A STUDY OF TEACHERS' ATTITUDES TOWARDS SELECTED CHALLENGES IN THE TEACHING OF MATHEMATICS IN MAPHUMULO CIRCUIT

VUKANI CLEOPAS MAPHUMULO

A STUDY OF TEACHERS' ATTITUDES TOWARDS SELECTED CHALLENGES IN THE TEACHING OF MATHEMATICS IN MAPHUMULO CIRCUIT

BY

VUKANI CLEOPAS MAPHUMULO

B.ED HONS (UZ), B.ED (UZ)

A Dissertation Submitted to the Faculty of Education in partial fulfillment of the requirements for the degree of

MASTER OF EDUCATION

In the Department of

MATHEMATICS, SCIENCE & TECHNOLOGY

at the

UNIVERSITY OF ZULULAND

Supervisor	:	**Prof. D.C. Sibaya**
Co-supervisor	:	**Prof. P.T. Sibaya**
Date Submitted	:	**APRIL 2015**

DECLARATION

I, VUKANI CLEOPAS MAPHUMULO hereby declare that ***"A Study of Teachers' Attitudes Towards Selected Challenges in the Teaching of Mathematics in the Maphumulo Circuit"*** is my own work, both in conception and execution, and that all the sources I have quoted have been indicated and acknowledged by means of complete references.

Signed by ____________________ on the day of ________________2015.

ABSTRACT

The present study examines teachers' attitudes towards selected challenges in the teaching of Mathematics in the Maphumulo Circuit. The was designed to determine teachers' attitudes towards the selected challenges brought about by additions or introduction of new chapters to the FET Mathematics curriculum; to establish the relationship, if any, between teachers' attitudes and the following variables: gender, age in years, academic qualifications, professional qualifications, post level, teaching experience in years and employment status; to establish the role played by the status of resources in influencing teachers' attitudes towards the selected challenges, that is, the introduction of new chapters to the FET Mathematics curriculum; and to mention reasons for teachers' happiness or unhappiness with the newly introduced chapters to the FET Mathematics curriculum.

To achieve the aim and objectives of the study a Likert 5-point scale questionnaire was, checklist, open-ended questions and quantitative data analysis methods were administered to a sample of one hundred Mathematics teachers in Maphumulo Circuit. The study results reveal that Mathematics teachers are negatively inclined towards the selected topics. The findings also show that gender, age, academic qualifications, professional qualifications, post level, teaching experience and employment status influence teachers' attitudes towards the selected topics. The findings further reveal that teachers have serious problems regarding matters related to the shortage of teaching resources. Finally, the findings reveal that teachers are not happy with the newly introduced chapters to the FET Mathematics curriculum.

The discussion of findings coupled with their implications is highlighted. The avenues for future research are indicated.

ACKNOWLEDGEMENTS

I wish to express my sincere gratitude to the following people for their assistance in making this research project possible:

- My supervisors, Prof. D. C. Sibaya and co-supervisor Prof. P. T. Sibaya for their patience, constructive criticism, academic guidance, enthusiasm, dedication and sacrifices, which greatly inspired and motivated me to complete this study. Their research expertise gave me the confidence that this research would achieve its purpose.

- Dr K. B. Biyela: self-appointed “mentor” for his motivation, advice and support.

- Mr S. Alwar in the Directorate: Research Strategy and Policy Development (KZN DoE) for granting me the permission to undertake research in the Ilembe District of KwaZulu-Natal schools.

- My sister Phumelele, for always showing a keen interest in my career.

- All Secondary School Mathematics teachers in the Maphumulo Circuit of the Ilembe District, who openly and honestly participated in this study.

- Mr Joe Magwaza who edited the dissertation.

DEDICATION

This work is dedicated to my mother, Thembisile (MaDladla), and the late Raphael Maphumulo (my father), who instilled in me the love of and value for education. To my sons, Anotha and Asemahle “Tina”, for adapting their life style to suit my schedule.

This work is finally and most especially dedicated to my lovely wife, Nozipho kaDlamini, for the love, encouragement and untiring support she gave me during the course of this study.

TABLE OF CONTENTS

CHAPTER TWO : REVIEW OF WORK DONE IN THIS FIELD

CHAPTER THREE : RESEARCH METHODOLOGY

CHAPTER FOUR : PRESENTATION, ANALYSIS AND INTERPRETATION OF DATA

CHAPTER FIVE: SUMMARY AND DISCUSSION OF FINDINGS

LIST OF TABLES

ANNEXURES

CHAPTER ONE
INTRODUCTION

1.1 BACKGROUND

Education in South Africa has experienced a variety of changes in the teaching and learning of Mathematics. These changes include review of the Mathematics Curriculum, teachers' practices and how these practices influence learners' contributions in Mathematics (Brodie, Jina & Modau). There are several studies in Mathematics teaching (Frykholm, 2007; Segall, 2004; Masinga, Mhlongo & Luneta; 2007, Anthony &Walshaw, 2007) which focus on teachers' content knowledge, curriculum implementation, instructional strategies, teachers' competencies in teaching the new Mathematics Curriculum and teacher education programmes. Facilitating the implementation of the Mathematics Curriculum is not only a South African problem; it is a world-wide concern (Van der Walt & Maree, 2007).

Although certain challenges in the implementation of new curriculum (Brodie, Jina & Modau, 2009; Bennie & Newstead, 1999) have been studied with regard to Mathematics, other challenges have not yet been studied. Such challenges for example, involve the introduction of new fields of study, such as Financial Mathematics, Eulidean Geometry, Data Handling and Probability. These are the challenges with which this study is concerned.

In Portugal, teachers observe that the new curriculum is difficult. The Portuguese curriculum aims at introducing learning strategies that allow learners to operate at different levels of thinking and curricular competencies. Levels of thinking and competencies involve learners as researchers of information; learners are exposed to citizenship education, sex education and health education. Teachers find the teaching of this unit of work difficult, because even though they are granted independence to prepare their own teaching materials according to government guidelines and regulations, there are no sources for reference, no consultation and no close supervision (Flores, 2005).

