoiding culturally offensive statements and being punctual. To put it in the words of Orton et al (1996:18): 'Learners will not become active learners by accident, but by design.' The role of the educator is crucial in any approach to teaching mathematics and a positive attitude towards and a belief in what is being done is essential. Orton and Frobisher inferred that the basic role of an educator was to design a method of teaching that required learners to become active and participant learners.

A study by Fisher (1995:32) showed that scientific understanding developed best when learners became active partners in learning, when they were encouraged to see mathematics in its human context and when they could refine their interpretation by means of collaboration with peer and mentor. Winter (1988:32) suggested that decisions about

methodology could be left to the individual classroom educators taking into account the needs of their learners and the purpose of particular lessons. Opportunities could then be made available for exposition by the educator, discussion between educator and learner and between learners themselves, appropriate practical work, consolidation and problem solving including the application of mathematics to day to day situations and investigations.

Factors that have not only retarded the orientation of the attitude of learners, especially African ones, towards science, but have also served to stultify any effort in that direction include, according to the findings of Seretlo (1973:4), home background and environment, religious beliefs, an iconoclastic image of science, language problems, facilities and opportunities. For the purposes of this research, the author considered the latter four factors because they related more closely to the school situation.

Similarly the literature study led to the identification of at least three environmental situations: the home, the school and the peer group. Each of these contained a distinct type of educational environment: the home in which the learner lives, the classroom in which the learner works and the peer group in which the learner plays.

Evidence gathered by Keeves (1974:29) indicated that learners who displayed a higher level of initial performance lived in more educative homes, worked in classrooms served by better educators and formed friendships that were more beneficial to their education. In this chapter the main focus fell on achievement in mathematics by learners and the wide spectrum of factors influencing this, which included the state of the school, what the classroom was, how learners got ready for mathematics, the effectiveness of educators in the achievements of learners, teaching methods and learners' achievement.

3.2 The state of the school

According to Burstein (1992:43) the factors that affected the size of schools had more to do with demography and economics than with beliefs about the effect of school size on educational outcomes. This could be a source of causes that could affect the educators' attitude towards school and possibly the learners' achievement. This potential source comprised the following factors.

3.2.1 Size of the school

As per the introductory note (section 3.2) above, the enrollment in most school was done regardless of the learners' educational outcomes. Especially in disadvantaged communities where poverty was rife, with the institutions lacking basic facilities, the school enrolment was generally not limited, resulting in excessively large classes (Keeves 1972:18). This had an adverse effect on the educator; hence poor learner performance was related to the class size. The relationship between class size and achievement was well supported by many researchers like Keeves (1974:29) who however later asserted that the contribution of class size was such that within the range of sizes, the larger the size of the class the better the performance. For Keeves' investigation the size of the class ranged from 10 to 44 learners. It would be worth investigating whether this result could hold when the size of the class was doubled, as is the size in the disadvantaged schools. The larger the class the more the educator is distanced from a learner; hence the reduction in individual attention.

3.2.2 School and the staffing

Staffing is dependent on the numbers of learners. The Departmental ratio is currently one educator for every 35 learners for high schools Department of Education (2000:25). Urban schools were at an advantage

in that they could easily attract educators. For rural schools, however, attracting educators was a major hurdle. Lack of incentives and infrastructure discouraged educators from going there. This resulted in rural schools exhibiting high enrolments with a skeleton staff that was inevitably overloaded. Insufficient staffing did not only make working conditions difficult but also affected the educators' attitudes. Clement et al (1996:117) found that insufficient staffing showed a negative correlation with learners' achievement. Perpetual poor performance could furthermore cause educators to lose interest in that particular school. Being underachievers or under- performers does not sit well with the affected school or educators.

3.2.3 School facilities

School facilities were taken to include the buildings, furniture and the teaching aids. Buildings obviously provided shelter. The inconvenience of the lack of buildings and furniture impacted negatively not only on the learners' achievement but also on educators' attitudes towards the school. Seretlo (1973:14) also argued that proper facilities for the teaching of science and mathematics are necessary to reduce effectively the barrier between the learner and the goal he or she had been set to achieve. Research by Harbison et al (1992:196) and Mullis (in Moyana 1996:48) indicated that providing quality basic facilities and adequate

writing materials and textbooks improved learner performance. Masutha and Ackermann (1999:243) highlighted the degree to which educational support services were generally lacking in rural South Africa.

While the importance of the use of certain facilities could not be underestimated, frequent use of them had adverse effects. Learners should be afforded the opportunity to develop their imaginative capacity and computation ability. Calculators, for example, are very useful but without them most matric learners cannot do simple sums of addition, subtraction and the like.

3.3 The classroom

Anthony (in Keeves 1972:82) viewed the classroom as a system, whose components comprised not only the educator, but also the learners, the materials and equipment used by the educator and the materials and experiences provided for the learner. A classroom lacking any of those components was incomplete and could not only frustrate the educator but also hinder the learners' achievement. A well-equipped class encourages both the educator and the learners and offers a fertile opportunity for learning.

The classroom is central to the educational process and, continued Fisher (1995:32), it is in the classroom that learners are introduced to the study of mathematics and it is the place where their concepts and attitudes are formed. It was the educator who had the responsibility for transmitting this knowledge to learners. The function of the classroom was stressed by Bloom (in Travers and Westbury 1989:6): 'Beautiful curriculum plans have little relevance for education unless they are translated into what happens in the classrooms of the nation or the community'. Bloom therefore regarded a classroom highly, as a convenient place where such important translations could occur; a place where the educator enticed learners into a receptive mood for learning mathematics by, say, using practical examples common to the life experiences of the learners.

3.4 Learners getting ready for mathematics

A number of factors aided learners' success. It was essential for the mathematics educators to be aware of them in order to prepare the ground for the teaching and learning of the discipline in question.

3.4.1 Medium of instruction

The medium of instruction is the language used in the teaching and learning process. It could be a learner's first language if it is his or her

mother tongue or second language if it is an additional language. The importance of the medium of instruction cannot be underestimated. To Leavis (in Weimann 1986:9) language is a vehicle for discovery and not merely a means to communicate. Language is used to put new ideas into words; it is used to combine new ideas with ones, which already existed; and according to the contribution of Weiman (1986:16) it could be used to test this new thinking in other people.

Fluent use of the medium of instruction as a facilitator of both teaching and learning was a must for both educators and learners. For rural schools of the disadvantaged communities of South Africa the language of instruction was a major problem and consequently many educators were reluctant to serve in these areas (Mhlanga 1995: 99). Not only learners but some educators also had difficulty using the English medium of instruction in the teaching of mathematics and so turned to code switching, thus using their mother tongue. This however was to the detriment of the learners if used excessively.

Educators in rural schools needed to be more creative and resourceful. The availability of teaching aids is paramount. Mhlanga (1995:15) warned that some concepts taught in subjects such as mathematics did not have equivalents in many of the African languages, with the result that neither

the learners' background nor the mother tongue could be used to mediate the learning of such concepts. The concept of a logarithm could be one of the many examples that had no equivalent in many mother tongues. The warning was given by Kunene (1996:68) that to teach a learner in a language he or she did not know was the best way to kill his or her interest in both the new language and the subject he or she was to learn. While one could think this was a challenge to English language educators, the Department of Education in South Africa thought it wise to introduce language across the curriculum where every educator in every subject was encouraged to offer lessons in English as well. The government proposed to develop all the other eleven languages to the level of using them as media of instruction, but until this time is ripe, English should be encouraged to facilitate the teaching and learning of the learners.

When educators and learners become frustrated they feel an African language should be developed to become such a medium. The author believes this could take time as long as Western Education is being embraced, and shares this view with Seretlo. Seretlo (1973:20) remarked that the task of developing the African languages to the level where they would eventually replace English as a medium of instruction seemed a most difficult one and the goal, in the light of the progress made so far,

unattainable. To supplement this argument Seretlo (1973:4) pointed out that the advancement of modern science had brought with it a new terminology, which was moreover far removed from a natural language.

3.4.2 Role of previous performance

Previous knowledge was of great importance to the learner. The knowledge of mathematics, brought over from Junior Secondary to Senior Secondary, was therefore necessary for the learner's success in higher mathematics. In this respect, Keeves (1974:3) found that a powerful factor influencing the present performance of a learner was his or her past performance. Guyton et al (2004:7) also stated that one's existing knowledge served as a basis for all future learning and filtered all new experiences. If mathematics educators could offer to each learner an opportunity to enjoy a certain degree of success, it would not only motivate but also prepare a learner for the future courses. Baur and Olsen (in Nel 1990:19) summarized the argument well. They concurred that learning to solve a problem was the principal reason for studying mathematics. Problem solving was the process of utilizing previous acquired knowledge in the resolution of a new and unfamiliar situation.

The absence of a public examination before matric was very demotivating to educators and consequently they prefer to serve in high schools

because these run from grade 8 to grade 12. Here educators are given ample time to train and prepare their learners for matric examinations. Alternatively many dislike serving in senior secondary schools that run only from grades 10 to 12 because of the insufficient time to prepare learners who are feared to have come inadequately prepared from many of the junior schools.

3.4.3 Learners' attitude and anxiety towards mathematics

Hughes et al (1998:44) and Husen (1967:149) found that academic performance was supported by learner perceptions and that liking mathematics was positively related to higher achievement. While this is true, Wong (in Moyana 1996:71) established a consistent, negative relationship between mathematics anxiety and performance. Anxiety produced tension and tension could interfere with the process of solving mathematical problems, hence leading to poor achievement in mathematics.

Learners possess a plethora of experiences that can be exploited by the educator in the process of learning. Mullis (1991:201) affirmed that learners come to the mathematics classroom with a wide variety of skills, prior knowledge, work habits, attitudes and beliefs that interact with learning. Good mathematics educators identify and better the learners'

experiences or rectify them in order to boost performance. The findings of Husen, Mullis, Hughes and Howie as referred to above pointed to the critical role of the mathematics educator. If learners are to better their performance, the educator would have to motivate them to a high degree. The extent to which an educator motivated learners hinged upon factors like the former's attitude towards school, mathematics itself and the learners. A discussion on learner motivation is found in section 3.4.6.

Smith (1974:17) stated that attitudes established over a period of 8 to 10 years were difficult to change. Lasting attitudes were developed at each grade level but the late elementary grades and the seventh grade were of greatest importance in developing attitudes. The implication of Smith's findings was that attitudes could be changed though not easily. The challenge for educators was to maintain a positive attitude in view of the conclusion by Yager and Penick (in Manganye 1994:18) that although learners in elementary school perceived science to be enjoyable, interesting and useful, a decline in attitude occurred throughout junior and high schools, which could possibly be contributing to poor performance in high school mathematics.

3.4.4 Peer influence and performance

Just as people say 'Tell me whom you move with and I will tell you who you are' implying the great influence of one's peers or friends in one's

educational goals, Reynolds (in Moyana 1996:64) identified peer attitude as one of the most influential factors in the learners' mathematics achievements. The author concurs entirely with Harbison et al (1992:101) that education is conveyed not only by parents and educators but also by other learners in the school. Monyela (1999: 82) observed that when these other learners were positive about school, when they aspired to complete the higher grades, and when they were generally engaged in the learning process, the individual learner was expected to perform better than when other learners held more negative attitudes. Educators could therefore strive to motivate as many learners as possible both to harmonize the school climate and to affect learner performance.

3.4.5 The learner and the environment

Unlike rural learners, Evans (in Budhal 1993:56) found that town learners developed a wider range of scientific interests at an earlier age. Likewise Manganye (1994:78) agreed that the earlier a learner is exposed to the scientific world, the more positive his or her attitude becomes likely to be towards science. This probably explained why mathematics was studied fairly well in urban rather than in rural schools. This point was also noted by Noonan (1976:78) in Scotland. Noonan found that schools serving learners with less advantaged backgrounds tended to have educators with fewer years of training and a larger size of classes than schools

serving learners with more advantaged backgrounds. Noonan's findings deserve special attention in view of the South African government's attempt to redress the past imbalances. An incentive may be needed to attract capable educators to serve in rural areas of South Africa.

3.4.6 Motivation of learners

Husen (1967:250) found a strong relationship between learners' educational and vocational plans and their mathematics scores. Learners who aspired to higher education performed better in mathematics tests than those who did not have such aspirations.

Seretlo (1973:18) pointed out that if the African learner never saw a Black professional scientist, never saw a Black engineer, he or she didn't know there were any - how could he possibly aspire to become one! Peterson (in English and Halford 1995:275) concluded that learners with a positive attitude might persist longer in the face of poor understanding than their counterparts with a negative attitude. Perseverance rewards, so it is said, but it is the ones who are motivated that persevere.

