ACADEMIC PERFORMANCE IN MATHEMATICS AMONG SELECTED HIGH SCHOOL STUDENTS IN PHUTHADITJHABA AS A FUNCTION OF THE TEACHER'S MOTIVATION

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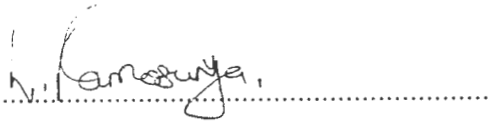
DECLARATION

I, Lerato Jacqueline Ramosunya-Helu, hereby declare that this mini dissertation is my original work and has not been presented for a degree in any other University. All sources I have used or quoted have been indicated and acknowledged by means of complete references.



LJ Ramosunya-Helu

October 2003

DEDICATION

To my loving son Obakeng Mbulelo Helu who had to do without a mother for long hours.

To my husband and friend Moses Khulekile Helu for his patience, support and understanding. His encouragement is hereby acknowledged.

To my mother Kebogile Sophia Ramosunya who was always by my side when the going got tough. Thank you for your unwavering support.

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- Glory to God Almighty who gave me power and courage to go on.

ABSTRACT

This study seeks to investigate the academic performance in Mathematics among selected high school students in Phuthaditjhaba as a function of the teacher's motivation. This investigation was triggered by the arguments put forward by some educationists' belief that children do not have a learning problem, but it is the teachers who are having a teaching problem.

For the purpose of this study, special focus was on learners doing Mathematics in Grade 11 and their teachers. It has been observed that South Africa is threatened with a shortage of Mathematics teachers and the number of Mathematics learners has decreased. It is therefore very crucial to unearth the difficulties bedeviling learning and teaching of Mathematics.

The study used the following instruments to arrive at the findings - namely: A teacher's questionnaire mainly to measure their motivation or self-efficacy. All learners doing Mathematics at Grade 11 in six High schools in Phuthaditjhaba were included for stratified sampling. Males and females, learners of different ages, from different socio-economic backgrounds were included. Test scores of learners obtained from their tests and half yearly examinations written at each school. To use a more or less consistent average performance for learners, four tests were decided upon. The fact that all the sampled schools apply the system of continuous assessment meant that these average marks ultimately determine whether a learner gets promoted to the next grade or fails. No other independent test that may purport to be more objective than the ones used by the teachers of the mentioned learners were constructed.

The findings of this study indicate that there is no significant relationship statistically between teacher's motivation and learner's performance and therefore the hypothesis that there is significant relationship is rejected. The results in table 4.7 indicate that there is some correlation between teacher's motivation and learner's performance. Though the correlation coefficient is positive, the correlation is very small ($r = 0.112$)

Although the study was conducted amongst all the African learners from historically disadvantaged

schools doing Grade 11 Mathematics in Phuthaditjhaba High schools, this does not however, rule out the fact that some of the findings may in the end be applicable to learners in other provinces not being targeted at.

CHAPTER 1

1.1. INTRODUCTION

This study aims to look at the academic performance in Mathematics among selected High school students in Phuthaditjhaba as a function of the teacher's level of motivation. The reason behind this study is to find out whether there is any significant correlation between learners' achievement scores (performance) in Mathematics and the level of motivation of the teachers.

This chapter will have a background to the study. The chapter will also have a statement of the problem. Research problems will also be posed and they will be answered by the findings of the research. Aims and objectives will also form part of this research. There will also be a review of related literature to the problem of this study. Literature review will also include operational definition of concepts such as motivation and academic performance.

Methodology, which is how the researcher went about conducting her research will also be discussed in this chapter. Details such as geographical location of the sample, size of sample, data collection procedure and analysis, discussion and interpretation of data will also be briefly discussed. The chapter will also have conclusions, recommendations and suggestions for future research. Organization of the remaining chapters will also be carried out in this chapter. Significance of the study and limitations of the study will also form part of this chapter.

1.2. BACKGROUND TO THE STUDY

The study has been motivated by the high failure rate of black matriculants in Mathematics which has been a predominant factor in this investigation. Although the problem is only seen with the grade 12 results, it is obvious that there are problems at the lower grades. It is on the basis of this that the researcher decided to undertake this study using grade 11 Mathematics students and teachers. It is mainly for purposes of continuity if need be. The performance of South African pupils in Mathematics is abysmal, by both international and national standards, whilst many Mathematics teachers have inadequate content knowledge and operate in poorly resourced schools, this is not the

whole story. The following statistics also indicate that the Mathematics failure rate nationally is very high. In 1996, only 41% of the students who wrote standard 10 Mathematics, passed it (Mogale, 1998). In the Free State province only, out of 15271 Mathematics candidates only 6649 managed to pass (i.e. 43.5%). (Mogale, 1998)

1996 Mathematics results for the province, show the seriousness and the magnitude of the problem. The following detailed report by the Research Institute Educational Planning (1996) best illustrates the extent of the problem. Given the general decline in pass rate for national grade 12 results for 1997, it may be argued that Mathematics results have worsened. It is therefore clear that there is a serious problem in Mathematics education. As to who should carry the blame, it is a dicey situation. However, the major source of the problem is centered around teacher motivation, assessment and teaching methodologies and these are interlinked (Lebeta, 2000).

This high failure rate in Mathematics challenges the researchers and educationists alike. They must devise strategies to enable more students to pass Mathematics. However, research must start by finding the cause for such high failure rate. According to Botha (1996), the high failure rate depends upon quite a number of factors such as motivation, human relations, aptitude, developmental aspects, teaching and learning styles, instructional strategies, lack of culture of learning and discipline and the political agenda.

Through the years of experience of the researcher as a teacher at a high school, lecturer at a teacher training college and at a university in the faculty of education, it has been observed that at the end of every year when matric results are poor nationally, blame tends to be put on the teachers. Other factors which prompted this study are:

- Some schools in the Free Sate province that have been labeled as 'dysfunctional' due to their poor matriculation results. It is assumed that the teacher's level of motivation in these schools is low, it will therefore affect the academic performance of the learners. Hence learners and teachers involved in grade 12 in such schools are not allowed to go for school holidays. They

have regular and unannounced visits from the office of the MEC for education. Their management team is expected to go and give a detailed report of why the learners performed badly in final matriculation examination.

- Another factor which could be the cause of lack of motivation and poor academic performance is wrong career choice especially with black teachers who ended up in teaching because of lack of opportunities and exposure to other career choices.
- Educators who are forced to teach Mathematics due to shortage of Mathematics teachers simply because they had Mathematics as part of their courses at a College of Education. This makes teacher specialization to have an impact on the academic performance of the learners.
- In the past there were in-service training centers for teachers to be introduced to current developments in their subjects. All these have been phased out and replaced by learning facilitators specializing in different subjects who visit schools on a regular basis.
- According to Dumbo (1988), students are exposed by the teacher to large amounts of material that they are supposed to master during a fixed period. Often, a number of chapters and pages covered is more important for the teacher than the number of Mathematical concepts and skills developed by the student. To cope with the task of absorbing more and more Mathematics information, the student tries to memorize it, usually with very little comprehension of its meaning. Frequently they are unable to apply this knowledge to handle new situations, and therefore they tend to forget it very fast.
- The problem as identified by a number of Mathematics educators is commonly and appropriately summarized by Breen (1993) in Lebeta (2000) as quoted by an anonymous author as follows: "*The classroom is highly organized, the syllabus is rigid, and the textbooks are fixed. Maths is considered as a science that does not make mistakes... There is one correct answer to every question and one meaning for every word and meaning is fixed for all people and for all times. 'Wrong' answers are not tolerated, students are usually punished if they make 'mistakes'. Teachers are also expected to perform according to a certain set of rigid expectations and they are punished if they don't*" (sic).

The above quotation indicates that the problem affects both learners and teachers nationally and

internationally. Due to apartheid education system of South Africa, the impact has had far reaching effects. Grade 12 results in Mathematics have not been satisfactory. Usually matric results are taken as a yardstick for performance. For this study, focus will be on Grade 11 Mathematics classes for purposes of continuity if follow-up is needed.

1.3. STATEMENT OF THE PROBLEM

The problem which will be investigated in this study is: "How is the performance of learners in Mathematics related to the teacher's level of motivation? Is there any significant correlation between learners' achievement scores (performance) in Mathematics and the level of motivation of the teachers?"

1.4. RESEARCH QUESTIONS

For the purposes of this study the following questions are asked.

- What is the level of motivation of teachers in selected schools in Phuthaditjhaba?
- Is there a relationship between the level of motivation of the teachers and the academic performance of learners?
- Is the level of male teachers' motivation more related to learner's academic performance than that of female teachers?
- Is teachers' level of motivation more related to the male students' academic performance than the female students' academic performance?

1.5. AIMS AND OBJECTIVES

1.5.1 AIMS

In the light of what has been presented in the previous section, and in the light of the researcher's own experiences, it is felt that a reasonably comprehensive view of achievement is necessary - especially at this stage of research and development in school Mathematics in South Africa. To this end, the present research aims to explore as comprehensively as possible the patterns and trends in pupils' performance in Mathematics in grade 11 learners in some selected High Schools in Phuthaditjhaba. In particular, this study proposes:

1.5.2. OBJECTIVES

- To find out whether teachers' level of motivation plays an important role in the performance of learners in Mathematics. (Focus will be put on grade 11 Mathematics classes for purposes of continuity if follow-up is needed).
- To determine what (if any) remedial measures of this situation can be constructed in order to improve the situation.

1.6. LITERATURE REVIEW

1.6.1. THEORETICAL FRAMEWORK

This study is a quantitative research. Quantitative approaches are applied in order to describe current conditions or to investigate relationships, including cause-effect relationships. Studies designed to describe current conditions are referred to as descriptive research. This terminology may be confusing at first since qualitative studies definitely describe; however, the term has traditionally been used to characterize studies which describe numerically, e.g., questionnaire studies.

Correlational research attempts to determine whether, and to what degree, a relationship exists between two or more quantifiable variables (in this case being teacher motivation and learner's academic performance). The argument for quantitative is that, the study wanted to find the extent to which teachers' motivation relate to learners' performance and correlation coefficient in quantitative seems to be the best the statistic to explore this relationship. While some qualitative approaches were used in sampling the schools, qualitative research was not that appropriate as one was not going to find the nature of motivation or qualitative differences in performance among learners.

1.6.2. DEFINITION OF OPERATIONAL CONCEPTS

Definition and discussion of:

1.6.2.1. Academic Performance.

This relates to out-comes as measured by an approved standard. This refers to achievernent under test (The Concise Oxford Dictionary, 1982). There is another paradigm that views academic performance as school construction. This view maintains that academic performance should be seen as 'emergent'

and constantly in the state of construction as the individual interacts with the world in order to understand academic performance, according to this view, one should not be blind to other confounding social structural and individual psychological factors. Thus the marks/scores that one could come up with irrespective of how objective, standardized, carefully designed, reliable and valid the assessment procedures might have been, will always be subjective value because academic performance cannot be absolute and static. It will always fluctuate and vary depending on factors such as: 1. the ideology permeating education theory and practice, 2. the nature of given tasks and subject materials, 3. the idiosyncrasies of the tester and testee and 4. the testee's level of motivation, inclination and interests sometimes due to socialization as well as acquired skills (Mahlomaholo, 1998).

From the above, it becomes clear that many factors play a role in the production of learners' marks/scores. Thus, that mark is not definite, it is only diagnostic within the limitations of the factors that will be discussed subsequently.