Similarly, Secondary Schools in New Zealand are facing challenges in the teaching of English as a subject, as there is a lack of acceptance and agreement among teachers regarding the aims and scope of language. Teachers are not involved in the development of policy, and school language structures are not designed to match standards with which English is conventionally regarded (May & Wright, 2007).

In South Africa and Japan, Science is another learning area in which both teachers and learners are not competent when it comes to teaching and learning. Teachers tend to teach some of the chapters and leave out others that they do not feel competent to teach. The new curriculum in Science involves indigenous knowledge systems. Teaching this unit of work is difficult for teachers as the concepts used in the Sciences are borrowed from an English culture (Ogunniyi & Ogawa, 2008).

In South African schools, particularly in KwaZulu-Natal, all learning areas except isiZulu, are taught in English, and they all involve indigenous knowledge systems, which are different from one another. Teaching units of work in these learning areas is difficult for teachers as the concepts used are borrowed from an English culture. Both Mathematics and Sciences in South Africa are difficult for teachers as they both involve practical work; Mathematics involves Investigation/ Project Work while Sciences entail experimenting.

In Science teaching, there is a shortage of laboratory equipment and laboratories. Teaching concepts that involve practical work is therefore difficult for teachers as they cannot demonstrate certain principles through the use of experiments (Onwu & Stoffel, 2005). In the case of Mathematics, there is a shortage of human and material resources to support teachers. Most of the schools have one Mathematics teacher teaching Grades 10- 12. The teacher has to visit neighbouring schools which are very far to discuss mathematical issues. This means that such consultation cannot take place during the week or between teaching sessions at school.

In Mathematics, teachers are required to choose concepts within the scope of the term/quarter that will be appropriate for Investigation/Project Work. Choosing these concepts is difficult for teachers as they often cannot identify which section of work is appropriate for Project Work/ Investigation (Flores, 2005). Teachers also have difficulty in making a distinction between Project Work and Investigations. It is stipulated in the National Curriculum Statement (NCS) and the Curriculum and Assessment Policy Statement (CAPS) that there is a difference between Project Work and Investigations. Project Work entails collection and display of real data, followed by deductions that can be validated from the data. On the other hand, investigations are open-ended activities which involve systematic exploration of a given situation and formulation of problems and conjectures, thus providing justifications for the conjectures (Department of Education, 2003; Department of Education, 2010, Ronda, 2011).

The researcher is a Mathematics teacher, as well as District Moderator of Cluster Convener for Mathematics. In his experience as a Mathematics teacher and moderator, the researcher has often found it difficult to moderate Project Work/ Investigation, especially in view of the newly-introduced concepts in the Mathematics Curriculum, such as Financial Mathematics, Euclidean Geometry and Project Method/ Investigation. All teachers experience change. It does not matter whether you have been teaching for a number of years or if you are a newly-appointed teacher of Mathematics (Anthony & Walshan, 2007).

The new curriculum builds on the thinking that learning with understanding is more powerful than memorizing (Brodie, Jina & Modau, 2009). One of the crucial roles of Mathematics teachers is to help learners become researchers of information. Learners often fail to use or read Mathematics textbooks, solve word problems and interpret instructions. All this is done using the language of English, while learners, and in most case teachers, are second language speakers of English (Latu, 2005). Teaching learners how to make deductions and conjectures, especially in Project Work and Investigations, seems like an uphill, and sometimes, overwhelming, battle.

A study conducted by Flores (2005) on teachers' views on the latest curriculum reveals that the introduction of new concepts proved to be especially difficult. The results indicate that teachers fail to plan projects in accordance with guidelines and regulations as specified by the Mathematics Curriculum. The results also indicate that there is a lack of support for schools and teachers in this regard.

Research in the teaching and learning of Mathematics indicates that language factors affect the teaching and learning of both Science and Mathematics. The results show that using a first or second additional language, as well as an indigenous knowledge system to communicate mathematical ideas, is difficult (Flores, 2005; Latu, 2005). Curriculum projects and language factors that affect Mathematics teaching and learning, have also been studied. It was found that a gap exists between how teachers feel about the introduction of the Project Method/ Investigation to the teaching of the New Mathematics Curriculum, and how teachers respond to the introduction of new fields of study in the New Mathematics Curriculum. The main focus of this study is to investigate the selected challenges (introduction of new chapters to the FET Mathematics Curriculum) presented by the additions to the Mathematics Curriculum in classroom practice of Mathematics teaching.

A shift from traditional ways of teaching and learning to more interactive approaches is observed (Department of Education, 2003; Brodie, Jina & Modau, 2009). Research shows that teachers are expected to be interpreters and adopters of the new curriculum (Shulman & Shulman, 2004)and this will enable them to select and implement Mathematics tasks (Bennie & Newstead, 1999; Walshaw & Anthony, 2007; Brodie, Jina & Modau, 2009; Molefe & Brodie, 2010). Mhlolo and Venkant (2009) focused on the alignment of Mathematics content and assessment.

Teachers’ attitudes towards the additions to the Mathematics content and assessment tasks, as outlined in the National Curriculum Statement (NCS), as well as in the Curriculum and Assessment Policy Statement (CAPS), have not been investigated. Financial Mathematics, Transformation Geometry, Data Handling and Probability have been added to the Mathematics content, while assessment tasks also include Project Work and Investigations. This study purports to investigate teachers’ attitudes towards selected challenges in the teaching of Mathematics.

Most of the FET teachers have never studied Mathematics at the tertiary level where these additions are taught. Due to the shortage of Mathematics teachers, some of them have never been trained as teachers. This evidence is reflected in the analysis of the results of Third International Mathematics and Science Study – Repeat (TIMMS-R) (Howie, 1999) show that 27% of South African teachers who were involved in the study, have never had formal training as Mathematics teachers.

1.2 RESEARCH QUESTIONS

The research questions were:

- What are the attitudes of teachers towards selected challenges brought about by addition or introduction of new chapters to the FET Mathematics Curriculum?
- What role do teachers’ biographical data play in determining teachers’ attitudes?
- Are teachers’ attitudes towards the selected challenges influenced by the status of resources?
- What are the reasons for teachers’ happiness or unhappiness with the newly introduced chapters in the FET Mathematics Curriculum?