Hence mathematics educators must motivate their learners. A study by Budhal (1993:53) indicated a high positive correlation between interest in school subjects and achievement in those subjects; an interactional effect

was also present because a high level of achievement in a subject tended to increase one's interest in it. Any learner's lack of interest on the other hand jeopardized the educator's good intentions for his or her class. Mathematics educators wished that learners were somewhat more enthusiastic about mathematics and perhaps that they had a more realistic view of the importance of mathematics to their future and in their everyday lives. This desire could only be realized by the initiative of educators themselves. Good teaching methods and subject guidance must rate highly in this respect. Prinsloo et al (1996:66) advised that guidance regarding subject components should be an integral part of the schooling system. Greater awareness amongst learners would inevitably help in boosting their interest in the subject and in achievement. Collis (1970:23) asserted that the lack of communication between an educator and the majority of the class could be due to a basic difference in orientation towards the subject matter of the discipline concerned. The consequences of an educator having a good command of the subject matter have already been highlighted. Moyana (1996:29) furthermore stated the importance of guidance in that knowledge of possible occupations enabled the adolescent to strengthen his or her background in prerequisite school subjects. Iben (in Moyana 1996:66) established that the attitude that mathematics is a useful subject was an important predictor of early adolescent success in mathematics. And Wither (in

Moyana 1996:67) noted that learners who see mathematics as valuable may not experience high levels of anxiety regarding tests and numerical manipulation, and that this further significantly correlated with achievement in mathematics.

3.5 The effective educator and achievement of learners

In this context the effective educator was considered as one whose impact caused learners to better their achievement or elevated their level of knowledge. The following factors point to such an educator:

3.5.1 The educator and his or her experience

Some research findings indicated that learners' performance was positively related to the educator's experience. This finding may attribute poor performance in rural and disadvantaged schools to a lack of experienced educators who shun such schools. While Lockheed and Komenan (in Moyana 1996:41) documented a significant positive relationship between educator experience and learner achievement, Chen (in Moyana 1996:41) found no such relationship. On the contrary, Mullis (in Moyana 1996:41) cited a lack of consistency in the relationships between educators and their learners' mathematical achievements across the United States of America.

Whether there is a relationship or not between experience and the achievement, this research ought to shed more light on the issue. The author also believes that any educator can do a wonderful job provided he or she has the ability to motivate learners.

3.5.2 Education and training

One may be intrigued by the general assumption expressed by Robitaille et al (1979:46): the sounder an educator's foundation in mathematics, the more likely it was that the educator had a deep commitment to the subject, could see where topics lead, could make links between topics, could respond to learners' questions with confidence and could draw on interesting and relevant applications. In the same vein Guyton et al (2004:6) believed that active learning accounts for educators' current knowledge, conceptual and reflective capacities, and motivations, and includes complex, new and highly engaging experiences such as mentoring, demonstration teaching, observation, self-assessment and reflection, review of learners' work, and presentation of the results. This assumption could hold in this country if certain conditions like the educator being satisfied with the working environment and being able to motivate his or her learners are met.

Lockheed and Komenan (in Moyana 1996:39) observed a consistent positive relationship between formal educational attainments of educators and learner achievement. While Husen (1967:37) found that learner performance tended to be slightly better with educators who have had more training, although the relationship was admittedly a weak one; Moyana (1996:122) established no significant difference in mathematics achievements by learners taught by better-qualified educators and those taught by less qualified ones.

If there is no definite relationship between the level of educator training and the learners' achievements in mathematics, the reason why some schools were not achieving well in mathematics remains a mystery and was therefore worth investigating. The idea that educators' attitudes towards school could probably be the major cause of learners' poor achievement prompted this research topic.

3.5.3 Educators' characteristics

What kind of educator would best tap the potential of, in particular, the poor disadvantaged rural learner, the learner with a medium of instruction problem and attending a school that lacks facilities! From the Educator Characteristic Rating Scale, Ryans (in Manganye 1994:53) observed that successful educators tended to be warm, understanding, friendly,

responsible, systematic, imaginative and enthusiastic. These qualities integrate well into Robitaille and Gorden's assumption in section 3.5.2. A sought after educator was one who strove to practise the above qualities.

3.6 Learners' achievement

Educators' attitudes towards mathematics as well as towards learners were found to influence learners' achievement. Tooke and Mudeliar (in Moyana 1996:35) not only discovered a strong relationship between educators' attitudes towards mathematics problem solving and learners' achievement but also asserted that educators' attitudes towards mathematics had a strong bearing on learners' attitudes to and achievement in mathematics. Ellis et al (2005:94) stated that skilled educators exhibit greater competence, which, in turn, generates better results. Perhaps the crucial role of a mathematics educator was expressed in the declaration by Clark (in Budhal 1993:61) that the greatest impact the educator exerts on learners' development of interest in mathematics is when the secondary school mathematics educator develops and executes an appropriate task designed to increase the likelihood of learners' continued successful participation in mathematics, by responding to the changing needs of learners. Secondary school learners are mostly adolescents who therefore are not yet adults and could be influenced substantially by educator attitudes and behaviours of

which the educator may not even be aware (Ryan and Cooper in Masuta et al 1999:243).

3.7 Teaching methods

The influence of the educators' and their teaching methods seemed to have the greatest effect on the development of learners' interest in mathematics. The Curriculum and Evaluation standards for school mathematics, published by the National Council of Educators of Mathematics (1989), highlighted the importance of learners being actively involved in their learning. According to English et al (1995:11) the council endorsed teaching methods where learners were offered an opportunity to 'construct, modify and integrate ideas by interacting with the physical world, materials and other learners.'

The following teaching methods could ignite the interest of the learners and boost their achievement in mathematics.

3.7.1 Cooperative learning

Cooperative learning methods are increasingly being used as a vehicle for the inclusion of learners with different abilities: learners benefiting from the diversity that characterizes our schools, communities and society at large.

Gavosto et al (1999:85) claimed that future employers have discovered that they no longer need human robots, but flexible thinkers who can work in teams to solve problems with tools appropriate to the task. Indeed in order for individuals to be successful in this twenty- first century, they will need to learn how to live and work with people who are different: different in colour, ethnicity, cultures and abilities. As a result of the above, cooperative learning could be seen as appropriate training for future employees. A combined study by Sutton, Abrami, Chambers, D'Appollonia and Farrel (in Moyana 1999:45) found that cooperative learning experiences tend to promote higher achievement than do competitive and individualistic learning experiences; it also established a positive relationship between educator use of cooperative learning strategies and learner achievement.

Slavin (in Putnam 1998:44) stated that cooperative learning is an instructional tool that capitalizes on one of the greatest untapped educational resources available: the learners themselves. Putnam (1998:24) argued that cooperative learning results in higher learner achievement, increased learner self-esteem, and improved peer relations. True friendships and support systems rarely develop when

learners are physically or socially separated from peers or other members of the community.

3.7.2 Discovery method

The author believes that the achievement of complex types of critical thinking (higher mental processes) was not likely to be attained by simple lecture methods or by merely telling the learners what they are to do or how they are to do it. Clements et al (1996: 63) found that demonstration of appropriate problem solving processes is not very effective in bringing about actual problem solving competence.

The learner's own discovery could be the fairest approach. The availability of adequate instructional activities was therefore essential for a productive teaching-learning process in which learners could offer a substantial constructive input.

Classroom processes such as sharing, discussion or negotiation were valued throughout the literature consulted. Krainer (in Jaworski 1999:139) acknowledged that 'an epistemological understanding of learning which sees the learner as an active producer of knowledge rather than as a consumer' necessitated the discovery method of teaching. The educator must provide a situation in which there is something to discover. To sum

up, Freudenthal (in Sierpinska and Lilpatrick 1998:287) urged that the objective of realistic mathematics education was that the mathematics the learners develop by themselves is experienced as a developing “common sense”; just as English et al (1995:264) stated that research in the last decade has presented convincing evidence that learners behave strategically, are able to direct their own learning and acquire acknowledge of the domain in which they are working.

3.7.3 Questioning method

This method was as important as the concern expressed by Waerner et al (in Manganye 1994:3): that scientific attitudes such as feeling the need to verify data, a willingness to have one’s ideas questioned and the willingness to change an idea or concepts when new evidence is presented, should be an outcome of proper science teaching. In this respect Seretlo’s observation deserved a special mention and attention. According to Seretlo (1973:5), in the traditional African culture, free inquiry and a search for truth as well as an understanding of the environment gained by scientific methods are elements which are sadly lacking. Educators need the skills of questioning in order to woo their Black learners into an inquiring attitude. The author’s experience as a mathematics educator has taught him one thing at least, possibly the

most important: if you show somebody how to do a problem you stop that person thinking.

Problem posing was an important companion to problem solving and lay at the heart of mathematical activity. As remarked by Moses, Bjork and Goldenbery (in English et al 1995:258) and Mnyandu (2000:58) we learn mathematics particularly well when we are actively engaged in creating not only the solution strategies but also the problems that demand them.

3.8 Summary and conclusion

Motivating learners was important to the educator as a prerequisite for his or her learners' achievement in mathematics. Educators should encourage diversity in teaching styles even as they take into account diversity in learning styles. Different styles will reach different learners; allow all learners to experience learning in more than one way. The key to motivation was providing variety in the classroom. If learners are motivated life becomes easier for both the educator and the learners.

Lebesgue (in Sierpinska et al 1998:374) put this point strongly: 'The only instruction which a professor can give, in my opinion, is to think in front of his learners.' Thinking out loud in front of the class has produced wonderful results for the author and is worth emulating.

In short, the most important conclusions of this chapter are:

It is the educator's responsibility to motivate and prepare the learner to comprehend, master and utilize the concepts taught. This responsibility could more thoroughly be executed if the educator exhibited a positive attitude towards school.

An educator's experience, education and training are desirable components for improving a learner's achievement in mathematics. These aspects formed the basis for the construction of items for the questionnaire.

The school itself in terms of enrolment, staffing, and facilities was a prominent factor in the teaching and learning of mathematics.

For the learner to be able to achieve, the following came into question: the command of the medium of instruction, previous performance, peer influence and the learner's feelings towards mathematics.

The next chapter is devoted to the planning and execution of the empirical investigation. The literature study gathered in chapters 2 and 3 formed the basis for the formulation of both the hypotheses and the items of the questionnaire. The testing of the hypotheses was performed by using F – test and t – test analysis.

CHAPTER FOUR

THE EMPIRICAL INVESTIGATION: PLANNING, METHOD, EXECUTION AND RESULTS

4.1 Introduction

This chapter discusses the research design used to investigate the selected factors that influence an educator's attitude towards school: the school management team, fellow colleagues, parent support for learners, the learners themselves and the subject of mathematics itself. It also sheds light on the relationships these factors had to the achievements of the learners and to other variables such as the educators' gender, age, education, teaching experience and the post held. Steyn (2002:83) stated in this respect that motivation and morale (attitude) were affected by different factors, depending on age, gender, qualification, experience and resources.

Hypotheses with reference to these variables were formulated. The procedures used to test these hypotheses were discussed and explained.

4.2 Objectives of the empirical investigation

The following were the objectives of the empirical investigation:

4.2.1 Literature study

As a result of the literature study, chapters two and three, a questionnaire was compiled with the aim of gauging an indication of the respondents' attitude towards:

- The school management team (SMT)
- Their colleagues (COLL)
- The parent support for learners (PAR)
- The learner (LEAR)
- The discipline of mathematics (MAT)
- The whole school in totality (TOTAL).

In addition some biographical data was collected from the respondents: These were: gender, age, education attained, teaching experience and the post held. The aim of having these variables or dividers was to find out whether there was a significant difference between the groups in each divider regarding their mean attitude towards the affective factors in the school.

4.2.2 Statistical techniques

The aim was to determine, by the use of appropriate statistical techniques:

- Whether there existed significant differences between each of the independent variables, SMT, COLL, PAR, LEAR, and MAT, if the following variables were used as dividers: gender, age, education, teaching experience and post held.

- What relationship existed between each of the independent variables SMT, COLL, PAR, LEAR and MAT and the dependent variable, which was the learners' achievement in mathematics!

4.3 Planning and execution of the empirical investigation

4.3.1 The research group

Participants were selected from the high and senior secondary grade 12 educators of mathematics in the Eastern Cape Province of South Africa, in particular the Libode Mega District that consisted of the former districts of Libode, Ngqeleni and Port St Johns, the Lusikisiki District comprising the former districts of lusikisiki and Flagstaff; and the Umtata District comprising Umtata and Mqanduli.

High schools and senior secondary schools were chosen because at this stage is where the first public examination, the yardstick of the learner's and educator's performance (matric), is written. Districts were

chosen by way of proximity since the researcher intended to convey the questionnaire to these schools personally.