1.6.2.2. **Motivation**

A term used in Psychology to mean the cause of behavior that is persistently directed toward a goal. Motivation is usually made up of a combination of motives, which may also be called drives, incentives or interests. Motivation is often based on acquired social values. Such values may motivate a person to seek a College education or to win the approval of others. Another person with different social values, might reject higher education for the immediate goal of a job in order to buy a car and expensive clothes. Adequate motivation is one of the important conditions for efficient learning. In general the stronger the motivation, the more effectively the student will learn (New Standard Encyclopedia, Volume 8,)

Motivation is the driving force, the impetus of the personality, which is put into effect by an act of the will in accordance with what a learner wants to do. Motivation energizes behavior and can be an intrinsic or extrinsic force. Motives are related to motivation in that they are the actual factors which motivate a person, such as a need to do well in a test, or to win in a race, or to get to school early.

Such motives get the person started, give the person direction and help him to select the appropriate behaviour to achieve his/her goal. No one is ever unmotivated. We are all continually endevouring to maintain and enhance our personal feelings. Motivation grows from a need to be competent, from a need for self-actualization, from a need to become functionable, from a need for personal adequacy, from a need for some satisfactory level of self-realization, a need to be somebody (Hamachek, 1977)

1.6.3 **RELATED LITERATURE.**

This investigation is only concerned with whether the teacher's level of motivation can influence the academic performance of the learners, with the ultimate aim of using the findings from this investigation to make recommendations which would assist in the alleviation of the persisting problems in Mathematics education. In both the TIMMS (Howie and Hughes, 1998) and TIMMS repeat (Howie, 2001) in (Grayson, Ono and Ngoepe, 2001) studies, South African pupils came last in Mathematics and science of the 41 countries that participated. In 2000, fewer than 20 000 pupils in South Africa, with a population of roughly 40 million, passed Grade 12 Mathematics well enough to allow them entry into University science-based studies. In the search for explanations for, and ways of addressing this poor performance, it is reasonable to look at the Mathematics teachers.

Another factor which has always been a concern of the researcher is the issue of poor performance of grade 12 pupils with regard to Mathematics. The performance of South African pupils in Mathematics is abysmal by both national and international standards. Many Mathematics teachers have inadequate content knowledge and operate in schools where there is lack of resources. This is not the whole story. Grayson, Ono and Ngoepe (2001) argue that from 1999 to 2000, a number of schools improved their overall final examination pass rates by more than 50%, largely by increasing their professional practice. They further argue that in developing countries, teachers' effectiveness is often diminished by a lack of motivation and commitment. The paper further argues that where commitment and dedication are high, good results may be achieved under poor conditions.

Research tells us that positive self-concepts in teachers facilitates not only their own classroom performance as a confident, un-anxious, respected guide to learning, but also pupil performance which flourishes in all respects when the pupil's view of himself/herself as someone of worth.

Expectation from such teachers lead to higher pupil self-esteem and performance. This could be proved or illustrated by the fact that from 1999 to 2000, a number of schools in South Africa improved their overall final examination pass rates by more than 50%, largely by increasing their professional practice. Conversely, where commitment and dedication are high, good results may be achieved under poor conditions (Grayson, Ono and Ngoepe, 2001).

Teacher motivation and commitment can be very influential in pupil's success. In South African schools that succeed despite poor conditions (Malcom, 2000) in Grayson, Ono and Ngoepe, 2001, it was found that the teachers have high levels of commitment and dedication, work hard and for long hours, and are available to pupils outside of class time. In a research paper presented by Grayson, Ono and Ngoepe in 2001 at the Third International Conference of the European Science Education Research Association, they came up with the following findings:

- Qualifications and resources are not the only factors that influence teachers' effectiveness. Equally important are teacher's motivation and commitment. Lockheed and Verspoor (1991) identify teaching time as a 'key determinant of student achievement' which is largely determined by teacher motivation.
- They go on to say that many countries do not get the best performance from their incumbent or their new teachers. Lack of motivation and professional commitment produce poor attendance, poor performance and unprofessional attitudes towards students. Referring to Africa, Ongunniyi (1986) identifies lack of teacher motivation as one of the problems hindering good science education. On the other hand, Obanya (1999, p. 171) suggests that, "the 21st century teacher in Africa has to be a professional educator in every sense of the term". By contrast, Caillds et al. (1997) suggest that poor quality teacher preparation and low motivation to teach with limited resources may be masked by complaints about poor facilities and teaching and learning conditions.

In view of the importance of Mathematics in society and in the schools, it seems obvious that the efficacy of Mathematics teaching and learning deserves continued and sustained scrutiny.

1.7 HYPOTHESES

Based on the above questions the following hypotheses were advanced:

- There will be no significant relationship between teachers' level of motivation and students academic performance.
- There will be no significant relationship between male teachers and students' academic performance.
- There will be no significant relationship between female teachers and students' academic performance.
- There will be no relationship between teachers' motivational level and male students' academic performance.

1.8. DISCUSSION ON RESEARCH METHODOLOGY AND PROCEDURES OPERATIONALISED IN THIS STUDY.

1.8.1. QUANTITATIVE OPERATIONALIZATION

1.8.1.1. SAMPLING

1.8.1.1.1. GEOGRAPHICAL LOCATION OF THE SAMPLE

The initial intention was to conduct a research whose findings would be valid for the whole of the North Eastern Free State region. But with the discovery that in striving for a broad external validity, a lot of sacrifice would be done on the depth of analysis and understanding of the research. Hence it was decided to choose one magisterial district in the North Eastern part of the Free State where research would be done. The choice made is QwaQwa which is the nearest place to the researcher. Due to time constraints and economic factors, a further delimitation of the study is that it will be limited to Phuthaditjhaba High schools only.

1.8.1.1.2. SIZE OF SAMPLES FROM SIX SCHOOLS

Phuthaditjhaba has six High schools offering Mathematics (at grade 11) to African pupils

exclusively. The target population in this study is all the African learners from historically disadvantaged schools doing grade 11 Mathematics in Phuthaditjhaba High schools.

1.9. INSTRUMENTATION

To facilitate triangulation of data during analysis, several different types of data collection tools were used to explore and answer the research questions that have been posed. The data collection for this proposed study includes the following tools: questionnaires, consultation of cold data i.e. statistics and records of the results of the learners from the High schools chosen for research in order to get the track records of their performance in Mathematics. The test results of the learners were used with the permission of the Department of Education in the Free State and the schools involved.

1.9.1. TEACHER'S QUESTIONNAIRE

The teacher's questionnaire measures their motivation or self concept. The questionnaires were administered in the presence of the researcher (i.e. face to face). It consisted of 25 closed ended questions.

1.9.2. VALIDITY AND RELIABILITY

It is important that all research instruments first be considered in terms of their validity. Validity may actually also refer to the degree of relevance of the instrument and, in that way, the instrument may be considered more reliable. Undoubtedly, a reliable instrument would be measured by its ability to obtain information that is free of measurement errors. It is often not just easy to ascertain if the test or survey items are germane to the subject under investigation. Therefore, in this research, the validity of the measuring instrument was based on content validity. The relevant content was obtained from the literature. The questionnaires were also given to a number of experts in the Department of Educational Psychology to ascertain their opinion whether it really measured teaching and learning effectiveness. They employed subjective judgements to determine if the statements were clearly stated, unambiguous, relevant and fit the informational background of the respondents. Overall, the content and face validity of the instrument, while certainly hard to defend quantitatively, appeared to be reasonably assured through expert opinion and judgement.

In this study, an instrument developed by Kieviet for her Doctoral studies (1996) at the University of Columbia was used. Although her instrument was mainly developed for Science Teaching Efficacy Beliefs Inventory (STEBI), it also adapted for Mathematics teaching in this study.

1.10 ADMINISTRATION OF THE INSTRUMENT AND DATA COLLECTION

One questionnaire has been administered for this purpose. Teachers in the sampled schools completed the questionnaire. The questionnaire was administered to the six targeted High school Mathematics teachers. The researcher asked all the teachers participating in this study to submit the mark schedules so as to check the performance of the learners against the background of the test written during the first semester of the academic year 2002 and their half-yearly examination marks/scores.

1.11. ANALYSIS, DISCUSSION AND INTERPRETATION OF RESULTS

Cross tables, graphs and regression models were used to determine the academic performance of learners and the responses from teachers' questionnaire were employed to analyze data.

1.12. RECOMMENDATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

The literature that I have consulted says that wrong choice of career can lead to a low level of motivation especially with black teachers who ended up in teaching because of lack of opportunities and exposure to other career choices. Furthermore, teacher specialization has an impact on the academic performance of learners in the sense that teachers chose those 'soft' options while at training institutions only to find themselves teaching Mathematics due to lack of employment opportunities. There is also lack of in-service training for teachers to be introduced to current developments in their subjects. Changing South African teacher's willingness to put in enough time and effort to their jobs properly is clearly essential if there is to be a significant improvement in pupils performance in Mathematics. If teachers' feelings of competence improve, and if they are supported and appreciated by their principals and communities, their motivation will likely increase.

1.13. ORGANIZATION OF THE REMAINING CHAPTERS

The research was done as follows:

- Chapter one: This chapter attempted to sketch the introduction, background to the problem, the motivation for the study, the statement of the problem, the research questions, aims and objectives, literature review, operational definitions of concepts, hypothesis, methodology, data collection procedure, analysis and interpretation of data, recommendations and suggestions for future research, significance of the study and limitations of the study.

- Chapter two: Literature review on performance and self-concept/motivation. Studies related to this topic were reviewed. Proper cognisance of previous work and literature was taken. Theoretical framework, related literature, definition of operational concepts, hypothesis and conclusion also formed part of this chapter.

- Chapter three: The research process is articulated in this chapter. The research population, sample, instruments as well as precautionary measures taken in the study are outlined in this chapter. The data analysis and interpretation are also outlined in this chapter.

- Chapter four: The findings were tabulated, analyzed and interpreted.

- Chapter five: The summary, conclusions, recommendations and suggestions for future research were addressed in this chapter.

1.14. SIGNIFICANCE OF THE STUDY

- The study will fill the gap in literature about the practical solution in the teaching and learning of Mathematics in the schools. Subsequently, it will benefit teaching because the results of its findings will improve the approach to the teaching and learning of Mathematics.
- Recommendations and suggestions for future relevant research based on the concepts in this research will be made.
- These recommendations if implemented may on a small scale contribute towards improving

learning and teaching of Mathematics in schools.

- There will be a change in Mathematics classroom practices such as communication, assessment, learning and teaching.
- Answers to the research questions will possibly facilitate the delineation of the essential processes involved in the access, learning, teaching and professional development to ensure enhanced knowledge and competence in Mathematics by generating an excellent approach to existing and future demands for Mathematics teaching and learning in particular.

1.15. LIMITATIONS OF THE STUDY

The study is confined to six high schools in Phuthaditjhaba offering Mathematics (at grade 11) to African pupils exclusively. The target population in this study is all the African learners from historically disadvantaged schools doing grade 11 Mathematics. In terms of the sample, this is too little to can make generalizations about academic performance and teacher motivation in a broader community. This does not however rule out the fact that some of the findings may in the end be applicable to learners in other provinces not being targeted at.

The problem of a sample such as the one defined in this study which is more or less "natural" in the sense that no artificial manipulation of variable was attempted, is that there may be too many confounding variables at play distracting from seeing the effect of, or on, the factors under study (Mahlomaholo, 1998).