1.3 AIM AND OBJECTIVES OF THE STUDY

The aim of the study was to examine teachers' attitudes towards selected challenges in the teaching of Mathematics in Maphumulo Circuit.

The objectives of the study were:

- To determine teachers' attitudes towards selected challenges brought about by additions or introduction of new chapters to the FET Mathematics Curriculum.
- To establish relationships, if any, between teachers' biographical data and teachers' attitudes towards the selected challenges.
- To establish the role played by the status of resources in teachers' attitudes, towards the selected challenges.
- To mention reasons for teachers' happiness or unhappiness with the newly introduced chapters to the FET Mathematics curriculum.

1.4 RESEARCH HYPOTHESES

The following hypotheses were formulated:

- There will be no significant differences in teachers' attitudes towards selected challenges brought about by additions or introduction of new chapters to the FET Mathematics Curriculum.
- There will be no relationship between teachers' biographical data and their attitudes towards the selected challenges.
- There will be no significant differences in teachers' attitudes in relation to the status of resources.
- Reasons mentioned will not influence teachers' attitudes differently.

1.5 OPERATIONAL DEFINITIONS OF TERMS

1.5.1 Selected challenges

The term ‘selected challenges’ in this study shall mean the introduction of new chapters to the FET Mathematics curriculum.

1.5.2 Mathematics

Mathematics will mean the subject which is taught at the FET level.

1.5.3 New fields of study in Mathematics

The term ‘new fields of study in Mathematics’ in this study shall refer to the new Mathematics content and assessment tasks added to the NCS and CAPS for FET Mathematics.

1.5.4 Attitude

In this study the term attitude is used to mean a disposition to behave favourably or unfavourably towards the selected challenges, faced by teachers in the teaching of Mathematics.

1.5.5 FET

The acronym FET in this study is used to mean Further Education and Training i.e. the curriculum offered in grades 10-12.

1.6 SIGNIFICANCE OF THE STUDY

The present study will help the Directorate: Research Strategy and Policy Development get informed of content topics which require special attention in conducting Mathematics workshops. Moreover, the study will also help Mathematics teachers receive rich, adequate and relevant content workshops which iron up their areas of difficulty.

1.7 RESEARCH METHODOLOGY

1.7.1 The research design

Research entailed a field study. This involved field experiments conducted in schools; Secondary Schools in the Maphumulo Circuit which offer Mathematics at the FET level, were studied.

1.7.2 Sampling design

The researcher identified individual Mathematics educators from the Ilembe District who teach Grades 10-12. The researcher was interested in obtaining detailed information with regard to curriculum changes as understood by Mathematics educators. All Secondary Schools in the Maphumulo Circuit were included in the research sample. There are 37 Secondary Schools in the Maphumulo Circuit. This is a multi-stage area sampling.

1.7.3 Research Instruments

Data were collected by using an attitude scale. Open-ended questions were constructed to assess the status of resources in schools.

1.7.4 Procedures and Administration of the research instrument

A formal letter requesting permission to conduct research in the Ilembe District was written to the Head of Department of Education. The researcher waited for a formal response from the Head of Department of Education. A letter of response from the District Manager was submitted to the university as concrete evidence that permission was granted.

1.7.5 Data analysis

Researchers (Flores, 2005, Ogunniyi & Ogawa, 2008) made use of qualitative data analysis. For the present study, quantitative and qualitative data analysis will be used. Qualitative analysis will assist in finding first-hand information from the teachers about challenges they faced in teaching Mathematics. On the other hand, quantitative data analysis makes use of numerical values that can be manipulated to achieve greater insight into the meaning of data, which could assist the researcher in examining specific hypotheses (Trochim, 2001).

1.8 ETHICAL ISSUES

Permission to conduct research was granted by the Department of Education. Participants were requested to sign a letter of consent after the research procedure had been discussed with them. Participants were informed that their participation was voluntary and that they had the right to withdraw at any point in the research, if they were not comfortable with the research. To conform with the ethical code of plagiarism, the document was submitted to Turnitin.

1.9 ORGANIZATION OF THE DISSERTATION

Chapter One

Chapter One consists introduction of study in this field, a statement of the problem/research question, aims of the study, operational definitions of terms, and the plan for the organization of the scientific report.

Chapter Two

Chapter Two provides a review of work done in this field. This review focused on teachers' feelings about the introduction of Project Method/ Investigation, teachers' response to the introduction of new fields of study to the New Mathematics Curriculum, and the relationship, if any, between teachers' biographical data and their responses to the new curriculum.

Chapter Three

Chapter Three consists of the research design and the results of the field study.

Chapter Four

Chapter Four details analysis and interpretation of the data. The hypotheses formulated in Chapter One were tested in this chapter.

Chapter Five

Chapter Five provided a synthesis of different findings. The summary and recommendations appeared in this chapter.

CHAPTER TWO
REVIEW OF WORK DONE IN THIS FIELD

2.1 STUDIES ON TEACHERS' ATTITUDES TOWARDS CURRICULUM CHANGE

Curriculum change is initiated by assessment (Johnson, 2010); it is an attempt to raise standards of education in any country. Usually these changes bring about tensions and uncertainty to teachers. This condition was reflected in the study conducted by Flores (2005), in which perceptions of Primary School teachers were examined. The research process involved the use of questionnaire and interviews with the Principal of the school, five Heads of Departments and the twelve teachers who were involved in the implementation of the new Mathematics curriculum. The four-point scale questionnaire was administered to all the Mathematics teachers at the school. The findings of Flores's study revealed that although teachers accepted the new changes, they were dissatisfied with the way the new curriculum was implemented in schools. Teachers indicated that they had not been not part of policy developments. Schools did not have resources to implement the new Mathematics curriculum. Teachers also stated that they were not trained to prepare themselves for the new Mathematics curriculum. Bulut (2007), Onwu and Stoffels (2005) also examined primary school Mathematics curriculum. They found that the time allocated to teaching content topics was not enough as they have difficulty in evaluating learners performance. Teachers stated that the new curriculum does not provide detail about the content. They also indicated that they have difficulty in arranging the physical classroom environment since classrooms were overcrowded.