Because of the problems experienced, as narrated in section 4.3.11, the final sample consisted of 46 mathematics educators.

Sample characteristics

In tables 4.1 – 4.5 the sample characteristics were described in terms of gender, age, education level, teaching experience and post held.

Table 4.1 The research sample in terms of gender

Gender	N	%
Male	27	(58.70%)
Female	19	(41.30%)
Total	46	(100%)

More males participated than females but there was an acceptable representation of both genders.

Table 4.2 The research sample in terms of age

Age (years)	N	%
20—30	11	(23.91%)
31--40	25	(54.35%)
41--50	5	(10.87%)
51+	5	(10.87%)
Total	46	(100%)

The age category 31 years – 40 years represented the highest percentage.

Table 4.3 The research sample in terms of education level

Education level	N	%
Diploma	18	(39.13%)
Degree	7	(15.22%)
Degree plus Diploma	21	(45.65%)
Total	46	(100%)

The sample consisted of well-qualified educators with no one holding only a matriculation certificate.

Table 4.4 The research sample in terms of teaching experience

Teaching experience	N	%
Less than 5 years	9	(19.57%)
5—9 years	16	(34.78%)
10—15 years	11	(23.91%)
Over 16 years	10	(21.74%)
Total	46	(100%)

The vast majority of the sample comprised educators having between 5 and 15 years of teaching experience.

Table 4. 5 The research sample in terms of post level

Post level	N	%
Educator	30	(65.22%)
H.O.D.	12	(26.09%)
Deputy Principal	2	(4.35%)
Principal	2	(4.35%)
Total	46	(100%)

The vast majority of the sample comprised post level one educators.

4.3.2 Ethical considerations

As will be seen in the discussion of the administration of the questionnaire (section 4.3.12), it was absolutely necessary to obtain permission from the school managements in order to conduct the research since the educator's information and learners' matric results were all attached to the schools. Copies of a letter of request to conduct research into the attitudes of mathematics educators (see appendix 1) were sent to the school principals.

4.3.3 The pilot study

It was necessary to establish whether the questions were clear and understandable. The questionnaire was therefore administered to a group of five mathematics educators. During this exercise, it was noted that the respondents could follow questionnaire instructions and responded to them without difficulty and that the items in the questionnaire were well understood. It was therefore not necessary to change the wording of the items in the questionnaire.

4.3.4 Measurement of academic achievement

For every learner, the matric pass mark in mathematics that he or she obtained for the year 2003 was used as a measure of academic achievement.

4.3.5 Construction of the questionnaire

The literature study (chapters two and three) constituted the backbone of the eventual construction of the questionnaire. Attention was focused on the fact that good survey questions give the researcher valid and reliable measures. The respondents should also feel that they understand the question and that their answers are meaningful. Questions that are beyond a respondent's perception or which are confusing are not good measures (Anntonon 1967: 176). To ensure the reliability of the questionnaire, the following guidelines were used, as given by Schumacher and McMillan (1993; 240).

- Make items clear

Vague and ambiguous items should be avoided. Words such as 'a few,' 'sometimes' and 'usually' should be avoided as they can make items unclear. For example, it can be difficult for a respondent to know what 'a few' really means.

- Questions should be relevant

It is important that questions should refer to matters, which affect the respondents or those things, which are relevant to them in one way or another.

- Simple terms are preferred

Items should be, as far as possible, simple, easy to understand and easy to respond to.

- Avoid negative items

Negative items can be misleading as the respondents may not give sufficient attention to a negative word when they answer, with the result that they provide answers which are different from what they truly wanted to say.

- Avoid biased items or terms

The wording of the items or the inclusion of certain terms may result in biased items, which may encourage respondents to give particular responses.

- Avoid double–barrelled questions

Double–barrelled questions contain two or more ideas which are usually connected by the word 'and'. It is possible that a respondent may give two different answers.

- Respondents must be competent to answer

The items should enable the respondents to record their true feeling or opinions. The respondents should feel confident when they give their own responses and this should make the information more reliable.

4.3.6 The format of the questionnaire

Special attention was paid to the warning of Schumacher and McMillan (1993:242) that 'the general layout and organization of the questionnaire is very important. If it appears to be carelessly done or confusing, respondents are likely to set it aside and never respond'. Therefore a well-designed format and appearance could stimulate interest in the respondents and this usually resulted in co-operation and reliable responses.

The following rules as specified by Schumacher and McMillan (1993:242) were strictly adhered to when compiling the questionnaire:

- Number the items and pages
- Print response scales on each new page
- Printing is clear and easy to read
- Instructions are brief and easy to understand
- Avoid abbreviated items
- Keep the questionnaire as short as possible
- Use a logical sequence, and group related items together.

The items in the questionnaire took the form of scaled items; a statement followed by a scale of potential responses: strongly disagree, disagree, agree and strongly agree. The respondents marked

the place in the scale that best reflected their beliefs or opinions about the statement. Schumacher and McMillan (1993:242) believed that the use of a scale is the most suitable for this type of research as scales can be fairly accurate in assessment of beliefs or opinions. The final questionnaire consisted of 58 items (see appendix 2). The grouping of the items is shown in table 4.6:

Table 4.6 Grouping of the items

Section	Item numbers	Total
SMT	1-10	10
Colleagues	11-19	9
Learners	20-30	11
Parents	31-40	10
Mathematics	41-50	10
Biographical	51-58	8
Total		58

4.3.7 Items for the School Management Team (SMT)

From the literature study (see chapters 2 and 3), the school management team (SMT) was selected as one of the affective factors that played an important role in determining the educators' attitudes towards school. The following were examples of the characteristics of

an educator with a positive attitude towards the school management team as identified from the literature study:

- Felt the school management team created a good working climate
- Liked the school management team to check his or her record books
- Considered the school management team to be supportive in resolving problems
- Believed that the school management team treated every educator equally
- Thought that the school management team encouraged educators' professional growth.

These characteristics comprised examples of the operational constructs of the school management team and formed the basis for the construction of items to measure educators' attitudes towards school. Ten items concerning the school management team were formulated.

4.3.8 Items for colleagues (COLL)

In terms of the literature study (see chapters 2 and 3), an educator's attitude towards his or her colleagues (COLL) was selected as one of

the affective factors that played a role in determining his or her attitude towards school. The following constituted examples of the characteristics of an educator who exhibited a positive attitude towards colleagues, as identified by the literature study:

- Shared experiences with ease and happiness
- Displayed an acceptable degree of treatment of colleagues
- Was enthusiastic about team work
- Was sensitive to others' needs
- Offered constructive criticism.

These characteristics constituted examples of the operational constructs of an educator's attitude towards colleagues and therefore formed the basis for the construction of items to measure the educator's attitude towards school. Nine items regarding colleagues were formulated.

4.3.9 Items for learners (LEAR)

The literature study (see chapter 2 and 3) indicated that an educator's attitude towards his or her learners (LEAR) was one of the affective factors that play a central role in determining the educator's attitude towards school. The following characteristics of an educator with a positive attitude towards his or her learners were identified from the literature study:

- The discipline of the learners could be acceptable
- The learners could be enjoying the subject of mathematics
- They could be active participants in the process of the lesson
- Lesson attendance could be acceptable
- The educator could have a desire to monitor the progress of the learners.

These characteristics were examples of the operational constructs of an educator's attitude towards his or her learners and consequently formed the basis for the construction of items to measure the educator's attitude towards them. Eleven items concerning learners were formulated.

4.3.10 Items for parent – learner support (PAR)

From the literature study (see chapters 2 and 3) an educator's attitude towards parent-learner support (PAR) was selected as one of the affective factors that played an important role in determining his or her attitude towards school. The following characteristics of an educator with a positive attitude towards parent-learner support were identified in the literature study:

- Had a desire to invite parents to discuss learners' progress

- Was happy with parent – learner care
- Felt parents were interested in the education of their learners
- Parents endeavoured to attend school activities
- Parents viewed mathematics as a manageable subject like any other.

These characteristics were examples of the operational constructs of an educator's attitude towards his or her learners' parents and therefore formed the basis for the construction of items to measure the educator's attitude towards school. Ten items regarding parents were formulated.

4.3.11 Items for mathematics (MAT)

As a result of the literature study (see chapters 2 and 3), an educator's attitude towards mathematics (MAT) was selected as one of the affective factors that played a significant role in determining the educator's attitude towards school. The following characteristics of an educator with a positive attitude towards mathematics were identified from the literature study:

- Continually tried to improve upon his or her teaching of mathematics
- Preferred to use practical rather than abstract examples

- Liked to have more mathematics lessons
- Believed mathematics was an exciting and not a boring subject
- Saw the importance of mathematics in the formation of the learner's education.

These characteristics were examples of the operational constructs of an educator's attitude towards mathematics and as a result formed the basis for the construction of items to measure the educator's attitude towards school. Ten items with regard to mathematics were formulated.

4.3.12 Administering of the questionnaire

Because of the great distance between schools and their inaccessibility, the researcher opted to post the questionnaire to all high schools and senior secondary schools as specified in section 4.3.1. A letter was sent to the principals or heads of the school and a covering letter to the mathematics educators of Grade 12. A period of one month was given as the deadline to have received all the responses. The covering letter contained the following information:

- The information was to be used for research purposes only

- That it was a questionnaire and not a test so there were no right or wrong answers
- Respondents were to choose the best answer applicable to them and were asked to be as honest as possible
- There was a right to withdraw if one felt uncomfortable
- Their opinions and the names of schools would be treated with strictest confidence.

Only 46 questionnaires were correctly completed out of the 82 sent out. Many opted out, claiming that the information requested was a threat to the security of their jobs despite the researcher's assurances. The data analysis was therefore based on these 46 questionnaires.

4.4 Data analysis

4.4.1 Method used for analyzing data

4.4.1.1 Item analysis

An item analysis was conducted on each of these five sections:

School management team	(SMT)
Colleagues	(COLL)
Learners	(LEAR)
Parents	(PAR)
Mathematics	(MAT)

The aim of any item analysis was to establish whether each item made a significant contribution to the total of the particular section for which it was meant. Where an item made no significant contribution or contributed negatively to the total, that item was omitted from that section. In this way the maximum reliability coefficient was obtained for each section and for the measuring instruments as a whole. The findings of the item analysis for each section are shown in tables 4.7 to 4.11:

Table 4.7 Item analysis of the section relating to the School Management Team (SMT)

Item	Item – total correlation	Alpha if item is left out
1	0.456	0.898
2	0.521	0.891
3	0.673	0.881
4	0.721	0.878
5	0.847	0.868
6	0.478	0.893
7	0.769	0.875
8	0.581	0.888
9	0.730	0.879
10	0.629	0.884

Number of subjects = 46

Number of items = 10

Alpha reliability coefficient = 0.894

In the SMT section, there were no items that correlated negatively with the total, and omitting any of the items would not have increased the alpha reliability coefficient significantly. Therefore all 10 items were retained.

Table 4.8 Item analysis of the section concerning colleagues (COLL)

Item	Item - total correlation	Alpha if item is left out
11	0.337	0.808
12	0.520	0.789
13	0.687	0.769
14	0.536	0.786
15	0.648	*0.773*
16	0.663	0.769
17	0.511	0.789
18	0.314	*0.809*
19	0.524	0.787
20	0.138	0.826

Number of subjects = 46

Number of items = 10

Alpha reliability coefficient = 0.809

In this section, only one item (item 20) had a negligible correlation with the total and excluding it would therefore increase the alpha reliability coefficient significantly. Item 20 was therefore omitted and the other 9 items were retained.

Table 4.9 Item analysis of the section regarding learners (LEAR)

Item	Item - total correlation	Alpha if item is left out
20	0.587	0.753
21	0.584	0.751
22	0.070	0.798
23	0.340	0.782
24	0.293	0.786
25	0.431	0.770
26	0.313	0.781
27	0.556	0.757
28	0.705	0.736
29	0.479	0.763
30	0.501	0.760

Number of subjects = 46

Number of items = 11

Alpha reliability coefficient = 0.785

In this section, there were no items that correlated negatively with the total and omitting any of the items would not have increased the alpha reliability coefficient significantly. Therefore all 11 items were retained.

Table 4.10 Item analysis of the section relating to the parents (PAR)

Item	Item total correlation	Alpha if item is left out
31	0.311	0.708
32	0.293	0.704
33	0.253	0.709
34	0.368	0.691
35	0.502	0.669
36	0.524	0.666
37	0.346	0.695
38	0.567	0.664
39	0.277	0.704
40	0.376	0.689

Number of subjects = 46

Number of items = 10

Alpha reliability coefficient = 0.713

As with the previous section, there were no items that correlated negatively with the total and omitting any of the items would not have increased the alpha reliability coefficient significantly. Therefore all 10 items were retained.