CHAPTER 2

LITERATURE REVIEW

2.1. INTRODUCTION

This chapter focused mainly on reviewing the existing literature related to the problem of this study. Arguments related to the same problem area from different authors were interrogated. The relationship between the performance of the learners and the level of motivation of teachers especially in Mathematics were also discussed. Furthermore evidence was also sought from different sources to show that the teacher's level of motivation can be affected by a number of factors. Studies related to the present one were reviewed - proper cognisance was taken of previous work and literature. A review of the relevant literature has an advantage because the researcher becomes familiar with the theoretical background to the problem and the interrelationships of ideas in the problem (Botha and Engelbrecht, 1992). The researcher also feels that a review of related materials ensures that unintended materials and ignorant duplication of ideas does not take place and this affords an opportunity for the researcher to justify more substantially why this study was selected. More importantly, the study of the latest articles, journals, major books on the subject, monographs and dissertations published nationally and internationally is essential.

2.2. THEORETICAL FRAMEWORK

This study is a quantitative research. Quantitative approaches are applied in order to describe current conditions or to investigate relationships, including cause-effect relationships. Studies designed to describe current conditions are referred to as descriptive research. This terminology may be confusing at first since qualitative studies definitely describe; however, the term has traditionally been used to characterize studies which describe numerically, e.g., questionnaire studies. (Mauch and Birch, 1993). Studies which investigate the relationship between two or more quantifiable variables are referred to as correlational research, and those which investigate cause-effect relationships are called causal-comparative or experimental research, depending on whether the relationship is studied after the fact or in a controlled environment. Correlational research attempts to determine whether, and to what degree, a relationship exists between two or more quantifiable variables (in this case

being teacher motivation and learner's academic performance). The purpose of a correlational study may be to establish a relationship (or lack of it) or to use relationships in making predictions. Relationship studies typically study a number of variables found not to be highly related are eliminated from further consideration, variables that are highly related may suggest causal-comparative or experimental studies to determine if relationships are causal. For example, the fact that there is a relationship between self-concept and achievement (or teacher motivation and academic) does not imply that self 'concept' 'causes' achievement or that achievement 'causes' self-concept or teacher motivation 'causes' academic performance 'causes' teacher performance). Such a relationship only indicates that students with higher self-concepts have higher levels of achievement and students with lower self-concepts have lower levels of achievement. From the fact that two variables are highly related, one cannot conclude that one is the cause of the other; there may be a third factor which 'causes' both of the related variables. For example, suppose it were determined that there is high degree of relationship between number of years of schooling and income at age 40 (two quantifiable variables). The temptation might be to conclude that if you stay in school longer, you will make more money; this conclusion would not necessarily be justified. There might be a third variable, such as motivation, which 'causes' people to stay in school and do well in their jobs. The important point to remember is that correlational research never establishes a cause-effect relationship only a relationship (Gay, 1996).

Regardless of whether a relationship is a cause-effect relationship, the existence of a high relationship permits prediction. For example, high school grades and college grades are highly related; students who have high Grade Point Averages (GPA's) in high school tend to have high GPA's in college, and students who have low GPA's in high school tend to have low GPA's in college. Therefore, high school GPA's can be, and are, used to predict GPA in college. The relationship between two variables is generally expressed as a correlation coefficient, which is a number between .00 and 1.00. Two variables that are not related will produce a coefficient near 1.00. Since very few relationships are perfect, prediction is rarely perfect. However, for many decisions, predictions based on known relationships are very useful. (Gay, 1996)

The argument for quantitative is that, the study wanted to find the extent to which teachers' motivation relate to learners' performance and correlation coefficient in quantitative research seems to be the best the statistic to explore this relationship. While some qualitative approaches were used in sampling the schools, qualitative research was not that appropriate as one was not going to find the nature of motivation or qualitative differences in performance among learners.

2.3. DEFINITION OF OPERATIONAL CONCEPTS

Definition and discussion of:

2.3.1. Academic Performance.

This relates to out-comes as measured by an approved standard. This refers to achievement under test (The Concise Oxford Dictionary, 1982). There is another paradigm that views academic performance as school construction. This view maintains that academic performance should be seen as 'emergent' and constantly in the state of construction as the individual interacts with the world in order to understand academic performance, according to this view, one should not be blind to other confounding social structural and individual psychological factors. Thus the marks/scores that one could come up with irrespective of how objective, standardized, carefully designed, reliable and valid the assessment procedures might have been, will always be subjective value because academic performance cannot be absolute and static. It will always fluctuate and vary depending on factors such as: 1. the ideology permeating education theory and practice, 2. the nature of given tasks and subject materials, 3. the idiosyncrasies of the tester and testee and 4. the testee's level of motivation, inclination and interests sometimes due to socialization as well as acquired skills (Mahlomaholo, 1998).

From the above, it becomes clear that many factors play a role in the production of learners' marks/scores. Thus, that mark is not definite, it is only diagnostic within the limitations of the factors that will be discussed subsequently.

2.3.2. Motivation

A term used in Psychology to mean the cause of behavior that is persistently directed toward a goal.

Motivation is usually made up of a combination of motives, which may also be called drives, incentives or interests. Motivation is often based on acquired social values. Such values may motivate a person to seek a College education or to win the approval of others. Another person with different social values, might reject higher education for the immediate goal of a job in order to buy a car and expensive clothes. Adequate motivation is one of the important conditions for efficient learning. In general the stronger the motivation, the more effectively the student will learn (New Standard Encyclopedia, Volume 8)

Motivation is the driving force, the impetus of the personality, which is put into effect by an act of the will in accordance with what a learner wants to do. Motivation energizes behavior and can be an intrinsic or extrinsic force. Motives are related to motivation in that they are the actual factors which motivate a person, such as a need to do well in a test, or to win in a race, or to get to school early. Such motives get the person started, give the person direction and help him to select the appropriate behaviour to achieve his/her goal. No one is ever unmotivated. We are all continually endevouring to maintain and enhance our personal feelings. Motivation grows from a need to be competent, from a need for self-actualization, from a need to become functionable, from a need for personal adequacy, from a need for some satisfactory level of self-realization, a need to be somebody (Hamachek, 1977)

Two types of motivation can be identified namely:
Extrinsic motivation. The driving force or impetus behind this type of motivation stems from without a person in order to gain approval or praise, to work for some reward or gain. The reason for an activity, be it work or play, lies primarily externally. Extrinsic motivation is heavily dependent upon others; the teacher is the assertive person and the learner remains motivationally passive. If excessive, the goals of the teacher will be reflected and the goals of the learner will be ignored. Extrinsic motivation needs continuous reinforcement for if it is withheld, motivation may cease. Cold cash reward is a powerful extrinsic motivator but it will lead to serious consequences, for performance in all probability become so conditioned that it will cease all together if the reward is withheld and another consequence, such as the recipient calling the giver 'mean' or 'mingy', may result. Extrinsic motivation should be gradually eliminated as the child develops, and if used, should

be used wisely and individually. Motivation such as blame or approval has a different effect on different learners. The abuse of extrinsic motivation can stifle the development of intrinsic motivation

Intrinsic motivation, on the other hand, is an inner drive which urges an individual on, by his/her own intrinsic goals, curiosity and interests. Intrinsic motivation in itself sustains learning. It is independent of external motivation, although external motivation does not feature to a certain degree. There is a self-perpetuating energy behind intrinsic motivation which can function in the complete absence of extrinsic motivation. Extrinsic motivation does not work but intrinsic motivation is preferable and the goal to be sought after. In every teaching and learning situation, both extrinsic and intrinsic motivation should be present. Motivation, therefore, is a term used to describe forces acting either on or within a person to initiate behavior. It is also important to understand that motivation is primarily a performance variable. That is, the effects of changes in motivation are often temporary. An individual, highly motivated to perform a particular task because of a motivational change, may later show little interest for that task as a result of further change in motivation (The New Encyclopedia Britannica, Vol. 24, Macropaedia, Knowledge in depth, 1992).

2.4. **RELATED LITERATURE.**

This investigation is only concerned with whether the teacher's level of motivation can influence the academic performance of the learners, with the ultimate aim of using the findings from this investigation to make recommendations which would assist in the alleviation of the persisting problems in Mathematics education. In both the TIMMS (Howie and Hughes, 1998) and TIMMS repeat (Howie, 2001) in (Grayson, Ono and Ngoepe, 2001) studies, South African pupils came last in Mathematics and science of the 41 countries that participated. In 2000, fewer than 20 000 pupils in South Africa, with a population of roughly 40 million, passed Grade 12 Mathematics well enough to allow them entry into University science-based studies. In the search for explanations for, and ways of addressing this poor performance, it is reasonable to look at the Mathematics teachers.

Another factor which has always been a concern of the researcher is the issue of poor performance of

grade 12 pupils with regard to Mathematics. The performance of South African pupils in Mathematics is abysmal by both national and international standards. Many Mathematics teachers have inadequate content knowledge and operate in schools where there is lack of resources. This is not the whole story. Grayson, Ono and Ngoepe (2001) argue that from 1999 to 2000, a number of schools improved their overall final examination pass rates by more than 50%, largely by increasing their professional practice. They further argue that in developing countries, teachers' effectiveness is often diminished by a lack of motivation and commitment. The paper further argues that where commitment and dedication are high, good results may be achieved under poor conditions.
Research tells us that positive self-concepts in teachers facilitates not only their own classroom performance as a confident, un-anxious, respected guide to learning, but also pupil performance which flourishes in all respects when the pupil's view of himself/herself as someone of worth. Expectations from such teachers lead to higher pupil self-esteem and performance. This could be proved or illustrated by the fact that from 1999 to 2000 a number of schools in South Africa improved their overall final examination pass rates by more than 50%, largely by increasing their professional practice. Conversely, where commitment and dedication are high, good results may be achieved under poor conditions (Grayson, Ono and Ngoepe, 2001).

Teacher motivation and commitment can be very influential in pupil's success. In South African schools that succeed despite poor conditions (Malcom, 2000) in Grayson, Ono and Ngoepe, 2001, it was found that the teachers have high levels of commitment and dedication, work hard and for long hours, and are available to pupils outside of class time. In a research paper presented by Grayson, Ono and Ngoepe in 2001 at the Third International Conference of the European Science Education Research Association, they came up with the following findings:

- Qualifications and resources are not the only factors that influence teachers' effectiveness. Equally important are teacher's motivation and commitment. Lockheed and Verspoor (1991) identify teaching time as a 'key determinant of student achievement' which is largely determined by teacher motivation.
- They go on to say that many countries do not get the best performance from their incumbent or their new teachers. Lack of motivation and professional commitment produce poor

attendance, poor performance and unprofessional attitudes towards students. Referring to Africa, Ongunniyi (1986) identifies lack of teacher motivation as one of the problems hindering good science education. On the other hand, Obanya (1999, p. 171) suggests that, "the 21st century teacher in Africa has to be a professional educator in every sense of the term". By contrast, Caillds et al. (1997) suggest that poor quality teacher preparation and low motivation to teach with limited resources may be masked by complaints about poor facilities and teaching and learning conditions.

In view of the importance of Mathematics in society and in the schools, it seems obvious that the efficacy of Mathematics teaching and learning deserves continued and sustained scrutiny.