Similarly, in the South African Secondary School Mathematics curriculum, new topics such as Financial Mathematics, Euclidean Geometry, Data Handling and Probability have been added. In addition to this, assessment tasks that include Project Work and Investigations were included. However, the training received in these topics is not enough for teachers to master the new content topics. Resources in the schools, especially in rural schools, have been scarce, even before the reformed Mathematics curriculum. However, teachers' attitudes towards Mathematics content, concepts and contexts impact on quality teaching. Research (Prescott & Cavanagh, 2006; White, Perry & Southwell, 2005/2006) into attitudes of primary pre-service teachers towards Mathematics revealed that teachers' attitudes influence teaching practices. This, in turn, affects learners interest to pass Mathematics. Furthermore, the process of becoming a skilled and confident Mathematics teacher is influenced by the teachers' attitudes to both Mathematics and Mathematics teaching (Johnson, Smith & Carinci, 2010; Kargar, Tarmizia & Bayat, 2010). On the other hand, Henderson and Rodrigues (2008) maintain that teachers' Mathematics self-efficacy beliefs are a result of attitudes towards Mathematics. Investigation (Levpuscek & Zupancic, 2009) showed that the teacher methodology beliefs contribute in developing attitudes towards Mathematics. As a result, a teachers' level of thinking in Mathematics affects how he/she responds to Mathematics and how the teacher believes about Mathematics; which has results for learners in the classroom (Brady & Bowd, 2005). One problem for mathematical fear is attitude towards Mathematics. In summary to this, the most recent research (Kalhotra, 2013) showed that the achievement in any subject of study is determined by the attitude towards that particular subject . On this basis, the present study aims to investigate the attitudes of Mathematics teachers with regard to the addition of new topics to the FET Mathematics curriculum. Skipping chapters is usually observed, if teachers are not properly exposed to changes in the curriculum (Anthony & Walshan, 2007; Ogunniyi & Ogawa, 2008).

Although some of the studies (Flores, 2005; Anthony & Walshan, 2007) focus on the perception of Primary School, questionnaires and interviews, the present study will use open-ended questions and an attitude scale to establish teachers' skills in relation to Data Handling and Probability, Financial Mathematics, Project Work or Investigation and Euclidean Geometry.

Furthermore, the sample consists of all Secondary School teachers who are teaching Mathematics in Grades 10-12. Very often when there are changes in the Mathematics curriculum, teachers become stressed and despondent. This view supports Ayres and McCormick (2006), where Secondary School teachers' attitudes were examined. The research process involved the use of questionnaires with 400 Grade 12 Mathematics teachers, who were involved in the implementation of the new Mathematics curriculum. The Likert type 11-point scale questionnaire was administered to all Mathematics teachers at Secondary School level. The findings of the study (Ayres & McCormick, 2006) revealed that although teachers accepted the Mathematics curriculum changes, they were not happy with the way in which they were implemented in schools. The teachers indicated that the new Mathematics curriculum was difficult. They also complained about the low ability of learners and those with weak literacy skills. We can relate Ayres and McCormick's study (2006) to similar situations in South Africa. In KwaZulu-Natal, Zulu-speaking teachers' anxiety is raised by the use of English as a medium of instruction (Shulman & Shulman, 2004). Furthermore the subject of Mathematics does not lend itself to Zulu cosmology.

Vagi and Green (2004) argued that developing more complex mathematics concepts in their own language, developing their own resources, teaching materials and relating mathematics effectively to daily life context were challenging for teachers. This means that teachers complained of frustration caused by complexity of terminologies used in the Mathematics curriculum, lack of training provisions and support (Gitlin, 2001). In summary, teachers choose to do certain sections that they feel comfortable to teach. Other teachers continue with their teaching approaches without attempting to change their practices to cater for the new curriculum changes (Gilley, 2000; Bal, 2008).

Shulman and Shulman (2004) identified English competence as the most important issue in the teaching of Mathematics. Regardless of subject taught, teachers must be competent in the medium of instruction. Very often teachers find it difficult to explain to the learners how to make deductions and conjectures, especially in Project Work/Investigations (Ronda, 2011; Ayres & McCormick, 2006). On the other hand, Brodie, Jina and Modau (2009) maintain that learning with understanding is more powerful than memorizing. Generally, it means that the interest in teaching and attitude of Mathematics teacher towards Mathematics teaching are basic factors associated with teaching success (Dagnew, 2012; Garm & Karlsen, 2004; Grossman & Onkol, 2006). Ayres and McCormick (2006) added that teachers are generally not happy with various sub-fields of Mathematics; as a result they fail to cope with the demands of the Mathematics curriculum. Conducting professional development workshops is an important strategy to improve teachers' skills in teaching the new Mathematics curriculum particularly, those that were not trained as Mathematics teachers. The literature (Henderson & Rodrigues, 2008) is another example which supported that training teachers will help them gain teaching skills and methods that translate them into effective Mathematics teachers. For example, concepts which involve measurement and evaluation in the Geometry Curriculum are difficult for teachers and, teachers need assistance in these topics (Cavanagh, 2006; Gelbal & Kelecioglu, 2007). This is evident in the study conducted by Yilmaz, Alkan, Baran, Elmas and Guven (2011), where teachers claimed that they were not involved in the Geometry Curriculum Design; as a result they did not implement the curriculum effectively. Schools did not have Geometry specialists to implement the Geometry Curriculum, effectively. Teachers also stated that teaching materials for the Geometry Curriculum did not indicate steps to be followed in order to find the correct answer; teaching materials only showed final answers to the problems. In this case, the new Geometry Curriculum has proven a change from process based approach to product based approach. Moreover, there exists the fact that teaching in the new curriculum is not effectively put into practice due to the lack of resources and tools. It means that teachers with weak literacy skills in the Geometry Curriculum are not catered for by the Geometry Curriculum (Ayres, Mc Cormick & Beechey, 2002).