Table 4.11 Item analysis of the section regarding mathematics (MAT)

Item	Item -total correlation	Alpha if item is left out
41	0.308	0.642
42	0.466	0.616
43	0.464	0.609
44	0.415	0.618
45	-0.286	0.778
46	0.483	0.609
47	0.572	0.589
48	0.456	0.616
49	0.482	0.612
50	0.278	0.648

Number of subjects = 46

Number of items = 10

Alpha reliability coefficient = 0.663

Item 45 was omitted from all further analysis because of being negatively correlated. This section therefore comprised the remaining 9 items.

4.4.1.2 Frequencies

(a) The frequency response and mean of each item were shown in table 4.12:

Table 4.12 Response scores and their mean for each item

Item	1	2	3	4	mean
1	2(4.35%)	11(23.91%)	24(52.17%)	9(19.57%)	2.869
2		5(10.87%)	26(56.52%)	15(32.61%)	3.217
3		9(19.57%)	17(36.96%)	20(43.48%)	3.239
4		8(17.39%)	24(52.17%)	14(30.43%)	3.130
5		12(26.09%)	21(45.65%)	13(28.26%)	3.021
6		2(4.35%)	24(52.17%)	20(43.48%)	3.391
7		8(17.39%)	22(47.83%)	16(34.78%)	3.173
8	1(2.17%)	9(19.57%)	23(50.00%)	13(28.26%)	3.043
9		8(17.39%)	29(63.04%)	9(19.57%)	3.021
10	2(4.35%)	10(21.74%)	30(65.22%)	4(8.70%)	2.782
11	1(2.17%)	6(13.04%)	31(67.39%)	8(17.39%)	3.000
12		1(2.17%)	25(54.35%)	20(43.48%)	3.413
13		6(13.04%)	30(65.22%)	10(21.74%)	3.086
14	3(6.52%)	29(63.04%)	13(28.26%)	1(2.17%)	3.260
15	1(2.17%)	4(8.70%)	31(67.39%)	10(21.74%)	3.086

16	1(2.17%)	5(10.87%)	27(58.70%)	13(28.26%)	3.130
17	1(2.17%)	1(2.17%)	25(54.35%)	19(41.30%)	3.347
18		2(4.35%)	17(36.96%)	27(58.70%)	3.543
19		4(8.70%)	26(56.52%)	16(34.78%)	3.260
20	1(2.17%)	4(8.70%)	34(73.91%)	7(15.22%)	3.021
21	1(2.17%)	1(2.17%)	25(54.35%)	19(41.30%)	3.347
22			13(28.26%)	33(71.74%)	3.717
23	1(2.17%)	13(28.26%)	22(47.3%)	10(21.74%)	2.891
24		9(19.57%)	23(50.00%)	14(30.43%)	3.108
25			17(36.96%)	29(63.04%)	3.630
26		2(4.35%)	13(28.26%)	31(67.39%)	3.630
27		2(4.35%)	29(63.04%)	15(32.61%)	3.282
28	1(2.17%)	3(6.52%)	29(63.04%)	13(28.26%)	3.173
29	1(2.17%)	8(17.39%)	25(54.35%)	12(26.09%)	3.043
30	1(2.17%)	8(17.39%)	24(52.17%)	13(28.26%)	3.065
31	4(8.70%)	6(13.04%)	16(34.78%)	20(43.48%)	3.130
32	1(2.17%)	11(23.91%)	23(50.00%)	11(23.91%)	2.956
33	1(2.17%)	3(6.52%)	11(23.91%)	31(67.39%)	3.565
34	1(2.17%)	15(32.61%)	21(45.65%)	9(19.57%)	2.826
35		5(10.87%)	15(32.61%)	26(56.52%)	3.456
36		5(10.87%)	8(17.39%)	33(71.74%)	3.608

37	1(2.17%)	1(2.17%)	8(17.39%)	36(78.26%)	3.717
38		2(4.35%)	14(30.43%)	30(65.22%)	3.608
39		3(6.52%)	24(52.17%)	19(41.30%)	3.347
40		8(17.39%)	21(45.65%)	17(36.96%)	3.195
41			16(34.78%)	30(65.22%)	3.644
42			12(26.09%)	34(73.91%)	3.733
43		1(2.17%)	23(50.00%)	22(47.83%)	3.444
44		3(6.52%)	15(32.61%)	28(60.87%)	3.533
46			18(39.13%)	28(60.87%)	3.600
47			21(45.65%)	25(54.35%)	3.533
48			14(30.43%)	32(69.57%)	3.688
49			13(28.26%)	33(71.74%)	3.711
50		1(2.17%)	12(26.09%)	33(71.74%)	3.688

According to the item analysis, a total of 49 items were retained.

Interpretation

In the SMT section, item 6 was among those with the highest mean score. The frequency showed that educators liked the SMT to check their record books. Item 1 however exhibited the lowest mean score, educators desperately voicing their dissatisfaction with the way the

SMT guided them professionally. This accusation has serious implications for learners' achievements and the SMTs ought to check on their own roles.

In the section relating to colleagues, item 18 displayed the highest rating and educators liked the spirit of teamwork among colleagues. Rather disappointing was item 13 with the lowest rating, where it was revealed that after all senior colleagues were not willing to share their considerable experience. This was not healthy for the smooth running of the school and offered a challenge for the SMT to probe into.

In the section concerning the learners, item 22 emerged with the highest frequency. Every educator agreed that they were doing their best to improve upon the performance of their mathematics learners. Despite their well-intentioned efforts, item 23 undermined them. The frequency showed that learners did not like to ask questions during classes.

In the parents' section, in item 38 educators expressed strongly that they would like to see the level of the support by parents improve. They however conceded that they were not collaborating with parents in

educating their learners, as evidenced in item 34. Both the educator and the parent ought to share the task of educating the learners.

In the section concerning mathematics, the desire of any good educator was well expressed in item 49. This high score showed that educators do not want their learners to miss any of their mathematics lessons. Strangely enough, not many educators needed more mathematics periods for their learners, as seen in the frequency of item 44. This contradiction was a point of concern because any educator would have desired more periods, so as to interact with learners in order to produce better results.

(b) The sections and the mean score frequencies are shown in table 4.13:

Table 4.13 Sections and mean frequencies

Section	Mean
SMT	3.089
Colleagues	3.236
Learner	3.264
Parent	3.341
Math	3.619
Total	3.310

Interpretation

With the mean response of each section having been calculated, the mean attitude towards the school management team evidenced the lowest score. This was followed by the mean attitude towards colleagues and learners respectively, each of which fell below the mean attitude towards the school in totality.

(c) The mark frequencies are shown in table 4.14:

Table 4.14 Mark frequencies

Mark	Frequency	Percent	Cumulative frequency	Cumulative percent
12	2	4.35	2	4.35
15	2	4.35	4	8.70
16	1	2.17	5	10.87
18	1	2.17	6	13.04
19	1	2.17	7	15.22
20	5	10.87	12	26.09
21	2	4.35	14	30,43
22	4	8.70	18	39.13
23	4	8.70	22	47.83
24	1	2.17	23	50.00

25	2	4.35	25	54.35
26	1	2.17	26	56.52
27	1	2.17	27	58.70
28	4	8.70	31	67.39
30	2	4.35	33	71.74
31	1	2.17	34	73.91
32	1	2.17	35	76.09
33	2	4.35	37	80.43
35	1	2.17	38	82.61
36	4	8.70	42	91.30
40	1	2.17	43	93.48
41	1	2.17	44	95.65
42	1	2.17	45	97.83
55	1	2.17	46	100.00

Interpretation

The interpretations in sections 4.4.1.2.1 and 4.4.1.2.2 shed light on the achievement of the learners. A matric pass in mathematics standard grade is “F” if the average percentage is above 33. It was indeed distressing to note that 37 respondents (80.43% of the respondents) indicated that the average mathematics achievement of their learners

was 33%. Hence this suggested that the classes of only 9 respondents exhibited an average above the pass mark. Out of these, only 1 respondent (2.17% of the respondents) indicated an average standard grade mathematics achievement above 50%, which was symbol “D”, the basic University entry requirement.

4.4.1.3 Analysis of variance

Analysis of variance was used in order to determine the relationship between the five affective factors and also to point out possible differences in these factors, if variables like gender, age, level of education, experience and rank are used as dividers. A F-test was applied for testing hypotheses (see paragraph 4.4.3 for the hypotheses).

4.4.1.4 Correlation coefficient

The Pearson’s product-moment correlation coefficient (r) was calculated to determine the relationship between each of the five affective factors and learners’ achievement in mathematics, and between the factors mutually.

4.4.2 Reliability of the questionnaire

According to Pienaar (in Sikhwari, 2004:71) the closer the reliability of a measuring instrument is to 1, the smaller the difference is between the variance of actual score and the observed score. In principle when an instrument is developed, its reliability should be as close to 1 as possible. Reliability was established by calculating the alpha reliability coefficient for each section (see Tables 4.7 to 4.11). The reliability coefficients are presented in Table 4.15:

Table 4.15 Reliability coefficients

Section	Alpha coefficient	Number of items
SMT	0.894	10
Colleagues	0.809	9
Learners	0.785	11
Parents	0.713	10
Mathematics	0.663	9

The alpha coefficients for all five sections were quite close to 1. The α coefficients were high ($\alpha \geq 0.8$), except for the sections relating to parents and to mathematics. The questionnaire as a whole could therefore be regarded as a reliable measuring instrument, supported by Pienaar's coefficient reliability analysis (see 4.4.2).

4.4.3 The hypotheses

A total of five main hypotheses were formulated in chapter 1 (see 1.4). These main hypotheses were divided into sub-hypotheses and stated in the form of null hypotheses.

4.4.3.1 Hypothesis 1

Hypothesis one predicted the relationship between the gender of the respondents and each of the five affective factors, as well as the relationship between gender and the total attitude of the respondents.

Hypothesis 1A

There was no significant relationship between the mean attitude, towards the school management team, of male and female educators.

Hypothesis 1B

There was no significant relationship between the mean attitude of male and female educators towards colleagues.

Hypothesis 1C

There was no significant relationship between the mean attitude of male and female educators towards learners.

Hypothesis 1D

There was no significant relationship between the mean attitude of male and female educators towards parent-learner support.

Hypothesis 1E

There was no significant relationship between the mean attitude of male and female educators towards mathematics**.**

Hypothesis 1F

There was no significant relationship between the mean attitude of male and female educators towards the school in totality.

Rationale

From the literature study (see 2.3.1), it was evident that the school management team has a major role to play in creating conditions conducive for teaching and learning to take place. As if to concur with the point of Malone et al (1998:176) that there should be a radical transformation of the history and culture of a school from a 'working place' to a 'learning place', the democratic South Africa has shifted the administration and governance of schools from their principals to a school management team.

In view of the traditional belief that females adapt more easily to changes than males do, the results of this study did shed light on how female and male educators reacted to the affective factors in the school. Diversity in ability among educators was of great importance since from the literature study (see 2.3.3) it was deduced that diversity, embraced by cooperation, enhanced the educator's attitude towards the school.

4.4.3.2 Hypothesis 2

Hypothesis two predicted the relationship between the age levels of the respondents and each one of the five affective factors, as well as the relationship between age level and the total attitude.

Hypothesis 2A

There was no significant relationship between the mean attitude, towards the school management team, of educators at different age levels.

Hypothesis 2B

There was no significant relationship between the mean attitude, towards colleagues, of educators at different age levels.

Hypothesis 2C

There was no significant relationship between the mean attitude, towards learners, of educators at different age levels

Hypothesis 2D

There was no significant relationship between the mean attitude, towards support of learners by parents, of educators at different age levels.

Hypothesis 2E

There was no significant relationship between the mean attitude, towards mathematics, of educators at different age levels.

Hypothesis 2F

There was no significant relationship between the mean attitude, towards the school in totality, of educators at different age levels.

Rationale

Since over 78% of the sample in this study comprised young educators less than 41 years of age, the researcher found it necessary to analyse how the age groups reacted to the factors that influence the educator's attitude towards school.

4.4.3.3 Hypothesis 3

Hypothesis three predicted the relationship between the level of education of the respondents and each of the five affective factors, as well as the relationship between this level and the total attitude.

Hypothesis 3A

There was no significant relationship between the mean attitude, towards the school management team, of educators with different levels of education.

Hypothesis 3B

There was no significant relationship between the mean attitude, towards colleagues, of educators with different levels of education.

Hypothesis 3C

There was no significant relationship between the mean attitude, towards learners, of educators with different levels of education.

Hypothesis 3D

There was no significant relationship between the mean attitude, towards parent support for learners, of educators with different levels of education.

Hypothesis 3E

There was no significant relationship between the mean attitude, towards mathematics, of educators with different levels of education.