Grayson, Ono and Ngoepe (2001) argue that from 1999 to 2000, a number of schools improved their overall final examination pass rates by more than 50% largely by increasing their professional practice. They further argue that in developing countries, teacher's effectiveness is often diminished by a lack of motivation and commitment. The paper further argues that where commitment and dedication are high, good results may be achieved under poor conditions. This argument is pursued further by Mogale (1998) in Lebeta 2000 where he states that some educationists believe that children do not have a learning problem, but it is the teachers who are having a teaching problem. This issue is therefore a complex one. It is on the basis of the above and also looking at the high percentage failure rate in Mathematics that the researcher is challenged to undertake this study. The basic aim being to look at whether there is a significant relationship between learners' academic performance and teacher motivation.

Murphy reports that quality and academic level of teaching force is reflective in poor matriculation results. Biehler and Snowman (1997) in Msimang 2002 state that another reason could be that teachers themselves spoon-feed learners to such an extent that learners are trapped in a condition where every time they need the teacher's aid to learn. Apartheid deliberately created vast inequities for pupils of different racial groups. The problem was compounded in the 1980's and early 1990's, the final days of apartheid, and the time when the bulk of today's Mathematics teachers were trained,

by frequent strikes and protests, with a concomitant loss of teaching time. The paper qualifications of many teachers trained during this period thus reveal little about teacher's actual knowledge. Furthermore, over 50% of Mathematics teachers lack even adequate paper qualifications in the subject. (Arnott et al, 1997 in Grayson, Ono and Ngoepe 2001). Given this background, many Mathematics teachers therefore lack adequate professional competencies and appropriate attitudes. Yet this is precisely what is needed for teachers to be effective. Seifert (1991) report that whilst demographic characteristics may vary, what effective teachers have in common are the skills and attitudes of professionalism.

The problems experienced in Mathematics are not only unique to South Africa. The Netherlands is threatened with a shortage of Mathematics teachers in the medium term, both within and outside the field of education and research. The demand for Mathematics teachers is steadily increasing, while a number of Mathematics students has decreased in recent years. This puts the continued existence of Mathematics in South Africa in danger in research and education and in the practical application of Mathematical techniques. Mathematics education in Dutch schools is highly praised internationally, yet still fails to motivate enough pupils to take up the subject. This is also a problem in the Universities, where the percentage of female Mathematics students is still extremely low (20% at the most). Of these who study Mathematics at University, very few choose to go on to become Mathematics teachers. The flow of Mathematics teachers with a University education into secondary education has all but dried up.

Insufficient motivation, lack of awareness of the dynamic character of Mathematics, and of career opportunities it offers, and too few teachers with a University education – these elements add up to a chain of problems in Mathematics education in Secondary schools and Universities, according to the fact-finding committee on Mathematics in its report (News Letter, 4/92). It is reasonable to look at the Mathematics and Science teachers in search for explanations for, and ways of addressing this poor performance in Mathematics. A baseline study of South African teachers' content knowledge was conducted in 1999 (Nagao, et al,) with a sample of 54 high school Science and 60 Mathematics teachers. Most of the material was based on elements of the Japanese grade 9 and 10 syllabus,

although some questions were at a lower level. The average mark for the science test was 46% and for the Mathematics test was 50%. As an example of the lack of content knowledge, 60% of science teachers could not correctly identify the gas that is most abundant in air from a choice of five gases.

As for Japanese teachers, given that Japan's per capita income is the second highest in the world, it is reasonable to expect its teachers to have greater content knowledge. The average teacher in Japan receives more rigorous training and a much higher salary than his or her South African counterpart. Japanese teachers also have access to better facilities and resources. However, Japan has not always been a wealthy country. After World War 2, its economy was totally destroyed. To a large extent, its current success is attributable to the hard work, selflessness and community-mindedness of its people. In Japan there is a strong perceived link between success and effort (Stevenson and Stigler, 1992) in Greyson, Ono and Ngoepe, 2001.

Teacher motivation and commitment can be very influential in pupil's success. In South African schools that succeed despite poor conditions (Malcom, 2000), it was found that the teachers have high levels of commitment and dedication, work hard and for long hours, and are available to pupils outside of class time. These characteristics are also common amongst teachers in Japan. In a research paper presented by Grayson, Ono and Ngoepe in 2001 at the Third International Conference of the European Science Education Research Association, they came up with the following findings:

1. Qualifications and resources are not the only factors that influence teachers' effectiveness. Equally important are teacher's motivation and commitment. Lockheed and Verspoor (1991) identify teaching time as a 'key determinant of student achievement' which is largely determined by teacher motivation.
2. They go on to say that many countries do not get the best performance from their incumbent or their new teachers. Lack of motivation and professional commitment produce poor attendance, poor performance and unprofessional attitudes towards students. Referring to Africa, Ongunniyi (1986) identifies lack of teacher motivation as one of the problems hindering good science education. On the other hand, Obanya (1999, p. 171) suggests that, "the 21st century teacher in Africa has to be a professional educator in every sense of the

term". By contrast, Caillds et al. (1997) suggest that poor quality teacher preparation and low motivation to teach with limited resources may be masked by complaints about poor facilities and teaching and learning conditions.

In view of the importance of Mathematics in society and in the schools, it seems obvious that the efficacy of Mathematics teaching and learning deserves continued and sustained scrutiny.

2.5 TEACHER SELF-CONCEPT

Purkey and Schmidt (1996 ; 31), define self-concept as "the totality of a complex and dynamic system of learned beliefs that an individual holds to be true about his or her personal existence and that gives consistency to his or her personality". Purkey and Novak as quoted by Grobler (1993 ; 21), refers to the essence of self-concept; it is the dynamic complex of attitudes held towards oneself. The self has three components where beliefs about the self are held, the evaluative component which refers to the feelings about ourselves and the behavioural which refers to the response one is likely to make based on feelings and beliefs towards oneself. According to Fox (1993), the origin of the self is in social interactions. A person's self-concept develops from the reactions of other people to his behaviour. They give the person feedback about what is acceptable and what is not acceptable. Gradually the person builds up a picture of who he /she is, this "self" is the core of the person's personality.

Because of the social origin of the self- concept, the quality of the interpersonal environment within the classroom also monitors the self-attitudes of many pupils. The teacher-pupil encounter is permeated on the teacher's side by his/her general outlook and philosophy of life. Like pupils, teachers also possess self-concepts which affect their own and the pupils' behaviour, their ability to build sound relationships with the pupils, their style of teaching and their perceptions and expectations of themselves as teachers and of children as learners.

Research on teaching, usually trying to answer the question what makes a good or effective or unsuccessful teacher, has had a long but to some extent an unproductive history. There exists a

plethora of findings but few are solid, and replicable, or hang together in a meaningful way. The source of trouble has been the lack of a reliable, objective, universal criterion of teacher effectiveness. The impossibility of discovering such a single criterion is inherent in the diverse nature of the teacher's role, and in the many and varied activities he/she performs in a wide range of contexts. Researchers have been moved to admit that the problem of teacher effectiveness is so complex that no one today knows what the competent teacher is. But from the compendious array of research into teacher effectiveness, a major trend emerges: successful teaching measured in terms of either pupil performance or ratings by others requires teachers who are able to form satisfactory human relationship and create a warm, supportive, and accepting classroom ethos.
Moreover, pupil behaviour is a major outcome of teacher behaviour since the teacher is a necessary though not sufficient condition for purposeful productive pupil performance, and pupil behaviour is a response to the way the teacher provides for learning situations in which the pupils are initiative (Ryans, 1995).

For example, Ryans (1995) demonstrated that in elementary school, high positive relationships exist between observed productive pupil behaviour; e.g. alertness, participation, confidence, responsibility and observed patterns of behaviour in the teacher which reflect understanding, empathy, warmth and friendliness. In secondary schools the same relationships were found to exist but were not so pronounced. Spaulding (1982) showed that the self-concepts of pupils were apt to be more positive in classrooms in which the teacher was 'socially integrative' and 'learner supportive'. Effective teachers then appear to be differential from ineffective ones by demonstrating:

a) a willingness to be more flexible;

b) an empathic ability, sensitive to the needs of pupils;

c) an ability to personalise their teaching;

d) an appreciative reinforcing attitude;

e) an easy, informal, warm, conversational teaching manner; and

f) emotional adjustment.

In other words, effective teachers create a different learning environment from ineffective teachers.

The personality characteristics which appear to discriminate effective from ineffective teachers are clearly related to the self-concept. The role teachers have to play must heighten their awareness of themselves and others, for teaching is a sharing of self with others. Hence attitudes to self and to others, would seem to be of vital importance in influencing interpersonal behaviour in the classroom and as a corollary in influencing preferred teaching style also (Burns, 1986).

Hence the possession of positive self attitudes facilitates the construction of warm, supportive relations with others, this acts as a therapeutic mechanism to promote the development and continuity of positive self attitudes in those others. Davidson and Lang (1982) showed that pupils were well able to evaluate their teacher's feelings towards them, and those who saw the teacher as one who presented favourable regard to them were the possessors of more positive self-concepts and higher scholastic performance. So research tells us that positive self-concepts in teachers facilitates not only their own classroom performance as a confident, un-anxious, respected guide to learning, but also pupil performance which flourishes in all respects when the pupil's view of himself/herself as someone of worth. Expectations from such teachers lead to higher pupil self-esteem and performance (Burns, 1986).

2.6 **MOTIVATION**

The burning issue in black education is the revival of the culture of teaching and learning. To some extent, it is argued that the high failure rate in matric is due to incompetent teachers. According to Oosthuizen (1994: 92) "An incompetent person is described as someone who is unsuitable or unable to carry out the duties connected with his position in a competent manner." From Van Wyk's point of view, an incompetent teacher can be described as one who fails to maintain discipline, fails to conduct himself/herself in a professional manner and fails to produce good results (Van Wyk, 1971) From the above, one can conclude that a competent teacher is one who has knowledge of the subject matter, has the ability to discipline his/her class and produces good results. In addition to knowledge of basic skills, Airasian (1993) indicates that proficiency refers to teachers' performance, when they plan, deliver and reflect upon their introduction. Effectiveness refers to teacher's impact on the pupils learning; judging the teacher's competence according to pupils' results at the end of the year.

Thus, competency should not only focus on the product, i.e. the student's measured achievement but also the process towards achieving those results (Airasian, 1993).

Competence has been described by Burke (1990) as the acquisition of skills that are related to one's career. To be seen as competent, one must meet the standards related to complex roles, i.e. planning, delivery and evaluation. Increasing research evidence strongly suggests that what teachers believe about students and how they behave toward students can influence for better or for worse – their achievement. There is a variety of ways in which teachers can have an impact on academic performance through attitudes they convey and the atmosphere they create. The teachers' use of freedom and reflection of respect, control and warmth contribute to a student's ultimate success.

The ways significant others evaluate the student directly affects the student's conception of his/her academic ability. This in turn establishes limits on his/her success in school. Teachers, in their capacity of significant others, need to view students in essentially positive ways and hold favourable expectations. Several studies bear directly on the importance of what the teacher believes about students.

Davidson and Lang (1982) found that students' perceptions of the teachers' feelings towards him/her correlated positively with his self-perceptions of their teacher's feelings. The better their academic achievement and the more desirable their classroom behaviour as rated by the teacher. Clarke (1981), reported a positive relationship between student's academic performance and his/her perception of academic expectations of him/her by significant others.

The almost unavoidable conclusion is that the teacher's attitude and opinions regarding his/her students have a significant influence on their success in school. In other words, when the teacher believes that his/her students can achieve, the students appear to be more successful, when the teacher believes that the students cannot achieve, then it influences their achievement negatively. This self-fulfilling prophecy has been illuminated by the research of Cohen (1975).