With this in mind, the researcher sees the findings of Yilmaz *et al*. (2011), as those which predominantly influence teachers' attitudes in the teaching of Geometry. Yilmaz *et al*. (2011), however, spoke of the Geometry concept in general as Mathematics learning content. The present researcher believes that there is a need to specify a sub-field of the Geometry Curriculum. As a result, the present study focuses on the topic of Euclidean Geometry in Grades 10-12. The literature (Benken, 2008) indicates that very often teachers leave training programmes with the same knowledge base as when they first entered their training. It means that the major disadvantage in the teaching of Mathematics is that other teachers do not have adequate content knowledge to teach Mathematics (Ning, 2009). Furthermore, recent research (Azuka, 2013b; Goldblatt, 2004) on teaching asserts that Mathematics teaching becomes more perfect when knowledge is supplemented by all possible skills which can be enhanced through appropriate activity-based learning methods. When Van der Sandt (2007) investigated Geometry knowledge among pre-service teachers, he found that together with an increase in the number of years of training, a decline in content knowledge was observed. Idolphus (2011) conducted a study on problems of teaching Geometry in secondary schools. The findings reveal that the foundation of most Mathematics teachers in the teaching of mathematics is poor. Teachers cannot come up with correct solutions to some of the problems. Teachers are not motivated to teach Geometry. Due to the shortage of infrastructures and teaching facilities the teaching of geometry was not conducive.

It is amazing to note a somewhat curvilinear relationship between knowledge of Geometry and years of training. Change is a difficult process for teachers and , they need to be given full support to effectively implement the Geometry Curriculum. It is also extremely difficult for teachers to divorce themselves from routines and practices which have been ingrained in them over a number of years. The literature (Richardson & Placier, 2001) revealed that teachers change in contexts which are not supportive, while others do not change at all. However, Onwu and Mogari (2004) is another example of research that supported the fact that changing teachers' practices in teaching is slow. Another study (Gokcek, 2009), suggests that curriculum change in Mathematics was interpreted differently by Mathematics teachers. Gokcek (2009) examined the feelings of teachers offering Mathematics curriculum in Turkey. The research process involved questionnaires with three Grade 6 Mathematics teachers who were involved in the implementation of the new curriculum. The 11-point scale questionnaire was administered to all Mathematics teachers at school. The findings of the study revealed that teachers had a problem adapting to the new Mathematics curriculum. Teachers indicated that they were unable to prepare teaching materials in accordance with government guidelines and regulations. Furthermore, they were unable to choose teaching methods which were suitable to meet the demands of the new Mathematics Curriculum. This resulted in teachers feeling incompetent.

Grossman, Onkol and Sands (2007) investigated attitudes of teacher educators towards change. The findings reveal that changing the curriculum and providing teaching resources over a very short time was challenging for teachers. Teachers stated that incorporating relevant up-to-date ideas, activities and other teaching materials were overwhelming battle. On the other hand, Alder, Ball, Krainer, Lin and Novotna (2005) observed that teachers found the teaching of statistics difficult. Teachers stated that the sources of variation and categorizing data are major sources of difficulty. Teachers indicated their level of expertise in statistics is poor. Teachers also indicated that they need workshop on statistics in order to improve their level of understanding. Garfield (2003) investigated teachers' attitudes on statistical reasoning. The findings reveal that teachers lack reasoning skills on statistics. Teachers stated that statistical symbols and formulae are too strange. Teachers also indicated that statistics is not valued in the society, therefore it is difficult to teach it. Onwuegbuzie (1998; 2003) and Pfannkuch (2006) argued that teachers' attitudes towards statistics have a strong relation to achievements on statistics; however, the impact on reasoning abilities in statistics is not so high. Statistical reasoning ability is strongly tied to mathematical than statistical outcomes. In short, the findings reported above related to attitudes to statistical achievement. It means that teachers are negatively inclined with the teaching of statistics. As by Marek and Methaven (1991), planning for teaching that model reasoning have greater influence on teaching achievement. In other words, teachers' attitudes towards Mathematics play an important role in shaping Mathematics teaching. Teachers' attitudes regarding Mathematics are relative to attitudes towards the teaching of Mathematics, which in turn, has a powerful impact on the atmosphere within the Mathematics classroom (Ernest, 1989; Van der Sandt, 2007).

Similarly, in South Africa, new topics such as Data Handling and Probability, Financial Mathematics, Project Work or Investigation and Euclidean Geometry were introduced without the provision of training in these topics. Of the various inputs studied, teachers had never taught these topics in many schools because prior training in these topics had not been provided. Data Handling and Probability in the Curriculum Assessment Policy Statement (CAPS) have been declared compulsory topics in Grades 10-12. Training in these Mathematics learning fields had been absent before they were declared compulsory topics. Regardless of whether you have been teaching Mathematics for a number of years or you are newly appointed, experience changes (Anthony & Walshan, 2007). As a result, the present study focuses on the attitudes of Mathematics teachers to the introduction of new chapters (Data Handling and Probability, Financial Mathematics, Euclidean Geometry and Project Work or Investigation) to the FET Mathematics Curriculum. In addition to this, the present study will determine whether teachers are sufficiently competent in the teaching of the new chapters.

Researchers seem to be using similar instruments to measure teachers' attitudes, but arrive at different conclusions. Gokcek's study (2009), administered a questionnaire to three Grade 6 Mathematics teachers to determine how Mathematics teachers changed within the context of curriculum reform. The results of the study were generalized from the three Grade 6 Mathematics teachers. The study by Yilmaz *et al*. (2011), was generalized from fifteen Mathematics teachers. The present researcher sees a need to use larger sample in order to obtain generalizable results. For example, all Secondary Schools which offer the Mathematics curriculum in the Maphumulo Circuit will be included in the sample. The instrument used in the study conducted by Gokcek (2009) involved the 11-point scale questionnaire to determine teachers’ views on recent curriculum. By contrast, the present researcher will use an attitude scale to measure teachers' attitudes. To assess the status of resources in schools, a check list will be used, and in order to in order to establish teachers' happiness or unhappiness with the newly introduced chapters in the FET Mathematics Curriculum, open-ended questions will also be used.