Hypothesis 3F

There was no significant relationship between the mean attitude, towards the school in totality, of educators with different levels of education.

Rationale

When Collis (1970:23) and Prinsloo et al (1996:55) concluded that a lack of communication between an educator and the majority of his or her class could be due to a basic difference in orientation towards the subject matter of the discipline concerned, they were only suggesting that educators' education levels had a role to play in the academic performance of a learner. Malone et al (1998:174) also concurred that low achievement test scores are reported to be linked to the inferior quality of science and mathematics education. However Moyana (1994:122) found no significant difference in the mathematics achievements of learners taught by better qualified educators and those taught by less qualified educators. This study did attempt to show if there was any relationship.

4.4.3.4 Hypothesis 4

Hypothesis four predicted the relationship between the teaching experience of the respondents and each of the five affective factors, as well as the relationship between teaching experience and the total attitude of the respondents.

Hypothesis 4A

There was no significant relationship between the mean attitude, towards the school management team, of educators with different levels of teaching experience.

Hypothesis 4B

There was no significant relationship between the mean attitude, towards colleagues, of educators with different levels of teaching experience.

Hypothesis 4C

There was no significant relationship between the mean attitude, towards learners, of educators with different levels of teaching experience.

Hypothesis 4D

There was no significant relationship between the mean attitude, towards parent support for learners, of educators with different levels of teaching experience.

Hypothesis 4E

There was no significant relationship between the mean attitude, towards mathematics, of educators with different levels of teaching experience.

Hypothesis 4F

There was no significant relationship between the mean attitude, towards the school in totality, of educators with different levels of teaching experience.

Rationale

It is commonly said that experience is the best teacher. Gavosto et al (1999:3) concurred that effective teaching requires that an educator know his or her learners, and be able not only to explain things to them but also to listen to them closely and with understanding. Whether this proverb regarding experience is true or not, the result of this study

made a contribution to the debate since members of its sample had a well spread range of teaching experience.

4.4.3.5 Hypothesis 5

Hypothesis five predicts the relationship between the post level of the respondents and each of the five affective factors, as well as the relationship between post level and the total attitude of the respondents.

Hypothesis 5A

There was no significant relationship between the mean attitude, towards the school management team, of educators at different post levels.

Hypothesis 5B

There was no significant relationship between the mean attitude, towards colleagues, of educators at different post levels.

Hypothesis 5C

There was no significant relationship between the mean attitude, towards learners, of educators at different post levels.

Hypothesis 5D

There was no significant relationship between the mean attitude, towards parent support for learners, of educators at different post levels.

Hypothesis 5E

There was no significant relationship between the mean attitude, towards mathematics, of educators at different post levels.

Hypothesis 5F

There was no significant relationship between the mean attitude, towards the school in totality, of educators at different post levels.

Rationale

In the literature study (see 2.3.1.2) Walberg (in Manganye 1994:53) established that the personality patterns of the educator, his or her deeds, values and attitudes predict the climate of his or her classes. Since the school management team (principal, deputy principal and head of division) ought to lead by personal example, this study attempted to reveal how each post level related to other factors affecting school performance.

4.5 Results of the testing of hypotheses

4.5.1 Introduction

This investigation focused on factors that affect educators' attitudes towards school and how these were related to the achievement of their learners in mathematics. These factors were discussed in chapters one, two and three.

A questionnaire was developed in order to collect the necessary data. The biography was also developed with the aim indicated in section 1.7.2. In addition, statistical techniques were employed in order to process the data: an item analysis, Pearson's correlation coefficient, F-test and frequencies. The item analysis was performed in order to establish whether each item in the questionnaire made a contribution to the total of the particular section of the questionnaire for which it was meant. Hypotheses relating to the attitudes of the school management team, colleagues, learners, parents, mathematics and some biographical variables were formulated and an instrument comprising a 58-item questionnaire was developed in order to measure the following:

- The educator's biographical data
- The educator's attitude towards the school management team (SMT)

- The educator's attitude towards colleagues (COLL)
- The educator's attitude towards learners (LEAR)
- The educator's attitude towards parents (PAR)
- The educator's attitude towards mathematics (MAT).

In order to test the hypotheses the data was processed using the following statistical techniques and processes (see 4.4): an item analysis, the F-test, the Pearson's product correlation coefficient and frequencies.

4.5.2 Hypothesis 1

With regard to hypothesis 1 stated in section 4.4.3.1, the following null hypotheses were tested:

(a) Hypothesis 1A

There was no significant difference between male and female educators regarding their mean attitude towards the school management team (SMT).

To determine whether or not females differed significantly from males in terms of their attitudes towards the school management team (hypothesis 1A), the mean of each group was calculated. The F-test

was used to determine whether or not the two means differ significantly. The result appears in table 4.16:

Table 4.16 Attitude towards school management team (SMT) of male and female educators

Gender	N	Mean SMT	S	F-Values
Male	27	3.214	0. 551	F = 5.61 df = (1.44)
Female	19	2.910	0.351	$p < 0.05$

Interpretation

According to the table 4.16 an F-value of 5.61 was obtained with p < 0, 05. Therefore the null hypothesis was rejected. There was a significant difference between the attitudes of male and female educators towards the school management team. The male educators exhibited a mean value of 3.214, which was significantly higher than the mean value for females, which was 2.910.

(b) Hypothesis 1B

There was no significant difference between male and female educators regarding their mean attitude towards their colleagues (COLL).

To determine whether or not females differed significantly from males in terms of attitudes towards their colleagues (hypothesis 1B), the mean of each group was calculated. The F-test was used to determine whether or not the two means differ significantly. The results appear in table 4.17:

Table 4.17 Attitude towards colleagues (COLL) of male and female educators

Gender	N	Mean COLL	S	F-value
Male	27	3.304	0.394	F= 0.00 df = (1.44)
Female	19	3.140	0.393	p > 0.05

Interpretation

According to table 4.17 an F-value of 0. 00 was obtained with p> 0.05. Therefore the null hypothesis could not be rejected. There was no significant difference between the attitudes of male and female educators towards colleagues.

(c) Hypothesis 1C

There was no significant difference between male and female educators regarding their mean attitude towards their learners (LEAR).

To determine whether or not females differed significantly from males in terms of attitudes towards their learners (hypothesis 1C), the mean of each group was calculated. The F-test was used to determine whether or not the two means differ significantly. The results appear in table 4.18:

Table 4.18 Attitude towards learners (LEAR) of male and female educators

Gender	N	Mean LEAR	S	F- value
Male	27	3.225	0.373	F = 0.37 df = (1.44)
Female	19	3.320	0.331	p > 0.05

Interpretation

According to table 4.18 an F-value of 0. 37 was obtained with p> 0. 05. Therefore the null hypothesis could not be rejected. There was no significant difference between the attitudes of male and female educators towards learners.

(d) Hypothesis 1D

There was no significant difference between male and female educators regarding their mean attitude towards parent support for learners (PAR).

To determine whether or not females differed significantly from males in terms of attitudes towards this support (hypothesis 1D), the mean of each group was calculated. The F- test was used to determine whether or not the two means differ significantly. The results appear in table 4.19:

Table 4.19 Attitude towards parent support for learners (PAR) of male and female educators

Gender	N	Mean PAR	S	F - value
Male	27	3.381	0.344	F = 0.80 df = (1.44)
Female	19	3.284	0.425	p > 0.05

Interpretation:

According to table 4.19 an F-value of 0. 80 was obtained with p > 0. 05. Therefore the null hypothesis could not be rejected. There was no significant difference between the attitude, towards parent support for learners, of male and female educators.

(e) Hypothesis 1E

There was no significant difference between male and female educators regarding their mean attitude towards mathematics (MAT).

To determine whether or not females differed significantly from males in terms of attitudes towards mathematics (hypothesis 1E), the mean of each group was calculated. The F-test was used to determine whether or not the two means differ significantly. The results appear in table 4.20:

Table 4.20 Attitudes towards mathematics (MAT) of male and female educators

Gender	N	Mean MAT	S	F - value
Male	27	2.814	0.323	F = 0.00 df = (1.44)
Female	19	2.926	0.328	p > 0.05

Interpretation:

According to table 4.20 an F– value of 0. 00 was obtained with p> 0. 05. Therefore the null hypothesis could not be rejected. There was no significant difference between the attitude of male and female educators towards mathematics.

(f) Hypothesis 1F

There was no significant difference between male and female educators regarding their mean attitude towards the school in totality (TOTAL).

To determine whether or not females differed significantly from males in terms of attitudes towards the school in totality (hypothesis 1F), the mean of each group was calculated. The F - test was used to determine whether or not the two means differ significantly. The results appear in table 4.21:

Table 4.21 Attitude towards the school in totality (TOTAL) of male and female educators

Gender	N	Mean TOTAL	S	F - value
Male	27	3.227	0.279	F = 0.05 df = (1.44)
Female	19	3.141	0.270	p > 0.05

Interpretation

According to the table 4.21 an F– value of 0. 05 was obtained with p> 0. 05. Therefore the null hypothesis could not be rejected. There was no significant difference between male and female educators regarding their mean attitude towards the school in totality.

4.5.3 Hypothesis 2

With regard to hypothesis 2 stated in section 4.4.3.2, the following null hypotheses were tested:

(a) Hypothesis 2A

There was no significant difference between educators of different age levels regarding their mean attitude towards the school management team (SMT).

To determine whether or not educators of different age levels differed significantly in terms of attitude towards the school management team (hypothesis 2A), the mean of each group was calculated. The F – test was used to determine whether or not the four means differ significantly. The results appear in table 4.22:

Table 4.22 Attitudes towards school management team (SMT) of educators at different ages

Age (years)	N	Mean SMT	S	F - value
1 (20-30)	11	2.900	0.376	F = 1.24 df = (3.42)
2 (31-40)	25	3.116	0.526	p > 0.05
3 (41-50)	5	3.200	0.430	
4 (51 +)	5	3.260	0.658	

Interpretation

According to table 4.22 an F – value of 1. 24 was obtained with p > 0. 05. Therefore the null hypothesis could not be rejected. There was no

significant difference between educators at different age levels regarding their mean attitude towards the school management team.

(b) Hypothesis 2B

There was no significant difference between educators at different age levels regarding their mean attitude towards their colleagues (COLL).

To determine whether or not educators at different age levels differed significantly in terms of attitudes towards colleagues (hypothesis 2B), the mean of each group was calculated. The F-test was used to determine whether or not the four means differ significantly. The results appear in table 4.23:

Table 4.23 Attitudes towards colleagues (COLL) of educators at different ages

Age (years)	N	Mean COLL	S	F -value
1 (20-30)	11	3.191	0.481	F = 1.04 df = (3.42)
2 (31-40)	25	3.177	0.371	p > 0. 05
3 (41-50)	5	3.244	0.265	
4 (50+)	5	3.622	0.300	

Interpretation

According to table 4.23 an F – value of 1.04 was obtained with $p > 0.05$. Therefore the null hypothesis could not be rejected. There was no significant difference between educators at different age levels regarding their mean attitude towards their colleagues.

(c) Hypothesis 2C

There was no significant difference between the mean attitude towards learners (LEAR) of educators at different age levels.

To determine whether or not educators at different age levels differed significantly in terms of attitude towards learners (hypothesis 2C), the mean of each group was calculated. The F–test was used to determine whether or not the four means differ significantly. The results appear in table 4.24:

Table 4.24 Attitude towards learners (LEAR) of educators at different ages

Age (years)	N	Mean LEAR	S	F - value
1 (20-30)	11	3.190	0.242	F = 2.46 df = (3.42)
2 (31-40)	25	3.320	0.337	p>0.05
3 (41-50)	5	3.163	0.447	
4 (51+)	5	3.254	0.590	

Interpretation

According to table 4.24 an F – value of 2. 46 was obtained with p>0.05. Therefore the null hypothesis could not be rejected. There was no significant difference between the mean attitude towards learners (LEAR) of educators at different age levels.

(d) Hypothesis 2D

There was no significant difference between the mean attitude, towards parent support of learners, (PAR) of educators at different age levels.

To determine whether or not educators at different age levels differed significantly in terms of attitude towards parent support for learners (hypothesis 2D), the mean of each group was calculated.

The F – test was used to determine whether or not the four means differ significantly. The results appear in table 4.25:

Table 4.25 Attitude towards parent support for learners (PAR) of educators at different ages

Age (years)	N	Mean PAR	S	F - value
1 (20-30)	11	3.418	0.285	F = 2,49 df = (3.42)
2 (31-40)	25	3.268	0.367	p > 0.05
3 (41-50)	5	3.240	0.618	
4 (51 +)	5	3.640	0.207	

Interpretation

According to the table 4.25 an F – value of 2.49 was obtained with p > 0. 05. Therefore the null hypothesis could not be rejected. There was no significant difference between the mean attitude towards parent support for learners (PAR) of educators at different age levels.