2.7. HYPOTHESES

Based on the above questions the following hypotheses were advanced:

- There will be no significant relationship between teachers' level of motivation and students' academic performance.
- There will be no significant relationship between male teachers and students' academic performance.
- There will be no significant relationship between female teachers and students' academic performance.
- There will be no relationship between teachers' motivational level and male students' academic performance.

2.8 CONCLUSION

On the basis of the related literature reviewed in this study, there seems to be some form of relationship between learner's academic performance and the level of teacher's motivation. However, one needs to carry out the investigation to arrive at findings which will establish without doubt whether or not such a relationship does exist.

CHAPTER 3

DISCUSSION ON RESEARCH METHODOLOGY AND PROCEDURES OPERATIONALISED IN THIS STUDY

3.1. INTRODUCTION

The previous chapters reviewed the relevant literature on the situational analysis of academic performance in Mathematics, teachers' motivation and some of the teaching and learning strategies. These empirical data which are obtained through the use of questionnaires are given scientific support to the main and educationally significant findings derived from the literature survey. This chapter looks at the research methodology and procedures operationalized in this study. The geographical location of the sample, size of samples from six schools, instrumentation, validity and reliability of the instrument, administration of the instrument and data collection and conclusions are discussed in this chapter.

3.2. QUANTITATIVE OPERATIONALIZATION

3.2.1. GEOGRAPHICAL LOCATION OF THE SAMPLE

The initial intention was to conduct a research whose findings would be valid for the whole of the North Eastern Free State region. But with the discovery that in striving for a broad external validity, a lot of sacrifice would be done on the depth of analysis and understanding of the research. Hence it was decided to choose one magisterial district in the North Eastern part of the Free State where research would be done. The choice made is QwaQwa which is the nearest place to the researcher. Due to time constraints and economic factors, a further delimitation of the study is that it will be limited to Phuthaditjhaba High schools only.

3.2.2. SIZE OF SAMPLES FROM SIX SCHOOLS

Phuthaditjhaba has six High schools offering Mathematics (at grade 11) to African pupils exclusively. The target population in this study is all the African learners from historically disadvantaged schools doing grade 11 Mathematics in Phuthaditjhaba High schools. This does not

however rule out the fact that some of the findings may in the end be applicable to learners in other provinces or other states not being targeted at. Fortunately, principals and teachers from Phuthaditjhaba High schools (or from the targeted High schools) were willing to participate in this research. On the basis of this, one may safely assume that this sampling was more or less randomly selected.

From all these six schools, all learners doing Mathematics in grade 11 were included for stratified sampling. Males and females, learners of different ages, from different socio-economic backgrounds were included. No attempt was made to have either an equal or proportional representation of all grade 11 learners in the sample, but for ethical and confidential reasons, only those learners whose records were available were used.

Schools that are to participate in the study are only identified using pseudonyms as Motebang, Clubford, Dinaledi tsa Pele, Difateng, Dinokaneng and Tjhabeng. The total number of learners in different schools and classes will obviously differ in sizes. The intention of this study is to include all the learners doing Mathematics at grade 11 in all the schools.

The above sample is considered to be representative and more suitable by the investigator. The main conditions determining the choice of the sample were:

- It should be as representative as possible of the teachers and learners involved in Mathematics teaching and learning respectively
- It should be large enough to provide suitably stable results
- It should be small enough to allow proper administration of the questionnaires

3.2.3. **INSTRUMENTATION**

To facilitate triangulation of data during analysis, several different types of data collection tools were used to explore and answer the research questions that have been posed. The data collection for this proposed study includes the following tools: questionnaires, statistics and records of the results of the learners from the High schools chosen for research in order to get the track records of their

performance in Mathematics. The test results of the learners were used with the permission of the Department of Education in the Free State and the principals of the schools involved.

3.2.4. TEACHER'S QUESTIONNAIRE

The teacher's questionnaire was used mainly to measure their motivation or self- concept. The questionnaires were administered in the presence of the researcher (i.e. face to face). It consisted of 25 closed ended questions. The questions are divided into four sections i.e. A, B, C and D. The respondents were assured that all information will be treated with the strictest confidentiality. General information which is mainly biographic was included in the first section of the questionnaire (i.e. section A) requiring gender, years of teaching experience, field of specialization during training, years of teaching Mathematics, professional qualification, academic qualification, highest qualification in Mathematics, availability of resources to support resource based activities, availability of educational support services, total teaching load and number of periods used for Mathematics teaching.

Section B of the questionnaire is based on the Mathematics Teaching Efficacy Belief questionnaire (adapted from the Science Teaching Efficacy Belief questionnaire used by Nomakhosana Kiviet for her doctoral thesis at Columbia University in 1996).

Section C consists of one question only which requires the respondents to voice out their feelings as to whether there were any particular significant factors that led to their present attitude and ability in Mathematics.

Section D requires the respondents to add any other comment they may wish to make. The last part of this section simply asks the respondents to indicate with 'yes or no' whether they would like a resume of the research findings of this study in due course

3.2.5. VALIDITY AND RELIABILITY

It is important that all research instruments first be considered in terms of their validity. Validity may

actually also refer to the degree of relevance of the instrument and, in that way, the instrument may be considered more reliable. Undoubtedly, a reliable instrument would be measured by its ability to obtain information that is free of measurement errors. It is often not just easy to ascertain if the test or survey items are germane to the subject under investigation. Therefore, in this research, the validity of the measuring instrument will be based on content validity. The relevant content was obtained from the literature. The questionnaires were also given to a number of experts in the Department of Educational Psychology to ascertain their opinion whether it really measured teaching and learning effectiveness. They employed subjective judgements to determine if the statements were clearly stated, unambiguous, relevant and fit the informational background of the respondents. Overall, the content and face validity of the instrument, while certainly hard to defend quantitatively, appeared to be reasonably assured through expert opinion and judgement.

In this study, an instrument developed by Kieviet in 1996 for her Doctoral studies at the University of Columbia was used. Although her instrument was mainly developed for Science Teaching Efficacy Beliefs Inventory (STEBI), it was also adapted for Mathematics teaching in this study. In her study she mentions that, concerning the teaching self-efficacy construct, the original developers of the Teacher Efficacy Scale (Dumbo, 1988) used to measure self-efficacy, submitted the responses of 203 elementary teachers to principal axis factoring. Two factors emerged with eigenvalues greater than 1. One indicated personal teaching efficacy while the other one suggested general teaching efficacy. The two dimensions were found to be correlated only at a moderate level, suggesting that they reflected related but somewhat different aspects of efficacy expectations. Factor 1 accounted for 18.2% of the total variance while factor 2 accounted for 10.6% of the total variance. Each of the remaining factors accounted for less than 6% of the total variance. All of the factors included in Factor 1 (Subscale 1) reflected the teacher's sense of personal responsibility in student learning, while those in Factor 2 represented a teacher's belief about the general relationship between teaching and learning (Subscale 2).

The Science Teaching Efficacy Beliefs Inventory (STEBI) employed in her study was developed by Riggs and Enochs (1990). This instrument was adapted from the original Teacher Efficacy Scale

developed by Gibson and Dembo (1984), which was modified by recontextualizing the instrument to science teaching learning situations (the word "Mathematics" inserted into existing items). They also employed principal component factoring followed by a varimax rotation. The two factor structure was confirmed, with Factor 1 accounting for a 16.22% variance while Factor 2 accounted for a 10.92% variance. The correlation between these two dimensions was also found to be moderate (r =.42), which led the developer of the instrument to conclude that both subscales were distinct and homogeneous.

The two-factor structure has since been confirmed by several studies in self-efficacy research (Ashton and Webb, 1986; Gibson and Dumbo, 1984; Guskey, 1987; Spector, 1990; Woolfolk et al., 1990) and shows concurrence with Bandura's (1977, 1980) two-factor model of self-efficacy. The self-efficacy instrument has typically been analyzed by subscale in previous research. For example, analysis of internal consistency reliability of the original Teacher Efficacy Scale (Gibson & Dumbo, 1984) yielded a Cronbach alpha coefficient of .78 for personal teaching efficacy (Factor 1), .75 for general teaching efficacy and .79 for the total scale. Enochs and Riggs (1990) found an alpha of .92 for personal teaching and .76 for general teaching efficacy. Woolfolk et al. (1990) found Cronbach alphas of .81 and .77 for the two subscales respectively. In her study, these were found to be .87 and .82 for personal and general teaching efficacy subscales, with the total scale having an alpha of .90. It was therefore concluded that the Science Teaching Efficacy Inventory was a highly reliable instrument for her sample under investigation (Kiviet, 1996).

It is on the basis of the above that the same instrument was used to measure teacher motivation in Mathematics teaching.

3.3. ADMINISTRATION OF THE INSTRUMENT AND DATA COLLECTION

One questionnaire has been administered for this purpose. Teachers in the sampled schools completed the questionnaire. The questionnaire is to be administered to the six targeted High school Mathematics teachers. The researcher will ask all the teachers participating in this study to submit the mark schedules so as to check the performance of the learners against the background of the test

written during the first semester of the academic year 2002 and their half-yearly examination marks/scores.

The researcher of this study decided to use the test scores of learners obtained from their test and half-yearly examinations written at each school. This decision was based on the discussion of problems relating to the absolutely objective evaluation of learners' performance in Mathematics. To use a more or less consistent average performance for learners, four tests were decided upon. The fact that all the sampled schools apply the system of continuous evaluation/assessment meant that these average marks ultimately determine whether a learner gets promoted to the next grade or fails. It is obvious that there are limitations, however, these tests are powerful tools for assessment and decision about the future of the learners in the study. This influenced the researcher of this study not to construct any other independent test that may purport to be more objective than the ones used by the teachers of the mentioned learners.

3.4 CONCLUSION

It is important to mention that in line with the argument advanced in this study, the category into which any learners may be assigned on the basis of his or her perceived performance then, that is, at the time of assessment and evaluation, is not finite, it may change given the changed circumstances at the time of the next evaluations. The fact that each of the learners sampled never obtained the same mark in all the continuous evaluation test and half yearly examination, attest to this fact.

CHAPTER 4

ANALYSIS AND INTEPRETATION OF RESULTS

4.1 INTRODUCTION

This chapter presents the quantitative analysis of the data gathered from the purposefully sampled schools. The data includes learners' continuous mathematics assessment and teacher's level of motivation in comparison to learners' performance.

4.2 BIOGRAPHICAL DATA

	Female		Male		
Teaching Experience	6-10 years	>10 years	0-5yrs	6-10yrs	>10yrs
	0(0%)	1(16.67%)	1(16.67%)	3(50%)	1(16.67%)
Experience in teaching mathematics	>10 years		0-5yrs	6-10yrs	>10yrs
	1(16.67%)		1(16.67%)	3(50%)	1(16.67%)
Special training in mathematics	Yes	No	Yes	No	
	1(16.67%)	0(0%)	3(50%)	1(16.67%)	
Professional Qualification	3yrs diploma	1yr post grad. Diploma	3yrs diploma	1yr post grad. Diploma	
	1(16.67%)	0(0%)	3(50%)	2(33.33%)	
Highest qualification in mathematics	Mathematics 111		Mathematics 111		
	1(16.67%)		4(66.67%)		

Table 4.1

4.2.1 INTERPRETATION OF TABLE 4.1

4.2.1.1 **Teaching experience**

The above table (4.1) shows that teacher's teaching experience from five years to more than 10 years. The teaching experience is equal to the teaching experience of Mathematics and this means that the teachers in this study have been teaching Mathematics since their appointment.