2.2 STUDIES ON REASONS FOR TEACHERS' HAPPINESS OR UNHAPPINESS WITH THE NEWLY INTRODUCED CHAPTERS IN THE FET MATHEMATICS CURRICULUM

In the teaching of Mathematics, the knowledge of subject matter and teaching methods is critical (Brodie, Jina & Modau, 2009; Mhlolo &Venkant, 2009). Perceptions of South African Secondary School teachers were examined by Brodie *et al.,* 2009. Brodie, Jina and Modau's research (2009), involved the observations, interviews and video recording with five lessons taught on each topic. All lessons were recorded, transcribed and analyzed qualitatively. The findings of the study revealed that although teachers cope with changes in the Mathematics curriculum, they were dissatisfied with assessment processes. Teachers indicated that assessment tasks for the new Mathematics content were chosen at a higher level. Teachers also stated that the level of questioning in the examination was above learners' levels.

Teachers are struggling to cope with the demands of Secondary School Mathematics and thus fail to achieve excellence in Mathematics. Designing assessment tasks is also an overwhelming battle. As noted by Flores (2005), teachers very often find it difficult to choose a topic within the scope of Mathematics which will be appropriate for Project Work/Investigation. Tirosh and Graeber (2003) suggested that there is a need for developing teachers in terms of how to design activities around the content. Furthermore, there is a need for improving national Mathematics results. However, time for teacher development programmes is insufficient to cover a wide range of content in one day. Workshops that are conducted by departmental officials focus on how to teach the content, not on how to assess the content. This results in teachers focusing more on teaching than assessment and promotes teaching which fails to meet the level of questioning expected of learners who will sit the Senior Certificate Examinations. The focus of the present study will be on the attitudes of teachers in teaching Project Work/Investigation, Financial Mathematics, Euclidean Geometry and Data Handling and Probability.

Teachers are expected to be interpreters and adopters of the new Mathematics Curriculum (Shulman & Schulman, 2004). The ability of teachers to interpret the curriculum will enable them to select and implement Mathematics tasks (Bennie & Newstead, 1999; Walshan & Anthony, 2007; Brodie, Jina & Modau, 2009; Molefe & Brodie, 2010). However, some FET teachers have never studied Mathematics at the tertiary level where these additions are taught. Due to the shortage of Mathematics teachers, some of them have never trained as teachers. However, Perker and Mirasyedioglue (2008) stated that teachers have a fear of Mathematics, which in turn, impact on developing attitudes towards Mathematics teaching. Teachers' attitudes towards Mathematics determine whether or not they can do well in mathematics teaching. Ignacio, Wieto and Barona (2006) supported that Mathematics anxiety can make teachers believe that they can never do well on Mathematics teaching thus accepting defeat. This implies that the success of any new curriculum depends on teachers' ability to critically view the theory and develop it to practice (Cheng, 2001; Fung, 2000; Fedman, 2007; Kasanda, Lubben, Gaoseb, Kandjeo-Marenga Kapenda & Campbell, 2005). The new curriculum requires change in the way that teachers think about the choices they make with regard to teaching methods. This creates positive climate where teachers prepare lessons which involve learners more deeply in the content (Randler & Hulde, 2007; Walczyk & Ramsey, 2003; Khoboli & O'Toole, 2011; Muijs & Reyholds, 2002; Manouchehri & Enderson, 2003; Jegede, Taplin & Chan, 2000).

Another important issue which was raised by Mathematics teachers was the lack of communication between curriculum advisors and Mathematics teachers. This was observed by Handal and Herrington (2003) whose study examined the perceptions of Mathematics teachers with regard to curriculum. The teachers who were offering the new Mathematics curriculum were interviewed. The findings of the study revealed that although teachers adopted the policies of the new Mathematics curriculum, they were dissatisfied with both the curriculum goals and prescribed Mathematics textbooks: Teachers indicated that there was a mismatch with teaching methods; in addition, Mathematics textbooks did not provide knowledge congruent with the demands of the curriculum. New Mathematics topics such as Financial Mathematics, Euclidean Geometry, Project Work/ Investigation, Data Handling and Probability had partially been mastered by Mathematics teachers. Brodie, Jina and Modau (2009) support that the number of learners who pass Mathematics in the Senior Certificate Examinations is small.

On the other hand, Ronda (2011) observed that teachers often find it difficult to use information from Mathematics textbooks in accordance with government teaching standards. This means that concepts that involve practical work are therefore difficult for teachers, as they cannot demonstrate certain principles through the use of experiments (Onwu & Stoffel, 2005). It was suggested that there is no relationship between content knowledge and content practice in the teaching of Mathematics (Flores, 2005). The study conducted by Ning (2009) supports this suggestion. Ning's study (2009) examined the perceptions of Secondary School teachers with regard to the addition of new topics in the Mathematics curriculum. During the research, observations, questionnaires and interviews were used. There were 76 Mathematics teachers who were involved in the implementation of the new curriculum. The findings of the study revealed that teachers needed workshops on teaching the additional topics in the curriculum. They also indicated that there was no link between teaching content knowledge and the demands of the content. Teachers stated that they were not ready for the new Mathematics curriculum. This was the result of the lack of sufficient understanding of principles, standards and objectives of the new Mathematics curriculum. This means that teachers are not competent enough to teach the new Mathematics curriculum (Birgin, Tutak & Turkdogan, 2009).

2.3 STUDIES ON THE ROLE PLAYED BY STATUS OF RESOURCES IN TEACHERS' ATTITUDES TOWARDS THE SELECTED CHALLENGES

Preparing effective tasks for teaching Mathematics depends on how one understands the Mathematics content. This view is supported by Brodie, Jina and Modau (2009), where perceptions of Secondary School teachers were examined. The research process involved observations with field notes, video recordings and interviews. The study revealed that teachers believed that prepared tasks for the Mathematics curriculum did not match the curriculum goals. Teachers indicated that interaction with the learners did not promote mathematical reasoning. This resulted in the decline of the cognitive demands of Mathematics tasks. Brodie, Jina and Modau (2009) identified the development of reasoning skills as the most important point in the teaching of Mathematics. Reasoning skills play a fundamental role in the teaching of Mathematics. For example, Project Work/Investigations demand a higher level of thinking. Bulut (2007) argued about Mathematics textbooks. He claimed that there are no textbooks prepared in line with new Mathematics curriculum for teachers. As a result, teachers felt that they were left alone with the new curriculum without any support.