(e) Hypothesis 2E

There was no significant difference between the mean attitude towards mathematics (MAT) of educators at different age levels.

To determine whether or not educators at different age levels differed significantly in terms of attitude towards mathematics (hypothesis 2E), the mean of each group was calculated. The F –test was used to determine whether or not the four means differ significantly. The results appear in table 4.26:

Table 4.26 Attitude towards mathematics (MAT) of educators at different ages

Age (years)	N	Mean MAT	S	F - value
1 (20-30)	11	2.872	0.241	F = 1.02 df = (3.42)
2 (31-40)	25	2.856	0.353	p > 0.05
3 (41-50)	5	2.800	0.316	
4 (51 +)	5	2.920	0.438	

Interpretation

According to table 4.26 an F – value of 1.02 was obtained with p>0.05. Therefore the null hypothesis could not be rejected. There was no significant difference between the mean attitude towards mathematics (MAT) of educators at different age levels.

(f) Hypothesis 2F

There was no significant difference between the mean attitude towards the school in totality (TOTAL) of educators at different age levels.

To determine whether or not educators of different age levels differed significantly in terms of attitude towards the school in totality (hypothesis 2F), the mean of each group was calculated. The F – test was used to determine whether or not the four means differ significantly. The results appear in table 4.27:

Table 4.27 Attitude towards the school in totality (TOTAL) of educators at different ages

Age (years)	N	Mean TOTAL	S	F - value
1 (20-30)	11	3.141	0.235	F = 0.47 df = (3.42)
2 (31-40)	25	3.183	0.268	p > 0.05
3 (41-50)	5	3.164	0.351	
4 (51 +)	5	3.377	0.33	

Interpretation

According to table 4.27 an F – value of 0. 47 was obtained with p > 0. 05. Therefore the null hypothesis could not be rejected. There was no

significant difference between the mean attitude towards the school in totality (TOTAL) of educators at different age levels.

4.5.4 Hypothesis 3

With regard to hypothesis 3 stated in section 4.4.3.3, the following null hypotheses were tested:

(a) Hypothesis 3A

There was no significant difference between educators at different levels of education regarding their mean attitude towards the school management team (SMT).

To determine whether or not educators at different levels of education differed significantly in terms of attitude towards the school management team (hypothesis 3A), the mean of each group was calculated. The F – test was used to determine whether or not the three means differ significantly. The results appear in table 4.28:

Table 4.28 Attitude towards school management team (SMT) of educators with different levels of education

Education level	N	Mean SMT	S	F - value
2 (Diploma)	18	2.950	0.520	F = 0.60 df = (2.43)
3 (Degree)	7	3.057	0.395	p > 0.05
4(Diploma+ Degree)	21	3.219	0.495	

Interpretation

According to table 4.28 an F – value of 0.60 was obtained with p>0.05. Therefore the null hypothesis could not be rejected. There was no significant difference between educators with different levels of education regarding their mean attitude towards the school management team (SMT).

(b) Hypothesis 3B

There was no significant difference between the mean attitudes towards colleagues (COLL) of educators with different levels of education.

To determine whether or not educators with different levels of education differed significantly in terms of attitude towards their

colleagues (hypothesis 3B), the mean of each group was calculated. The F – test was used to determine whether or not the three means differ significantly. The results appear in table 4.29:

Table 4.29 Attitude towards colleagues (COLL) of educators with different levels of education

Education level	N	Mean COLL	S	F - value
2 (Diploma)	18	3.179	0.401	F= 0.32 df = (2.43)
3 (Degree)	7	3.285	0.492	p > 0.05
4(Diploma+ Degree)	21	3.269	0.376	

Interpretation

According to table 4.29 an F – value of 0.32 was obtained with p>0.05. Therefore the null hypothesis could not be rejected. There was no significant difference between the mean attitude towards colleagues (COLL) of educators with different levels of education.

(c) Hypothesis 3C

There was no significant difference between educators with different levels of education regarding their mean attitude towards the learners (LEAR).

To determine whether or not educators at different levels of education differed significantly in terms of attitude towards the learners (hypothesis 3C), the mean of each group was calculated. The F – test was used to determine whether or not the three means differ significantly. The results appear in table 4.30:

Table 4.30 Attitude towards learners (LEAR) of educators with different levels of education

Education level	N	Mean LEAR	S	F - value
2 (Diploma)	18	3.232	0.216	F = 3.10 df = (2.43)
3 (Degree)	7	3.155	0.465	p > 0.05
4(Diploma +Degree)	21	3.329	0.413	

Interpretation

According to table 4.30 an F – value of 3.10 was obtained with p>0.05. Therefore the null hypothesis could not be rejected; hence there was

no significant difference between educators with different levels of education regarding their mean attitude towards the learners (LEAR).

(d) Hypothesis 3D

There was no significant difference between the mean attitude, towards parent support, of learners, (PAR) of educators with different levels of education.

To determine whether or not educators with different levels of education differed significantly in terms of attitude towards parent support of learners (hypothesis 3D), the mean of each group was calculated. The F–test was used to determine whether or not the three means differ significantly. The results appear in table 4.31:

Table 4.31 Attitude towards parent support for learners (PAR) of educators with different levels of education

Education level	N	Mean PAR	S	F - value
2 (Diploma)	18	3.344	0.382	F=0.56 df = (2.43)
3 (Degree)	7	3.100	0.465	$p > 0.05$
4(Diploma + Degree)	21	3.419	0.326	

Interpretation

According to table 4.31 an F – value of 0. 56 was obtained with p>0, 05. Therefore the null hypothesis could not be rejected. There was no significant difference between the mean attitude towards parent support for learners (PAR) of educators with different levels of education.

(e) Hypothesis 3E

There was no significant difference between educators with different levels of education regarding their mean attitude towards mathematics (MAT).

To determine whether or not educators at different levels of education differed significantly in terms of attitude towards mathematics (hypothesis 3E), the mean of each group was calculated. The F – test was used to determine whether or not the three means differ significantly. The results appear in table 4.32:

Table 4.32 Attitude towards mathematics (MAT) of educators with different levels of education

Education level	N	Mean MAT	S	F – value
2 (Diploma)	18	2.888	0.351	F = 0.63 df = (2.43)
3 (Degree)	7	2.800	0.258	p > 0.05
4(Diploma + Degree)	21	2.857	0.335	

Interpretation

According to table 4.32 an F – value of 0.63 was obtained with p>0.05. Therefore the null hypothesis could not be rejected. There was no significant difference between educators at different levels of education regarding their mean attitude towards mathematics (MAT).

(f) Hypothesis 3F

There was no significant difference between educators with different levels of education regarding their mean attitude towards the school in its totality (TOTAL).

To determine whether or not educators at different levels of education differed significantly in terms of attitude towards the school as a whole (hypothesis 3F), the mean of each group was calculated. The F–test

was used to determine whether or not the three means differ significantly. The results appear in table 4.33:

Table 4.33 Attitude towards the school in totality (TOTAL) of educators at different levels of education

Education level	N	Mean TOTAL	S	F - value
2(Diploma)	18	3.145	0.263	F= 0.07 df = (2.43)
3(Degree)	7	3.107	0.304	p > 0.05
4(Diploma+ Degree)	21	3.260	0.274	

Interpretation

According to table 4.33 an F – value of 0.07 was obtained with p>0.05. Therefore the null hypothesis could not be rejected. There was no significant difference between the mean attitude towards the school in totality (TOTAL) of educators with different levels of education.

4.5.5 Hypothesis 4

With regard to hypothesis 4 stated in section 4.4.3.4, the following null hypotheses were tested:

(a) Hypothesis 4A

There was no significant difference between educators with different levels of teaching experience regarding their mean attitude towards the school management team (SMT).

To determine whether or not educators with different levels of teaching experience differed significantly in terms of attitude towards the school management team (hypothesis 4A), the mean of each group was calculated. The F – test was used to determine whether or not the four means differ significantly. The results appear in table 4.34:

Table 4.34 Attitude towards school management team (SMT) of educators with different levels of teaching experience

Teaching experience (years)	N	Mean SMT	S	F - value
1 (Less than 5)	9	2.688	0.480	F= 0.58 df = (3.42)
2 (5 - 9)	16	3.087	0.411	p > 0.05
3 (10 – 15)	11	3.354	0.429	
4 (More than 15)	10	3.160	0.544	

Interpretation

According to table 4.34 an F – value of 0.58 was obtained with $p>0.05$. Therefore the null hypothesis could not be rejected. There was no significant difference between educators with different levels of teaching experience regarding their mean attitude towards the school management team (SMT).

(b) Hypothesis 4B

There was no significant difference between educators with different levels of teaching experience regarding their mean attitude to their colleagues (COLL).

To determine whether or not educators with different levels of teaching experience differed significantly in terms of attitude towards their colleagues (hypothesis 4B), the mean of each group was calculated. The F–test was used to determine whether or not the four means differ significantly. The results appear in table 4.35:

Table 4.35 Attitude towards colleagues (COLL) of educators with different levels of teaching experience

Teaching experience (years)	N	Mean COLL	S	F - value
1(Less than 5)	9	3.024	0.467	F = 0.64 df = (3.42)
2(5 – 9)	16	3.243	0.347	p > 0.05
3(10- 15)	11	3.313	0.325	
4(More than 15)	10	3.333	0.465	

Interpretation

According to the table 4.35 an F – value of 0.64 was obtained with p>0.05. Therefore the null hypothesis could not be rejected. There was no significant difference between educators with different levels of teaching experience regarding their mean attitude towards their colleagues (COLL).

(c) Hypothesis 4C

There was no significant difference between educators with different levels of teaching experience regarding their mean attitude towards their learners (LEAR).

To determine whether or not educators with different levels of teaching experience differed regarding their mean attitude towards their learners (hypothesis 4C), the mean of each group was calculated. The F – test was used to determine whether or not the four means differ significantly. The results appear in table 4.36:

Table 4.36 Attitude towards learners (LEAR) of educators with different levels of teaching experience

Teaching experience (years)	N	Mean LEAR	S	F - value
1 (Less than 5)	9	3.161	0.207	F= 1.17 df = (3.42)
2 (5 – 9)	16	3.250	0.383	p > 0.05
3 (10 – 15)	11	3.280	0.323	
4 (More than 15)	10	3.363	0.459	

Interpretation

According to the table 4.36 an F – value of 1.17 was obtained with $p>0.05$. Therefore the null hypothesis could not be rejected. There was no significant difference between educators with different levels of teaching experience regarding their mean attitude towards their learners (LEAR).

(d) Hypothesis 4D

There was no significant difference between educators with different levels of teaching experience regarding their mean attitude towards parent support for learners (PAR).

To determine whether or not educators with different levels of teaching experience differed regarding their mean attitude towards parent support for learners (hypothesis 4D), the mean of each group was calculated. The F –test was used to determine whether or not the four means differ significantly. The results appear in table 4.37:

Table 4.37 Attitude towards parent learner support for learners (PAR) of educators with different levels of teaching experience

Teaching experience (years)	N	Mean COLL	S	F - value
1 (Less than 5)	9	3.277	0.402	F = 1.02 df = (3.42)
2 (5 – 9)	16	3.268	0.448	p > 0.05
3 (10 – 15)	11	3.309	0.246	
4 (More than 15)	10	3.550	0.327	

Interpretation

According to the table 4.37 an F – value of 1.02 was obtained with $p>0.05$. Therefore the null hypothesis could not be rejected. There was no significant difference between educators with different levels of teaching experience regarding their mean attitude towards parent support for learners (PAR).

(e) Hypothesis 4E

There was no significant difference between educators with different levels of teaching experience regarding their mean attitude towards mathematics (MAT).

To determine whether or not educators with different levels of teaching experience differed regarding their mean attitude towards mathematics (hypothesis 4E), the mean of each group was calculated. The F – test was used to determine whether or not the four means differ significantly. The results appear in table 4.38:

Table 4.38 Attitude towards mathematics (MAT) of educators with different levels of teaching experience

Teaching experience (years)	N	Mean MAT	S	F - value
1 (Less than 5)	9	2.800	0.316	F = 0.08 df = (3.42)
2 (5 – 9)	16	2.875	0.325	p > 0.05
3 (10 – 15)	11	2.854	0.347	
4 (More than 15)	10	2.900	0.355	

Interpretation

According to the table 4.38 an F – value of 0. 08 was obtained with p>0. 05. Therefore the null hypothesis could not be rejected. There was no significant difference between educators with different levels of teaching experience regarding their mean attitude towards mathematics (MAT).