4.2.1.2 **Special Training in mathematics**

Of the six teachers involved, only one had not received any special training in Mathematics. This training refers to one-year diploma in Mathematics and short courses.

4.2.1.3 **Professional qualification and highest qualification in Mathematics**

There are two categories of professional qualifications for the teachers. Some (66.67%) have done a three-year diploma and 33.33% of them have done a one-year teachers' diploma. The table 4.1 shows that 66.67 % of the teachers have done Mathematics up to course 111 in their three year diploma and 16.67% is for those who did Mathematics up to course 111 in their degree which was followed by one year post graduate diploma.

4.3 MATHEMATICAL TEACHING CONTEXT

	Yes	No
Availability of teaching and learning materials	1(16.67%)	5(83.33%)
Any support services to monitor the use of instructional media facilities	1(16.67%)	5(83.33%)

Total teaching load per week	35-39 hrs	40-44 hrs	45-49 hrs	50-54 hrs
	2(33.33%)	1(16.67%)	2(33.33%)	1(16.67%)
No. of periods used for Mathematics teaching	35-39 hrs	40-44 hrs	45-49 hrs	50-54hrs
	3 (50%)	2(33.33%)	0(0%)	1(16.67%)

Table 4.2

4.3.1 INTERPRETATION OF TABLE 4.2

Resources and support services.

Table 4.2 shows that there is lack of teaching and learning material at the selected schools. There is also lack of support services to monitor the use of instructional media facilities.

4.3.1.1 **Workload and contact time for Mathematics**

The workload ranges from 35 hours per week to 50 hours per week. The average workload is about 44 hours per week. This contact time seems to be equal to the time the

teachers spent in the teaching of Mathematics. This means that the larger part of the teachers' workload is in Mathematics.

4.4 TEACHERS' LEVEL OF MOTIVATION

The two tables (table 4.3 and table 4.4) below show the extent to which teachers rate the influence of their motivation in the performance of learners. Table 4.3 summarizes teachers' self-rating in this direction. In line with the way likert scale is used to find consistency. Table 4.4 rates teachers' assessment on motivation in a negative sense.

Table 4.3 Educators' responses

	Disagree	Uncertain	Agree
When a student does better than usual in Mathematics, it is often because the teacher exerted a little extra effort.	16.67%	8.33%	50%
I am continually finding better ways to teach Mathematics		8.33%	66.67%
When Maths grades of students improve, it is often due to their teacher having found a more effective teaching approach		8.33%	83.33%
I know the steps necessary to teach Mathematics concepts effectively		8.33%	83.33%
The inadequacy of students' Mathematics background can be overcome by good teaching		8.33%	83.33%
When low-achieving child progresses in Mathematics, it is usually due to extra attention by the teacher			100%
I understand Mathematics concepts well enough to be effective in teaching Mathematics			100%
The teacher is generally responsible for the achievement of students in Mathematics	16.67%		83.33%
I am typically able to answer all students' Mathematics questions		8.33%	83.33%
When teaching Mathematics, I usually welcome student questions.			100%
Student's achievement in Mathematics is directly related to their teacher's effectiveness in Mathematics teaching	16.67%	8.33%	66.67%
If parents comment that their child is showing more interest in Mathematics at school, it is probably an indication of the good performance of the child's teacher.		8.33%	83.33%

NB: category on 'strongly disagree' and 'disagree' have been collapsed into one category of 'disagree'. Similarly, the categories on 'agree' and 'strongly agree' have been collapsed into 'agree' category. The recoding led to values of disagrees as 1, Uncertain as 2 and Agree as 3.

4.4.1 INTERPRETATION OF TABLE 4.3

The above table (table 4.3) shows that the teachers' level of confidence (motivation) is high. Out of 216 points, teachers scored between 66.67% and 100% on the likert scale. The table shows general agreement among the selected teachers that their influence could have a very positive role in learners' performance.

On the other hand 16.67% indicates that they disagree that "Student's achievement in Mathematics is directly related to their teacher's effectiveness in Mathematics teaching" and 16.67% also disagree that "The teacher is generally responsible for the achievement of students in Mathematics".

In general teachers think that the outcome of their learners' performance is dependent on the abilities, good teaching and knowledge of the subject matter (ability to explain concepts).

The table that follows presents teachers responses on the level of their confidence in some sections and how they see their teaching relating to the performance of their learners. The difference between table 4.3 and 4.4 is that, in table 4.4 the statements are presented in a negative form.

Table 4.4 Educators' responses

	Disagree	Uncertain	Agree
Even when I try very hard, I do not teach Mathematics as well as I do most subjects	50%	33.33%	16.67%
I am not very effective in monitoring Mathematics tutorials.	50%	33.33%	16.67%
If students are underachieving in Mathematics, it is probably due to their teacher's lack of motivation to teach.	83.33%	16.67%	

I generally teach Mathematics ineffectively.	83.33%	16.67%	
The low Mathematics achievement of some students cannot generally be blamed on their teachers.	16.67%	16.67%	66.67%
Increased effort in Mathematics teaching produces little change in some student's Mathematics achievement.	33.33%		66.67%
Poor ability in Mathematics is not because of poor teaching.		33.33%	66.67%
I wonder if I have the necessary skills to teach Mathematics	83.33%	16.67%	
Effectiveness in Mathematics teaching has little influence on the achievement of students with low motivation.	50%		50%
Given a choice, I would not invite the principal to evaluate my Mathematics teaching	100%		
When a student has difficulty understanding a Mathematics concept, I am usually at a loss as to how to help the student understand it better.	100%		
I don't know what to do to turn students on to Mathematics	66.67%	16.67%	16.67%
Even teachers with good Mathematics teaching abilities cannot help some kids learn Mathematics.	16.67%	33.33%	50%

NB: category on 'strongly disagree' and 'disagree' have been collapsed into one category of 'disagree'. Similarly, the categories on 'agree' and 'strongly agree' have been collapsed into 'agree' category. Since the statements are in negative form, the recoding led to values of disagrees as 3, Uncertain as 2 and Agree as 1.

4.5. INTERPRETATION OF TABLE 4.4

The responses in table 4.4 are consistent with the kind of affirmation given in table 4.3. The teachers are divided on whether "even teachers with good Mathematics teaching abilities cannot help some kids learn Mathematics". 33.33% is uncertain, 16.67% disagree and 50% agree.

4.6 OTHER COMMENTS FROM TEACHERS

The teachers argue that the way Mathematics is taught in lower grades has contributed to the current teachers' attitude towards Mathematics. The following statement by one

educator summarizes some of the teachers' comments: "Yes, the way I was taught Maths in lower grades made me to have +ve attitude towards it"

4.7. LEARNERS' FORMATIVE AND SUMMATIVE ASSESSMENT OVER A PERIOD OF 6 MONTHS

	School A taught by educator 1	School B taught by educator 2	School C taught by educator 3	School D taught by educator 4	School E taught by educator 5	School F taught by educator 6
Learners' performanc e	28.8 %	34 %	28%	43%	14%	39%

Table 4.5

4.7.1 INTERPRETATION OF TABLE 4.5

The above table shows the average marks for continuous assessment and summative assessment. There are about 163 learners, with about 30 per school. The table shows that that learners' marks range from 14% to 43% per school.

In table 4.6 below, the comparison is made between learners' average performance and level of teachers' motivation.

4.8 TEACHERS' LEVEL OF MOTIVATION vs LEARNERS' PERFORMANCE

The table below shows the relationship between teacher's level of motivation and average performance of learners.

	Teacher's level of motivation	Learners' average performance taught by educator x
1	80.6%	28.8%
2	100%	34%
3	86.1%	28%

4	94.4%	43%
5	91.7%%	14%
6	84.3	39%

Table 4.6.

Statistical analysis table [refer to attached table] or to be transferred here.

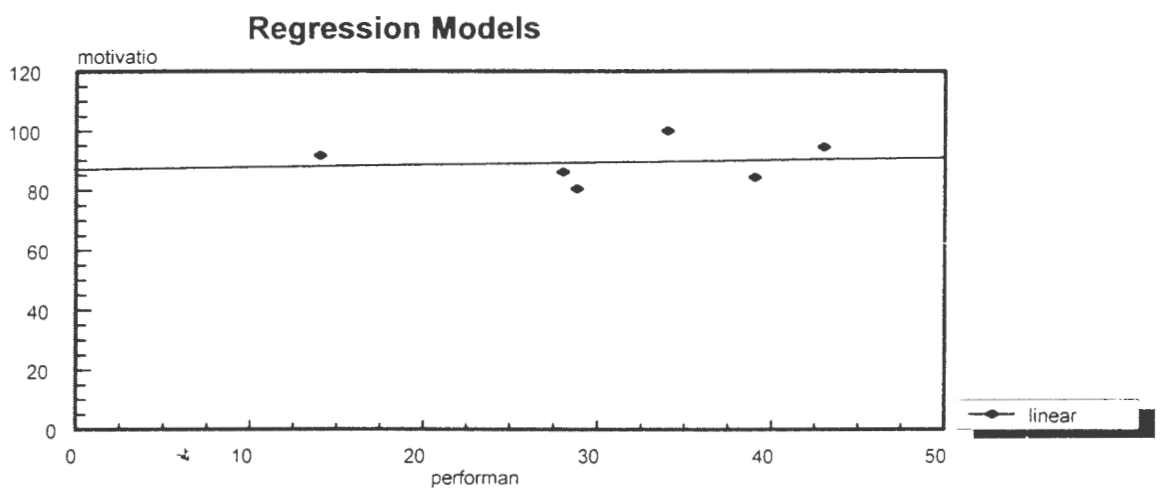
$Y = C + BX$

$Y = 87.057 + 0.079X$

	C	B	r^2	r	Ltl	P
	87.057	0.079	0.0126	0.112	7.67	0.832

Table 4.7

Graph



4.8.1 INTERPRETATION

The statistical analysis shows that there is a relationship between teachers' motivation and corresponding performance of learners. Since there is positive correlation coefficient,

0.112 (though small), the null hypothesis that there is no relationship between teachers' motivation and the learners' performance in Mathematics and state that there is association between learners' performance and teachers' motivation. Using Cohen (1988)'s criteria on effective size, the relationship between teachers' motivation and learners' performance is small. However calculated t-value for 1 and 4 as degrees of freedom is 7.67 at p = 0.832. This is rejected at p = 0.8 both for 1 and 4 as degrees of freedom. This means that there is no significant relationship (statistically) between motivation and learners' performance.

On the other hand at p = 0.05 for 1 degree of freedom, the calculated t-value is less that the value in the table (critical value) this then means that at p = 0.05 (five in hundred) there is no significant relationship statistically between motivation and learners' performance and therefore the hypothesis that there is significant relationship is rejected.

4.9 DISCUSSION

The following questions were initially at the centre of the investigation of the study:

a. What is the level of motivation of teachers in selected schools in Phuthaditjhaba?
b. Is there a relationship between the level of motivation of the teachers and the academic performance of learners?
c. Is the level of male teachers' motivation more related to learners' academic performance than that of female teachers?
d. Is teachers' level of motivation more related to the male students' academic performance than the female students' academic performance.

As the main study was underway, on the issue of gender, it was found out that learners' performance at schools was not recorded in terms of gender and consequently, the average performance reflected in the results does not reflect the learners' performance in terms of gender. The discussion in this section will therefore focus on the first two research questions. The remaining two that deal with gender will not be discussed as explained above.