Allegedly, South African schools have one Mathematics teacher teaching Grades 10-12. The teacher has to visit neighbouring schools which are very far to discuss Mathematics issues. This implies that bringing about change and improvement in the teaching of the Mathematics curriculum, sharing teaching strategies and mastering Mathematics content are difficult for schools with one Mathematics teacher (Tirosh & Graeber, 2003). Such schools are not in a position to hold consultations during the week or between teaching sessions at school. In addition to this, there are content topics that are difficult to unpack. Inadequate teacher background in Mathematics and Science and negative attitudes about Mathematics and Science have all been cited by teachers as difficulties to effectively teaching these subjects (Turik, 2000). This is evident in the study conducted by Lyons, Cooksey, Panizzon, Parnell and Pegg (2006), where teachers revealed that sharing Mathematics ideas is hard for the school in the rural areas. Hudson and Hudson (2008) maintain that rural schools have been an issue for many years. However, it is also noted by Harsings and Cooper (2008) that Mathematics teacher shortages is usually observed in the rural schools. In support to this, the teaching of Mathematics in the rural schools has been reported infective (Mulford, 2003; Nelson, 2004; Rosenkoetter, Irwin & Saceda, 2004; Williams, 2005; Wright & Osborne, 2007). In this regard a teacher, who is not clear about Investigations/Project Work, Financial Mathematics, Euclidean Geometry, Data Handling and Probability will not have access to discuss whether or not work prepared for learners is appropriate for the targeted Grades, with regard to the required level of thinking. In support to this, Ning (2009) stated that teachers need more time to discuss key areas of Mathematics content. Brodie (2007) is another example of research that supports the belief that sharing ideas promote mathematical understanding to the extent that no teacher is found wanting in certain areas of the Mathematics content.

Hopefully, the present study attempts to investigate the role played by status of resources in teachers' attitudes towards the selected challenges (the introduction of new chapters to FET Mathematics learning content). Whether resources are available or not available in schools is part of the present investigation.

The availability of teaching materials in schools contributes towards achieving excellence in Mathematics. There are no fruitful results without relevant resources. This is evident in the study conducted by Indoshi, Wagah and Agak (2010), where teachers revealed that schools lacked teaching materials, equipment and laboratories. Teachers also indicated that teaching concepts which involve practical work, was difficult. This resulted in teachers skipping chapters which demand practical work. The literature (Vagi & Green, 2004) however, asserts that the shortage of teaching models makes teaching of the Geometry concepts difficult. Secondary School teachers' perceptions were examined. The research involved the use of the 4-point Likert rating scale and questionnaires. The findings of the study revealed that schools were running short of teaching aids and models, and teachers lacked a foundation in the

Geometry concepts. Vagi and Green (2004) also indicated that the teaching and learning of Geometry were ineffective. As a consequence, learners do not understand the Geometry concepts. The process of proving mathematical theorems involves an understanding of the structure of concept through selective use of existing knowledge, use of logical reasoning presented step-by-step in order strengthen arguments for the viability of the mathematical claims (Nyauwme & Buzuzi, 2007; Herbst, 2002; Knuth, 2002; Martin, Mcrone, Bower & Dindyal, 2005). Junor Clarke, Thomas and Vidakovic (2009) supported that knowing appropriate facts, algorithms, and procedures for proofs is not sufficient to guarantee success of Mathematics teaching.

There is a curvilinear relationship between teaching resource materials and human resource materials. Human resource materials are key elements in the process of implementing content, while teaching aids and models are key facilities in the development of Geometry concepts. Vagi and Green (2011) identified the most important tool in the teaching and learning of Geometry as the availability of teaching aids and models. However, the present researcher sees a need to identify sections to be studied. For example, Euclidean Geometry, Financial Mathematics, Project Work/ Investigation, Data Handling and Probability are part of the present study. The present study will also determine whether or not teaching aids and models for these sections are available in schools.

The integration of technology - particularly computer applications in the teaching of Mathematics- have been found effective for the past decades. Studies (Hartsell, Herron, Fang and Rathod, 2009; Cuban, Kirkpatrick & Peck, 2001; Deaney, Ruthven & Hennessy, 2003; Ruthven & Hennessy, 2002; Windschitl & Sahl, 2002) supported this view when they studied the perception of highly qualified teachers with regard to the use of technology in Mathematics teaching. These studies revealed that computer application skills help in using calculators and other software programmes. Teachers also indicated that knowledge of computers made them compete in the teaching of fractions and percentages. Furthermore, Doering, Huffman and Hughes (2003), assert that knowledge of incorporating. Any successful transformation in education practice requires positive attitude towards change and, teachers' attempts to technology use in the teaching of Mathematics can hardly ensure the quality of their teaching. It is also supported in the literature (Stoh & Garofalo, 2003; Ocak, 2005; Rizza, 2000; Becker & Lin, 2005) that positive attitudes often encourage less technological capable teachers to gain skills necessary for the curriculum implementation. Technology in the teaching of Mathematics improves the learning of Mathematics.