(f) Hypothesis 4F

There was no significant difference between educators with different levels of teaching experience regarding their mean attitude towards the school in totality (TOTAL).

To determine whether or not educators with different levels of teaching experience differed regarding their mean attitude towards the school in totality (hypothesis 4F), the mean of each group was calculated. The F–test was used to determine whether or not the four means differ significantly. The results appear in table 4.39:

Table 4.39 Attitude towards the school in totality (TOTAL) of educators with different levels of teaching experience

Teaching experience (years)	N	Mean TOTAL	S	F - value
1 (Less than 5)	9	3.014	0.271	F = 0.53 df = (3.42)
2 (5 – 9)	16	3.175	0.262	p > 0.05
3 (10 – 15)	11	3.262	0.222	
4 (More than 15)	10	3.302	0.307	

Interpretation

According to the table 4.39 an F – value of 0. 53 was obtained with p>0. 05. Therefore the null hypothesis could not be rejected. There was no significant difference between educators with different levels of teaching experience regarding their mean attitude towards the school in totality (TOTAL).

4.5.6 Hypothesis 5

With regard to hypothesis 5 stated in section 4.4.3.5, the following null hypotheses were tested:

(a) Hypothesis 5A

There was no significant difference between educators at different post levels regarding their mean attitude towards the school management team (SMT).

To determine whether or not educators at different post levels differed significantly in terms of attitude towards the school management team (hypothesis 5A), the mean of each group was calculated. The F–test was used to determine whether or not the four means differ significantly. The results appear in table 4.40:

Table 4.40 Attitude towards the school management team (SMT) of educators at different post levels

Post level	N	Mean SMT	S	F - value
1 (Educator)	30	2.970	0.464	F= 0,16 df = (1.40)
2 (H.O.D.)	12	3.266	0.512	p > 0.05
3 (Deputy)	2	3.400	0.424	
4 (Principal)	2	3.500	0.707	

Interpretation

According to table 4.40 an F – value of 0. 16 was obtained with p>0. 05. Therefore the null hypothesis could not be rejected. There was no significant difference between educators with different post levels regarding their mean attitude towards the school management team (SMT).

(b) Hypothesis 5B

There was no significant difference between educators at different post levels regarding their mean attitude towards their colleagues (COLL).

To determine whether or not educators at different post levels differed significantly in terms of attitude towards their colleagues (hypothesis 5B), the mean of each group was calculated. The F – test was used to

determine whether or not the four means differ significantly. The results appear in table 4.41:

Table 4.41 Attitude towards colleagues (COLL) of educators at different post levels

Post level	N	Mean SMT	S	F - value
1 (Educator)	30	3.233	0.450	F = 4.07 df = (1.40)
2 (H.O.D)	12	3.250	0.246	p > 0.05
3 (Deputy)	2	3.055	0.392	
4 (Principal)	2	3.388	0.549	

Interpretation

According to table 4.41 an F – value of 4. 07 was obtained with p>0. 05. Therefore the null hypothesis could not be rejected. There was no significant difference between educators at different levels of ranking regarding their mean attitude towards their colleagues (COLL).

(c) Hypothesis 5C

There was no significant difference between educators at different post levels regarding their mean attitude towards their learners (LEAR).

To determine whether or not educators at different post levels differed significantly in terms of attitude towards their learners (hypothesis 5C), the mean of each group was calculated. The F – test was used to determine whether or not the four means differ significantly. The results appear in table 4.42:

Table 4.42 Attitude towards learners (LEAR) of educators at different post levels

Post level	N	Mean SMT	S	F - value
1 (Educator)	30	3.275	0.347	F =0.01 df = (1.40)
2 (H.O.D)	12	3.174	0.366	p > 0.05
3 (Deputy)	2	3.590	0.449	
4 (Principal)	2	3.318	0.449	

Interpretation

According to table 4.42 an F – value of 0. 01 was obtained with p>0. 05. Therefore the null hypothesis could not be rejected. There was no significant difference between educators at different post levels regarding their mean attitude towards their learners (LEAR).

(d) Hypothesis 5D

There was no significant difference between educators at different post levels regarding their mean attitude towards parent support for learners (PAR).

To determine whether or not educators at different post levels differed significantly in terms of attitude towards parent support for learners (hypothesis 5D), the mean of each group was calculated. The F – test was used to determine whether or not the four means differ significantly. The results appear in table 4.43:

Table 4.43 Attitude towards parent support for learners (PAR) of educators at different post levels

Post level	N	Mean SMT	S	F - value
1 (Educator)	30	3.310	0.422	F =3.15 df = (1.40)
2 (H.O.D.)	12	3.408	0.227	p > 0.05
3 (Deputy)	2	3.400	0.141	
4 (Principal)	2	3.350	0.777	

Interpretation

According to table 4.43 an F – value of 3. 15 was obtained with p>0. 05. Therefore the null hypothesis could not be rejected. There was no

significant difference between educators at different post levels regarding their mean attitude towards parent support for learners (PAR).

(e) Hypothesis 5E

There was no significant difference between educators at different post levels regarding their mean attitude towards mathematics (MAT).

To determine whether or not educators at different post levels differed significantly in terms of attitude towards mathematics (hypothesis 5E), the mean of each group was calculated. The F –test was used to determine whether or not the four means differ significantly. The results appear in table 4.44:

Table 4.44 Attitude towards mathematics (MAT) of educators at different post levels

Post level	N	Mean SMT	S	F - value
1 (Educator)	30	2.880	0.313	F = 0.57 df = (1.40)
2 (H.O.D)	12	2.850	0.372	p > 0.05
3 (Deputy)	2	2.900	0.424	
4 (Principal)	2	2.600	0.282	

Interpretation

According to table 4.44 an F – value of 0. 57 was obtained with $p>0.05$. Therefore the null hypothesis could not be rejected. There was no significant difference between educators at different post levels regarding their mean attitude towards mathematics (MAT).

(f) Hypothesis 5F

There was no significant difference between educators at different post levels regarding their mean attitude towards the school in totality (TOTAL).

To determine whether or not educators at different post levels differed significantly in terms of attitude towards the school in totality (hypothesis 5F), the mean of each group was calculated. The F–test was used to determine whether or not the four means differ significantly. The results appear in table 4.45:

Table 4.45 Attitude towards the school in totality (TOTAL) of educators at different post levels

Post level	N	Mean SMT	S	F - value
1 (Educator)	30	3.162	0.294	F =3.41 df = (1.40)
2 (H.O.D)	12	3.225	0.180	p > 0.05
3 (Deputy)	2	3.322	0.361	
4 (Principal)	2	3.300	0.581	

Interpretation

According to table 4.45 an F – value of 3. 41 was obtained with p>0. 05. Therefore the null hypothesis could not be rejected. There was no significant difference between educators at different post levels regarding their mean attitude towards the school in totality (TOTAL).

4.5.7 Hypothesis 6

There was no significant correlation between the achievement of the learners and each of the following factors or components: the educators' attitudes towards the school management team, colleagues, learners, parent support for learners, perception of the importance of mathematics and general attitude towards the whole school.

To determine the relationship between the achievement of the learners and these six variables, Pearson's product correlation coefficients between the variables were calculated. The findings are reported in table 4.46:

Table 4.46 The Pearson's correlations between the educators' attitude towards the school management team (SMT), the colleagues (COLL), the learners (LEAR), Parent support for learners (PAR), mathematics (MAT), the school in totality (TOTAL) and the achievement of their learners (ACH)

	SMT	COLL	LEAR	PAR	MAT	TOTAL	ACH
SMT	1.000						
COLL	* * 0.535	1.000					
LEAR	* 0.308	0.084	1.000				
PAR	* 0.335	* * 0.413	* * 0.566	1.000			
MAT	0.004	0.145	* * 0.376	* 0.317	1.000		
TOTAL	* * 0.754	* * 0.674	* * 0.684	* * 0.778	0.389	1.000	
ACH	* * 0.450	0.184	* * 0.346	* * 0.467	0.036	0.489	1.000

* * $p < 0.01$ * $p < 0.05$

On the basis of the information in table 4.46, there was a significant correlation between learners' achievement and the educators' attitude towards the school management team, colleagues, learners and parents respectively. There was, however, no significant correlation

between learners' achievement and the educators' mean attitude towards the subject of mathematics. This suggested that an educator's attitudes towards the school management team, colleagues, learners and parents were significant predictors of the learner's academic achievement.

4.6 Summary

The research group consisted of 46 senior secondary and high schools from the districts as mentioned in section 4.3.1. The research group comprised only schools willing to participate in the research as they were given the freedom to withdraw if they felt uneasy to release the requested information. The matric (mathematics) results for 2003 were used as a measure of academic achievement.

The following results summarised in table form were obtained after testing the hypotheses: See table 4.47:

Table 4.47 Summary of hypotheses 1, 2, 3, 4 and 5

	SMT	COLL	LEAR	PAR	MAT	TOTAL
Male/ Female	*	0	0	0	0	0
Age level	0	0	0	0	0	0
Education level	0	0	0	0	0	0
Experience level	0	0	0	0	0	0
Post level	0	0	0	0	0	0

* - indicates a significant difference

0 – indicates no significant difference

The summary of hypothesis 6 is shown in table 4.48.

Table 4.48 Summary of hypothesis 6

	SMT	COLL	LEAR	PAR	MAT	TOTAL	ACH
SMT	1.000						
COLL	* * 0.535	1.000					
LEAR	* 0.308	0.084	1.000				
PAR	* 0.335	* * 0.413	* * 0.566	1.000			
MAT	0.004	0.145	* * 0.376	* 0.317	1.000		
TOTAL	* * 0.754	* * 0.674	* * 0.684	* * 0.778	0.389	1.000	
ACH	* * 0.450	0.184	* * 0.346	* * 0.467	0,036	0.489	1.000

* * $p < 0.01$ * $p < 0.05$

In conclusion, it is important to note that the results of the empirical investigation concurred with the information gained from the literature

study. For example, various authors in the literature indicated the positive correlation between parent support and the achievement of the learners. On the strength of these findings, one could say that the school management team, colleagues, learners and parents played an important role in the academic achievement of their learners. It was however shown in the findings that the educators' attitude towards mathematics did not significantly affect learners' achievement. It will therefore be of great interest for educationists to pay particular attention to the implications of the findings as well as the recommendations. Conclusions, implications for educationists and the recommendations of the study will be discussed in chapter five.

CHAPTER FIVE

CONCLUSIONS, IMPLICATIONS FOR EDUCATIONISTS AND RECOMMENDATIONS

5.1 Introduction

It has often been a point of concern as to why equally equipped or disadvantaged schools perform differently even though subjected to the same environmental circumstances. Internal factors in these institutions had much to contribute to the disparity in learner achievement. Since schools are rated as 'good' because of their learners' performance, schools are therefore judged not on their buildings but on their internal organization and achievements. Good schools display a climate conducive to hard work, for educators and learners alike.

The purpose of this study was to research reasons which caused educators to be satisfied or created in them a positive attitude towards school and how this state of mind was related to the achievement of their learners. The aim of this chapter was therefore to demonstrate whether the investigation had provided possible answers to the initial statement of the problem, which was whether a mathematics educator's attitude towards school affected his or her learners'

achievement. Conclusions and implications for school managers, educators, parents and learners were discussed in this chapter and recommendations for improving the attitudes of educators towards school and therefore for enhancing learner performance were made.

5.2 The literature study: summary of findings, discussion and conclusion

5.2.1 Introduction

The literature study (chapter 2 and 3) yielded valuable insights with regard to the role of affective factors in determining educators' attitudes towards school and how these related to the achievements of their learners. The following is a summary of the findings of the literature study:

5.2.2 Affective factors and their importance in shaping educators' attitudes towards school and achievement of learners

5.2.2.1 Educators' attitudes towards school management team

The school management team provides leadership in a school. Good management created an atmosphere conducive to hard work in both educators and learners. An educator's attitude towards the management was in the end reflected in his or her class. An educator

with a negative view of a school either dodged classes without any guilt or arrived in the class merely to do a job. This was the type of educator described by learners as being boring and lacking creativity. The school management team could always be more alert and stay abreast of the state of the educators' attitudes towards school.

5.2.2.2 Educators' attitudes towards colleagues

The nature of the prevailing climate in a school could be reflected in the way educators interact among themselves. A healthy relationship between the educator and other colleagues is of great benefit to the learners. Reliance on one another not only cements their relationship but also increased their interest in the school. Strongly advocated teamwork, which was proven to be a precursor of success, could only develop where educators interact freely among themselves.

5.2.2.3 Educators' attitudes towards learners

The relationship between educators and their learners is of paramount importance. It determines their attitude towards each other and also affects the performance of the latter. The educator him- or herself should initiate the relationship with learners. A good educator finds that his or her good qualities naturally evoked respect from the learners. Such authority came naturally from bottom – up. The reverse, that is

the authority of the educator, the top – down syndrome, generally caused many issues like learners disrespecting their educators, declining performance, disciplinary problems, and so on.