4.10 LEVELS OF TEACHERS IN SELECTED SCHOOLS IN PHUTHADITJHABA

The biographical information shows that teachers who were selected for the study included those who have reasonable experience (all have completed probation period) to those who may be regarded as well experienced (10 years teaching experience). The background information also shows that these teachers have been teaching Mathematics under difficult circumstances if one considers the lack of resources, workload that is reasonably high (average of 44%) and lack of support services. Given this information, one is of the view that the results as presented above reflect their sincere views on the motivation and performance of learners.

In studying the analysed views of teachers, the results show that the teachers have registered between 66.67% and 100% in table 4.3 an average of 75%, and between 16.67% and 100% in table 4.4 with an average of 61.11% in likert scale type questionnaire. These results consistently show that the teachers firmly believe that learners' performance come as a result of teachers' motivation and teachers' work. The conclusive view is that the level of teachers' motivation is high in selected schools in Phuthaditjhaba.

4.11 RELATIONSHIP BETWEEN TEACHERS' MOTIVATION AND LEARNERS' PERFORMANCE

The results in table 4.7 indicate that there is some positive correlation between teachers' motivation and learners' performance. Though the correlation coefficient is positive, the correlation is small ($r = 0.112$). By Cohen's (1988) criteria, the size of the correlation is small. Furthermore looking at t-test, there is no statistically significant relationship between motivation and learners' performance at $p = 0.8$ for degrees of freedom 1 and 4. As earlier explained, at this level, the statistical analysis shows that there is no relationship between teachers' motivation and learners' performance. It was further shown that the relationship between teachers' motivation

and learners' performance is statistically significant at p = 0.05, that is, there is no relationship between teachers' motivation and learners' performance.

On the basis of the two versions above of statistical analysis, the response to the question that: Is there a relationship between the level of motivation of the teachers and the academic performance of learners?

As the correlation coefficient is small, the strong conclusion that as the teachers' motivation increases, the learners' performance improves or becomes better cannot be emphatically made.

Furthermore, the studies referred to earlier in the literature review, for instance, the findings from the Tracer Project in Kenya, baseline study by Nagao et al. (1999) confirm teachers' view in this that teachers play a very crucial role in the performance of learners. Finally the study by Malcom (2000) that shows that teacher motivation can be very influential in pupils' success is an indication that a relationship between teachers' motivation and learners' performance exists. As Grayson, Ono and Ngoepe (2001) point out, the "key determinant of student achievement" is largely determined by teacher motivation.

The findings from other studies conducted elsewhere acknowledge that the relationship between learners' performance and other key variables such as teachers' motivation exist. The point is made that in conducting this kind of study, motivation is the key variable, but there are other variables that need to be closely looked into.

4.12 CONCLUSION

The findings on the current study are indicative of a pertinent and immense challenge to all educators of Mathematics in South Africa. The challenging situation is for Mathematics educators to devise means and ways of how best they can assist the learners to improve their academic performance in Mathematics. Despite the fact that

most of the teachers involved in this study indicated a very high level of motivation and enthusiasm towards their work, the academic performance of their learners was very low. This calls for very rigorous intervention by the teachers, Department of Education, specialists in Mathematics education outside the teaching profession and the parents. Learners also need to take the responsibility of their own success and improve their performance in Mathematics. The challenging situation applies to Mathematics in general. Tackling the challenge may demand that the problem areas should be addressed and resolved purposefully and constructively in order to achieve real professional integrity.

CHAPTER 5

SUMMARY, CONCLUSION, RECOMMENDATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

5.1 INTRODUCTION

This chapter summarises and highlights the major findings of this research. Conclusions, recommendations and suggestions for future research will also be discussed.

5.2. SUMMARY

5.2.1. Research questions restated

For the purposes of this study, the following questions were asked:

- What is the level of motivation of teachers in selected schools in Phuthaditjhaba?
- Is there a relationship between the level of motivation of the teachers and the academic performance of learners?
- Is the level of male teachers' motivation more related to learner's academic performance than that of female teachers?
- Is teachers' level of motivation more related to the male students' academic performance than the female students' academic performance?

5.2.2. Aims and Objectives Restated

The aim of the study was to explore as comprehensively as possible the patterns and trends in pupils' performance in Mathematics in grade 11 learners in some selected High Schools in Phuthaditjhaba. In particular, this study proposed:

5.2.2.1. OBJECTIVES

- To find out whether teachers' level of motivation plays an important role in the performance of learners in Mathematics. (Focus was put on grade 11 Mathematics classes for purposes of continuity if follow-up is needed).

- To determine what (if any) remedial measures of this situation can be constructed in order to improve the situation.
- To find out whether there is any significant correlation between learner's achievement scores (performance) and the level of motivation of the teachers.

5.2.2. Hypotheses restated

In this study it was initially hypothesized that:

a. There will be no significant relationship between teachers' level of motivation and students academic performance.
b. There will be no significant relationship between male teachers and female students' academic performance.
c. There will be no significant relationship between female teachers and students' academic performance.
d. There will be no relationship between teachers' motivational level and male students' academic performance.
e. As earlier mentioned in chapter 4, as the study progressed, the issue of gender was not pursued as the difference became insignificant and not possible to work out in the case of learners' performance. This then leaves the study with one key hypothesis to investigate, that is, there will be no significant relationship between teachers' level of motivation and students academic performance.

The study found that the relationship exists but it is small and therefore it will not be strongly claimed that as the motivation increases, the learners' performance increases.

5.2.3 FINDINGS RESTATED

The purpose of the study was to investigate how the performance of learners in mathematics relates to the teacher's level of motivation. Summary of findings are indicative of the following:

a. Teachers agree that attitude plays an important role in the teaching of mathematics and that negative attitude that they got during their schools days might have affected them the way they teach.
b. Mathematics teachers in selected schools teach under difficult environments - no support services, high teaching workload and no resources.
c. Teachers are reasonably highly motivated.
d. Teachers strongly agree that learners' performance depend on their motivation, teaching and knowledge of the subject.
e. Learners' performance is significantly low even at grade 11: continuous assessment and summative assessment range from 14% to 41% in six selected schools.

5.3 CONCLUSION

If teacher's feelings of competence improve, and if they are supported and appreciated by all stakeholders in the education system, that is, their principals, parents, community members, officials in the department, learners, their motivation and level of commitment will likely increase. This will in turn have a positive influence on the academic performance of their learners. Parental support and the common practice of paying for extra lessons will also have an effect on the learners' academic performance.

5.4 RECOMMENDATIONS

Based on the findings of this study, the following recommendations are made by the researcher. That the South African government needs to take the issue of the retention of teachers very seriously, especially Mathematics and Science teachers who have the potential of being absorbed by the private sector. The South African Department of Education is loosing experienced teachers at an alarming rate. Perhaps one way of retaining these teachers would be to ensure that teachers are well paid like in other countries such as Japan.

Teachers should also be encouraged to be more committed and motivated and put in more time on school related activities. It is further recommended that the government should pursue the re-establishment of in-service training and life-long learning. In this way, teachers will be kept abreast with the current developments in their subjects of specialization as well. The new strategies employed in Mathematics will make it more meaningful and interesting to the learners. A series of workshops, seminars and conferences should be arranged amongst Mathematics teachers from different schools by their respective chief education specialists. In this way they will be able to share information and aspire to provide quality education to the learners. Teachers will also have greater subject matter competence and confidence in their knowledge of Mathematics. More support and learning opportunities for teachers within schools in the form of a one year induction programme and school-based in-service training would also be an added benefit to both teachers and learners. Professional development courses to improve the teachers' subject matter knowledge should be introduced and be compulsory for all Mathematics teachers.

South African teachers could be required to pass a content knowledge test in order to obtain their certification, as is done in countries like Japan. As we strive to re-orient teacher evaluation to have a positive influence on students learning, we must be cognisant of time. Schools are under a constant barrage of requests to accept additional responsibilities, which often directly or indirectly increase the already heavy work loads and responsibilities of teachers.

Evaluating teachers for the primary purpose of improving instruction is in its formative stages. As new systems are developed, the quality of Mathematics taught must be a central concern and teachers must guide its development and implementation. Doing so will help ensure needed teacher commitment, take into account teacher beliefs and disposition, and produce a workable system that will help all learners reach their highest Mathematical potential. Restructuring the teaching evaluation process is challenging, but the many opportunities it affords for student learning demand that it be given immediate attention (Prevost, 1994).

The above quoted statement demonstrates the extent to which the quest for teacher evaluation should be a concern for South Africa. It is also clearly essential that if there is to be a significant improvement in learners' performance in Mathematics, we need to encourage and appeal to the teacher's willingness to put in enough time and effort to do their jobs properly.

Teachers and parents should spend more time encouraging students to believe in themselves and take Mathematics just like any other school subject. This could be done by rewarding every positive move (like passing a test or getting a sum right) a student takes with comments like "well done", "you are on the right track", etc.

There seems to be a lack of coordination, cooperation and collaboration between training, school and departmental levels, which may negatively impact even further on the relevance and effectiveness of the pre-service training concerned.

Mathematics and Mathematics courses are mostly conducted in a prescriptive transmission manner. Hence, prospective Mathematics teachers are told what to do, but they are denied the opportunity to gain first-hand experience of what is required of them in class, particularly with respect to "new" methodologies (e.g. OBE).

Most practising teachers have to cope with insufficient managerial, administrative, curricular and resource support, which may contribute to the lack of ample constructive teaching-learning action and time observed in Mathematics classes.

Based on the findings, it is recommended that focus should be on learners in order to improve on their performance in Mathematics.

Career guidance centers should be introduced at school level starting at grade 8. Grade 8 learners should be afforded the opportunity to learn subjects from all the three streams (Humanities, Sciences and Commercials).

Learners should be encouraged to practice Mathematics a lot and work on their own. The amount of time the majority of learners today spend on Mathematics study "does not correlate with the importance of Mathematical understanding to their lives".

Learners should be trained in problem-solving skills, as this seems to be affecting their achievement in Mathematics.

Topics treated in class should be related to daily situations. This will also give the learners the skills to pursue a certain career, even before they get to tertiary level. This will not only build love for the subject but will also encourage learning and using Mathematics widely. Teachers should at all times build confidence in their students. The myth that very few people can understand and master Mathematics should be driven away from the minds of the learners. This could be done by showing/relating the use of Mathematics in our society to, for example, by Physicists, Biologists, Land surveyors, Economists, Chemists, Builders , Shopkeepers, Street vendors, and so on.
Learners should be encouraged to arrive at their own conclusions and not wait for "right" answers/solutions from teachers. Teachers should therefore not always work out solutions on the chalkboard but should provide ample time for students to do this.

Workshops to update skills should be planned with teachers and address their specific needs. These workshops should be provided as part of the implementation on new classroom programs or other curricular changes which teachers are expected to undertake. These sessions should be of practical value to teachers and focus on specific instruction techniques rather than theory.

"Record cards" on Mathematics skills to monitor individual performance, allowing teachers to spot students needing remedial help as well as those with talent. It is extremely important to monitor student progress on a skill by skill basis, and provide a means for this information to be passed from teacher to teacher and school to school.

Support personnel should also be part of the school package. In most predominantly white schools, when a learner has difficulty with reading, the classroom teacher can turn for assistance to a reading consultant or specialist. But that option is rarely available in predominantly black schools. Without such specialized assistance, the problem is left unresolved or dealt with at the expense of the remainder of the class.