5.2.2.4 Educators' attitudes towards parent learner support

Parents' support of learners had a role to play in their learners' achievements and interest in school. A learner who leaves home hungry will probably have no interest in attending school. Likewise a learner receiving a good breakfast may well look forward to going to school. Homes that are not able to provide facilities for studying may undermine a learner who may not be able to do the assigned homework. This creates a potential conflict between this learner and his or her educator. For learners to achieve success, the literature study showed a need for both the educator and the parent to work together as a team.

5.2.2.5 Educators' attitudes towards mathematics

The educator should have a liking for and a good knowledge of the subject of mathematics. Such an educator is able to invite questions from learners and when the learners receive an enthusiastic and satisfactory explanation their interest becomes boosted in mathematics and their respect for the educator increased. For the educator to

motivate his or her mathematics class, he or she must first posses a sound mathematical foundation. Many researchers consulted during the literature study have affirmed that the key to motivation is to provide variety in the classroom. It looked very probable that there was a positive relationship between the educators' attitudes towards mathematics and the achievement of their learners.

5.2.2.6 Educators' attitudes towards school and the achievements of their learners

Learners' achievements were of great importance to any school. They determined the public perception of the school, whether good or bad, achieving or underachieving. The literature study revealed that learners' achievements were determined by the educators' attitude towards the school management team, colleagues, learners, mathematics and parent-learner support. These factors explained why the performance of schools differs.

5.3 The empirical study: summary of findings, discussion and conclusion and implications

- In terms of the information gained from the empirical study, it could be concluded that there was a significant difference ($p<o.o5$) between the mean attitude, towards the school management team, of female and male educators. Female educators tended to tolerate changes in management more easily than their male counterparts. Probably this was the reason why Visscher (1999:149) found that women displayed higher levels of commitment than men.
- No significant difference ($p>0.05$) existed between the mean attitudes of female and male educators towards colleagues, learners, parents, mathematics and school.
- Likewise, no significant difference was apparent between the mean attitude of educators of different age levels towards the school management team, colleagues, learners, parents, mathematics and the school.
- There was no significant difference between the mean attitude of educators at different levels of education towards the school management team, colleagues, learners, parents, mathematics and the school.

- No significant difference could be detected between the mean attitude of educators at different levels of teaching experience towards the school management team, colleagues, learners, parents, mathematics and the school.
- No significant difference existed between the mean attitude of educators at different post levels towards the school management team, colleagues, learners, parents, mathematics and the school.
- There was a significant correlation between the educators' mean attitude towards the school management team and the achievements of their learners. This was in line with the research findings in the literature study.
- A small (but statistically significant) correlation existed between the educators' mean attitude towards colleagues and their learners' achievement.
- A significant correlation was apparent between the educators' mean attitude towards learners and the latter's achievement.
- There was a significant correlation between the educators' mean attitude towards parent support of learners and the achievements of their learners. This was supported by Gottfried (in Mnyandu 2000:59) who established a

significant relationship between performance and the home environment of the learner.

- No significant correlation existed between the educators' mean attitude towards mathematics and the achievements of their learners. This contradicted many research findings in the literature study. It could be argued that other factors, like intrinsic motivation, cause learners to do better.
- There was a significant correlation between educators' attitudes towards school and the achievements of their learners. The truth of this was affirmed by findings like that of Visscher (1999:150), that if relationships with supervisors, co-workers and learners were positive, these enhanced commitment.

5.4 Recommendations and implications

It was demonstrated in the preceding sub - sections that an educator's attitude towards school was an important factor in a learner's achievement, especially in mathematics. It was therefore essential that, for learners to better their achievement, educationists could know the factors that affect educators' attitudes towards school.

In the following sections recommendations and implications based on the findings of this study were suggested. These served as guidelines that could be utilized by Department of Education officials, school managers, educators and parents in order to better the achievements of learners in mathematics.

- **Departmental Officials**
  - It is requested that the monitoring team encourages the lagging junior schools to improve so that learners arrive at high schools adequately prepared. This should not only increase the attitude of secondary school educators towards school but also improve the quality of intake in senior secondary schools, thus translating, it is hoped, into improved performance of learners.

- **School Managers**
  - Asked to be more open and listening managers who are willing to embrace changes.
  - Male educators were more resistant to changes in school management than their female counterparts. This difference could be kept in the managers' minds.
  - Should continuously evaluate their relationship with the staff as this exerted a significant impact on the learners' achievement.

- **The educator**

  - Should communicate a sense of caring and a sense of awareness of learners' personal worth. This has a significant influence on the educator- learner relationship.
  - Should teach for understanding, appreciation and application of the subject content.
  - Should use different teaching methods in order to reach more learners. The most popular methods have proved to be:

    = cooperative learning, which helps to include learners with different abilities.

    = the discovery method where an educator supplies learners with instructional activities for them to discover.

    = the question method where an educator applies a questioning skill to woo learners into an attitude of inquiry.
  - Should carry out, or be involved in doing research in their own classes.
  - Learners should at all times be motivated. Educators should make them aware of

    = the importance of mathematics

    = career opportunities

    = how mathematics solves any life problems.

- **Parents**

- Should be more involved in their learners' education if Success is to be achieved. Parents should:

= try to make available the facilities needed for study at home

= properly feed their learners at home, especially before going to school

= where possible help them with their homework or just peruse their books

= attend school activities like meetings and concerts

= just give words of encouragement to their learners.

Although the study succeeded in generating the findings on which its recommendations were based, the following limitations were noted during the course of the research.

5.5 Limitations of the study

The limitations of any study, according to Treece and Treece (in Mbatha: 2004:148), are the weaknesses noted in the entire study. Accordingly, the following limitations were identified here:

- Only some schools in the Eastern Cape Province were selected. Further research incorporating educators in other

provinces would allow an investigation into the generalizability of the findings.

- Another limitation of the study was that only Grade 12 mathematics educators were chosen. Educators of Grade 11, the beginning of the matric syllabus, could have been included since they had contributed to the matric results that were used as measures of the learners' achievement
- The number of the educators who served as the respondents in the study was not substantial enough to allow the data collected from them to be sufficiently representative for the purposes of generalization.

5.6 Suggestions for future research

- Further research was needed to more fully investigate the relationship between educators' attitudes towards school and the learners' achievements in other subjects as well.

- The empirical investigation revealed a significant correlation between the mathematics achievement of learners and the educators' attitude towards the school management team, colleagues, learners, mathematics and parents. Further research could be done to develop programme for enhancing

these affective factors and consequently improving learners' achievements in mathematics. It was also important to note that these affective factors could not be treated as separate entities, but rather as an interdependent collective.

5.7 Concluding remarks

The purpose of this study, as indicated in the problem statement (see 1.3), was to investigate the relationship between the attitude of senior secondary mathematics educators towards the school and the achievement of their learners. As the literature indicated, the relationships between the educator and the school management team, colleagues, learners, mathematics and parents constitute affective factors in determining their attitudes towards school and were therefore selected for this study.

- The empirical investigation demonstrated that a significant correlation existed between the school management team, colleagues, learners, mathematics, parents, the school and learners' achievements.
- It is the researcher's sincere hope that the implications of the findings will be pondered and the recommendations based thereon applied since this could go a long way

towards bettering learners' achievements in mathematics.

It is also the desire of the researcher that further research be conducted in the areas specified.

APPENDIX 1

DAVID MWIRIA
P.O. BOX 110,
PORT ST. JOHNS
5120
……2003

TO
THE MATHEMATICS GRADE 12 EDUCATOR
THROUGH
THE PRINCIPAL

Institution: ----------

Dear Sir / Madam

I salute you and call upon your kind participation. I am a mathematics educator doing the present research to fulfill the requirements for a Masters Degree and possibly also to contribute to better performance in the subject.

Most studies have either been done overseas or in urban areas whose conclusions may not adequately address our conditions on the ground. This is therefore an attempt to correct the imbalance. The one grade 12 mathematics educator is therefore urged to give a true reflection of his or her attitude towards each activity in the questionnaire, hence making the conclusion accurate. This investigation and its conclusions will be of interest not only for future researchers but also to the stakeholders in the Department of Education. This investigation is an attempt to find out if there is any relationship between the attitude of grade 12 mathematics educators towards their schools and the achievement of their learners.

The Principal, if not a grade 12 mathematics educator, is asked to pass on the questionnaire to the grade 12 educator to fill in and post it in the enclosed self addressed envelope.

The confidentiality of the educator, the school and information provided is guaranteed.

May God bless you so much!

Yours truly,

D. MWIRIA.
Tel/Fax: 047 564 1534
Cell: 072 2260499

APPENDIX 2

ATTITUDE QUESTIONNAIRE

Instructions

1. Be absolutely honest with yourself when you indicate to what extent you agree or disagree with an activity.
2. Put a cross in the box representing your choice e.g. [X]
3. Your answers are confidential and for research purposes only.
4. The identities of the school and participants remain confidential.
5. Please answer all the items.
6. Thank you for your co-operation

SECTION A

	Strongly Disagree	Disagree	Agree	Strongly Agree
1. The School Management Team (SMT) guides me in my profession.				
2. I can consult the SMT when making decisions.				
3. The SMT treats every educator equally.				
4. I find the SMT receptive and friendly.				
5. I find the SMT supportive in resolving problems.				
6. I like the SMT to check my school record books.				
7. The SMT creates a good working climate in the school.				

	Strongly Disagree	Disagree	Agree	Strongly Agree
8. The SMT causes me to like staying in this school.				
9. I find the SMT helpful.				
10. The SMT entertains my ideas about school governance.				
11. My colleagues (fellow educators) mind about sound interpersonal relations.				
12. I enjoy the association with my colleagues.				
13. I find senior colleagues willing to share their vast experiences.				
14. I find interaction with my colleagues very constructive.				
15. My colleagues cause me to like the school.				
16. Colleagues treat each other respectfully.				
17. I am welcome to seek help from colleagues.				
18. I like the spirit of teamwork among colleagues.				
19. Colleagues treat me like any other colleague.				

	Strongly Disagree	Disagree	Agree	Strongly Agree
20. My mathematics learners are disciplined.				
21. I enjoy talking to my mathematics learners.				
22. I do my best to improve the performance of my mathematics learners.				
23. My mathematics learners like to ask questions during class.				
24. The daily attendance in my class is good.				
25. I enjoy correcting mistakes made by my mathematics learners.				
26. I give room for learners to ask questions during lessons.				
27. The learners give attention as my mathematics lessons progress.				
28. I generally get on well with my mathematics learners.				
29. My learners like discussing mathematics among themselves.				
30. My classes are excited by mathematics periods.				
31. I think that home support greatly aids a child's learning in mathematics.				

	Strongly Disagree	Disagree	Agree	Strongly Agree
32. I invite parents to discuss their children's mathematics problems.				
33. Parents should provide their children with basics, like calculators.				
34. I collaborate with parents in educating their children.				
35. Parents should encourage their children to achieve better in mathematics.				
36. Parents should be interested in the mathematics education of their children.				
37. It is important for parents to attend school activities.				
38. I would like to see the level of the learners' home support improves.				
39. I would like to meet more of my learners' parents.				
40. Parents would be disappointed if I am transferred from the school.				
41. I try to improve upon my teaching of mathematics.				
42. I find mathematics to be an interesting subject.				

	Strongly Disagree	Disagree	Agree	Strongly Agree
43. I use practical examples to make my mathematics teaching more exciting.				
44. I need more mathematics periods for my learners.				
45. In my school there are many sources of mathematics information.				
46. I like teaching mathematics to my learners.				
47. Mathematics helps the learners to think logically.				
48. Mathematics is an exciting subject.				
49. I don't want my learners to miss any of my mathematics lessons.				
50. Mathematics is an important subject for each learner.				

BIOGRAPHY

Put a cross as above in the box relevant to you.

51. Gender

Male		Female	

52. Age in years:

20-30		31-40		41-50		51or older	

53. Marital status:

Single		Married		Widow		Widower	

54. Education attained:

Matric		Diploma		Degree		Diploma and Degree	

55. Teaching experience in years:

Less than 5		5-9		10-15		Over 16	

56. How many Grade 12 learners in total do you teach?

Less than 40		40-60		61-80		Over 80	

57. How many Grade 12 learners are in your school?

Less than 50		50-80		81-100		Over 100	

58. Rank or Post Level:

Educator		H.O.D.		Deputy Principal		Principal	

Please make sure that you have answered each of the 58 items in the Questionnaire.

THANK YOU FOR YOUR KIND COOPERATION.

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