While the departmentalised nature of secondary schools should allow for Mathematics supervisors, additional personnel need not be necessarily full-time. These positions could be filled by using expertise of existing staff through time-release arrangements, team leaders or other dual positions. Assignments of more staff is certainly not a panacea for overcoming all the problems with Mathematics, but commitment to better Mathematics programmes strongly suggests the need for specialized Mathematics personnel.

To deliver good quality teaching, the concern must not only be just what is to be taught but also how it is to be taught (Fox, 1993). These two factors have implications for resource materials for teaching-learning relationships going on in the classroom. No matter how motivated or competent teachers may be, lack of resource materials will prevent them from accomplishing their responsibilities and may even result in frustration and demotivation (Fox, 1993).

Furthermore, the question that needs to be asked is what will become of the low achieving learners in Mathematics who are already struggling to pass the subject? This brings about an urgent need to introduce remedial Mathematics intervention for low achievers in Mathematics. The focus of the proposed intervention should be on developing the confidence, skills, competencies and conceptual understanding of the learners in relation to specific Mathematics topics. The purpose of the intervention should be to attempt to diagnose the source of the learner's difficulties within the mentioned areas and to put them through a specifically designed (four – months) remedial intervention programme in Mathematics. The expectation is that this will further develop their confidence and conceptual understanding, thinking strategies and reasoning abilities in order to improve their understanding and academic performance in Mathematics.

There is an urgent need for the support services of trained remedial teachers in (ordinary) predominantly black schools. These teachers' services are essential in cases in which the nature of the learning problem requires specialised methods and techniques that "ordinary" teachers are not equipped to use. Trained remedial teachers who are attached to a school or who visit schools from time to time to do tests and help some children with serious problems have an important contribution to make in supporting the teacher or advising him or her on remedial teaching for these learners.

The schools may record Television broadcasts of Mathematics lessons or order and keep them in the media center where the Mathematics teacher is aware that several learners do not fully understand a particular theme in the syllabus or have not received any instruction on it, they can watch the applicable video lessons.

The teacher should follow up the video lesson with a discussion in which further information is provided and it is checked that the Mathematical concept or method that was dealt with has been properly understood. If the Mathematics lesson is pre-recorded in a classroom set-up where learners can ask questions, it will improve the quality still further.

The microcomputer is a versatile aid with new possibilities for effective teaching and assistance, helping learners to overcome their learning problems and disadvantages more quickly. The motivation, attitude to work, interest and self-image of learners with learning problems improve as a result of computer-aided teaching and learning methods. Learners can request the computer to repeat explanations of method and principles until they understand them.

Group work should be promoted among learners as a strategy in the Mathematics courses. In group work, learners who have fully mastered a Mathematical method or principle can be asked to demonstrate it to their classmates, commenting verbally on the

relevant steps and principles. Teachers also spontaneously adopt good and better methods from each other. It promotes learner motivation and reduces tension and anxiety.

Parents of learners with learning problems in Mathematics can fulfil an extremely important supportive function, whether or not they are familiar with the subject and how it is taught. For an example, they can encourage their children to work hard and regularly especially in Mathematics. They could also discuss any signs of learning problems with the teacher and obtain his or her advice on remedial measures.

The use of open-ended and probing questions is encouraged in order to encourage learners to explain their thinking.

The importance of creating a classroom culture where learners can explore, make mistakes and explain their thinking cannot be overlooked.

The view of Mathematics assumed by the Mathematics courses, and made explicit in some of them, is that of developing body of knowledge, open to critique and change.

Assistance for underachievers in Mathematics should be seen as closely connected with general forms of assistance and programmes intended for underachievers. A general improvement of this group of learners' motivation, attitude to work, study methods and so on, will improve their performance in subjects such as Mathematics and reduce underachievement.

In an attempt to extend learning opportunities for all, it is recommended that teaching methods be improved and resources be made available for enhanced teaching and learning effectiveness.

5.5. SUGGESTIONS FOR FUTURE RESEARCH

The following are recommendations for future research:

5.5.1. A replication of this research with a representative sample.

5.5.2. As a follow up to the present study which attempted to find out whether there is any significant relationship between teacher motivation and learning effectiveness, a similar study should be undertaken. Since only six high schools in QwaQwa (a semi rural area) were involved in the sample, it would be interesting to find out what the position is in the urban schools, especially the historically white schools.

5.5.3. Subsequent studies may investigate whether learners' influence or classroom interaction between the teachers and their learners is significantly related to teacher's job satisfaction.

5.5.4. An independent study on the assessment of the impact of the lack of career guidance, Mathematics and Science Teacher Training and supportive compensatory programmes like Science bridging programmes as remedial endeavours.

5.5.5. Research on the effects of Mathematics anxiety or learner's Mathematics learning.

5.5.6. Research on identifying characteristics of an effective remedial Mathematics intervention for low achievers in Mathematics.

5.5.7. Research on the effects of overcrowding in classrooms on learner's performance in Mathematics.

5.5.8. Research of factors that contribute to the Mathematics teacher's level of motivation.

5.5.9. Teacher retention. Career histories of teachers after graduating from Colleges. Mobility within the profession. The extent of teacher wastage and the reasons for it.

5.6 A FINAL WORD

Doing research on academic performance and teacher motivation was an interesting and challenging endeavour. What came out of this study is that the decline in Mathematics scores is not independent of features of schools and teachers. That the teaching of Mathematics has become very problematic for teachers and learners, that as a group teachers are aware that what and how they are teaching are far from effective, that teachers want to do a better job, are glimpses of the obvious. What is equally obvious, but hardly dealt with, is that school personnel (almost without exception, in my experience) believe that the decline in academic performance has its roots within and without the schools. At this point in this discussion, the validity of that fact is not important. What is important is that school personnel have a definite explanation: by virtue of climate, structure and practices of schools, the effectiveness of teaching has suffered and will continue to suffer. If the society had not changed the way it has, schools could do the jobs they are supposed to do.

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November 11, 2002

TO WHOM IT MAY CONCERN

This is to certify that Ramosunya, LJ (8600422) is a registered MEd (Educational Psychology) student at the QwaQwa Campus of the University of the North.

As part of the programme, the students are required to conduct a research project on different topics or fields. To fulfill this requirement, we kindly request you to assist with anything which may contribute towards the completion of their projects. This may involve interviews, observations or administering of questionnaires.

We thank you and appreciate your understanding.

Sincerely

Lebeta TV
(Executive Dean – Education)

Learners' Academic Performance in Mathematics as a function of Teachers' Motivation Questionnaire

Teachers' Questionnaire

Purpose: To measure learners' academic performance in mathematics as a function of teacher's motivation. This questionnaire is a series of statements about your personal level of motivation. Each statement represents a commonly held belief. Read each statement and decide to what extent it describes you. There are no right or wrong answers. You will probably agree with some of the statements and disagree with others. Please indicate your own personal feelings about each statement below by marking the letter that best describes your attitude or feeling. Please be very truthful and describe yourself as you really are, not as you would like to be. (Respond to every statement. You should not respond in a general way but according to how you feel about each statement. All information will be treated with the strictest confidentiality).

Thank you for your co-operation.

Instruction: Use " ✓ " where applicable.

1. Male: _____ Female:

2. Years of teaching experience: 0 - 5 _____ 6 - 10 _____ above 10 years

3. Have you received special training to teach Mathematics? Yes _____ No

4. Years of teaching of Mathematics: 0 - 5 _____ 6 - 10 _____ above 10 years

5. Professional qualifications:

Two years Teacher's Diploma	1
Three Years Teacher's Diploma	2
One Year Post-Graduate Diploma	3

6. Academic qualifications:

a) Highest Degree held:

Bachelors Degree	1
Honours Degree	2
BEd	3
MEd	4

b) Highest qualification in Mathematics:

Mathematics 1 or equivalent	1
Mathematics 11	2

Mathematics 111 3

Mathematics (Hons) 4

7. Are there teaching/learning materials (audio-visual aids) available in your department to support resource-based activities like practical? Yes_____ No

8. Do you have educational support services to monitor the use of instructional media facilities and materials in your department? Yes_____ No

9. Total teaching load: No. of periods (per week)

10. No. of these periods used for Mathematics teaching

SECTION B

Mathematics Teaching Efficacy Belief Questionnaire (Adapted from the Science Teaching Efficacy Belief Questionnaire used by Dr. Kiviet.
Directions: Please indicate the degree to which you agree or disagree with each statement below by circling the appropriate number to the right of each statement.

Strongly Disagree (1) Disagree (2) Uncertain (3) Agree (4) Strongly Agree (5)

	STATEMENTS	SCALE				
1.	When a student does better than usual in Mathematics, it is often because the teacher exerted a little extra effort.	1	2	3	4	5
2.	I am continually finding better ways to teach Mathematics.	1	2	3	4	5
3.	When the Mathematics grades of students improve, it is often due to their teacher having found a more effective teaching approach.	1	2	3	4	5
4.	I know the steps necessary to teach Mathematics concepts effectively	1	2	3	4	5
5.	The inadequacy of students' Mathematics background can be overcome by good teaching.	1	2	3	4	5
6.	When a low-achieving child progresses in Mathematics, it is usually due to extra attention given by the teacher.	1	2	3	4	5
7.	I understand Mathematics concepts well enough to be effective in teaching Mathematics.	1	2	3	4	5
8.	The teacher is generally responsible for the achievement of students in Mathematics.	1	2	3	4	5
9.	I am typically able to answer all students' Mathematics	1	2	3	4	5

questions.

10.	When teaching Mathematics, I usually welcome student questions.	1	2	3	4	5
11.	Student's achievement in Mathematics is directly related to their teacher's effectiveness in Mathematics teaching.	1	2	3	4	5
12.	If parents comment that their child is showing more interest in Mathematics at school, it is probably an indication of the good performance of the child's teacher.	1	2	3	4	5
13.	Even when I try very hard, I do not teach Mathematics as well as I do in most subjects.	1	2	3	4	5
14.	I am not very effective in monitoring Mathematics tutorials.	1	2	3	4	5
15.	If students are underachieving in Mathematics, it is probably due to their teacher's lack of motivation to teach.	1	2	3	4	5
16.	I generally teach Mathematics ineffectively.	1	2	3	4	5
17.	The low Mathematics achievement of some students cannot generally be blamed on their teachers.	1	2	3	4	5
18.	Increased effort in Mathematics teaching produces little change in some student's Mathematics achievement.	1	2	3	4	5
19.	Poor ability in Mathematics is not because of poor teaching.	1	2	3	4	5
20.	I wonder if I have the necessary skills to teach Mathematics.	1	2	3	4	5
21.	Effectiveness in Mathematics teaching has little influence on the achievement of students with low motivation.	1	2	3	4	5
22.	Given a choice, I would not invite the principal to evaluate my Mathematics teaching.	1	2	3	4	5
23.	When a student has difficulty understanding a Mathematics concept, I am usually at a loss as to how to help the student understand it better.	1	2	3	4	5
24.	I don't know what to do to turn students on to Mathematics.	1	2	3	4	5
25.	Even teachers with good Mathematics teaching abilities cannot help some kids learn Mathematics.	1	2	3	4	5

SECTION C

Do you feel there were any particular significant factors that led to your present attitudes and ability in Mathematics?

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SECTION D (Optional)

- Please add any other comment you may wish to make.

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- Please indicate if you would like a resume of the research findings of this study in due course.

  Yes: _____ No: _____