Isiksal and Askar (2005) conducted a study on technology integration in Mathematics teaching. The findings revealed that using computers preadsheets in the teaching of Geometry is important. For example, computers are very useful in the teaching of two dimensions in Geometry (Olkun, Allun & Smith, 2005; Earle, 2002). Sinclar (2004) shares the same view as Olkun *et al.,* (2005) that graphical representation of Geometry is taught effectively when using computers. Ruthven and Hennessy (2002) suggested that the availability of computer resources in school enables teachers to use different video materials to support Mathematics teaching and plan relevant activities. They (Ruthven and Hennessy, 2002) extended their discussion by saying that teaching Data Handling and graphing skills to operationalize basic ideas and provide conjectures is easily accessible. Ruthven and Hennessy (2002) added that teaching Mathematics with technology improves learners understanding, reasoning skills and Mathematics achievement. It means that the use of technology in the teaching of Mathematics has positive effect to change both the teaching and learning of Mathematics. Of the various inputs studied, teaching is more effective if it is presented through the use of technology. Research (Drier, 2001; Olkun, Altun & Smith, 2005; Beyerbach, Walsh & Vannatt, 2001; Di, 2000; Shamata, Peressini & Meymaris, 2004; Wang, 2001; Yildirini, 2000) on teaching showed that technology plays an important role in all educational areas. Hsu, Wu and Hwang (2007) examined factors influencing Junior High School Teachers' computer-based instructional practices regarding teaching. During the research, questionnaires were administered to six hundred Science and Mathematics teachers. The findings their study revealed that technology is an adequate tool for teaching both Science and Mathematics. Nies (2005) shares the same view as Hsu *et al*. (2007) that using technology in Mathematics assists teachers to access online teaching resources which help them arrange flexible learning activities, analyze and organize large amount of information. Olkun *et al.,* (2005) indicated that learners without computers at home obtained low marks in the Geometry section when they were doing proof and calculations. With this in mind, technology influences the Mathematics teaching and learning. Learners with computers at home are likely to do better in Project Work/Investigations as they will be accessing internet software. Sinclar (2004) stated that geometric sketchpad activities help learners explore and understand geometric relationship, and develop reasoning skills in the Geometry concept, particularly, in geometric proofs.

Notwithstanding the importance of computers in Geometry, it is also noted that they enhance the understanding of number concepts. This was evident in the study of Mbugua (2011) in which perceptions of Secondary School Mathematics teachers were examined. The study (Mbugua, 2011; Nyauwe, 2006; McCauliff, 2004; Rey & Arbaugh, 2001) suggested that the availability of calculators improves learners' ability to solve Mathematical problems. Furthermore, the use of calculators in the teaching of Mathematics develops interest in learners to learn Mathematics. This means that teaching Mathematics with technology integration motivates learners to learn Mathematics (Lin, 2008). Halat and Peker (2011) studied the impact of Mathematical representations developed through web quest and spreadsheet activities on the motivation of pre-service elementary school teachers and the result indicated that using technology in the teaching of Mathematics has positive effect on teaching; the content of Mathematics programmes and the methods by which Mathematics is taught are completely changing. In contrast, other studies (Niess, Ronau, Shafer, Driskell, Harper, Johnston, Browning, Ozgun-Koca & Kersaint, 2009) are concerned that the use of calculators by the learners in Mathematics does not develop calculation skills, and technology in the teaching of Mathematics interferes with learning key Mathematical ideas.

It is impressing to note this curvilinear relationship between technology resource and human resource material. Human resource materials are an important part of effective Mathematics teaching; the shortage of qualified teachers affects learners' performance in Mathematics (Yara, 2010). Hartsell, Fang and Rathod (2009) suggest that well-qualified teachers prepare lessons which develop interest in the learning of Mathematics. On the other hand, Mbugua (2011) identified the calculator as the most crucial resource for effective teaching of Mathematics. However, the present investigation will identify Mathematics resources which are relevant to the teaching of Project Work/Investigation, Data Handling and Probability, Financial Mathematics and Euclidean Geometry. Whether all teachers use calculators in their daily contact with learners, is part of the present study. In this regard, it is important to use Mathematics resources which are taken from real-life contexts in order to develop a good background in Mathematical concepts. Mathematics resources taken from real-life contexts provide a share of memory by allowing discussion that brings about a common understanding of Mathematics. However, the use of resources which are not within the school environment are not relevant to the teaching of Mathematics, as some of the teachers have not come across those resources (Hew & Brush, 2007).

2.4 STUDIES ON THE RELATIONSHIP BETWEEN TEACHERS' BIOGRAPHICAL DATA AND ATTITUDES TOWARDS THE SELECTED CHALLENGES

While Mathematics content knowledge is seen to be essential in the teaching of Mathematics, it is worth noting that teachers' gender has an impact on the Mathematics learning field. Female teachers have lower ability in teaching Mathematics than males (De Haven & Wiest, 2003). The study (De Haven & Wiest, 2003) reported that female teachers experience difficulties more frequently than males. This resulted in low participation of female teachers in Mathematics professional development activities (Bae, Choy, Sable & Snyder, 2000). Females have been shown not to be interested in Mathematics teaching (Jackson & Leffingwell, 1999). The National Center for Education Statistics (2002) revealed that females often obtained lower marks in the tests than males did. This implies that gender differences play a fundamental role influencing teachers' interest in the teaching processes. It means that gender differences affect teachers' willingness in any academic subject, and quality teaching and learning relies on gender differences (Altunsoy, Cimen, Gokmen & Ekici, 2011), while age in learning has decisive role in reasoning. For example, the most recent research (BouJaoude & Saad, 2012) on teaching has confirmed that teachers who have been teaching for a number of years (prior to 1999) have difficulty in adopting curriculum changes. In contrast, Festus, David, Orobosa and Olatunji (2013) argued that gender and teaching experience of the teachers do not affect the attitude Primary School Teachers towards adopting curriculum change. Azuka (2013a) supports the view that there is no significant relationship between gender and attitude of Mathematics teachers towards the teaching of Mathematics in schools.

It is interesting to note a correlation of different studies with significant results. However, all these studies seem to highlight issues of gender, age and experience. The present research seeks to fill in this gap in the literature by adding these: teachers' qualifications, post level and status of employment in order to determine whether they impact negatively on Mathematics teaching.

On the other hand, with the same understanding that Mathematics needs qualified teachers, it is worth noting that teachers with academic and professional qualifications share the same attitude towards teaching (Choudhry, Gujjar & Iqbal, 2011). In contrast, Liakopoulou (2011) argued that teachers with academic and professional qualifications have different attitudes towards teaching.

Another important issue arises in promotional posts. Teachers that hold promotional posts have difficulty in teaching (Budge, 2006). It means that teachers who hold promotional posts do not have enough time to prepare themselves for teaching. As a result, they concentrate too much on office work at the expense of teaching. It is also noted that teachers who work on a contract basis (temporarily employed) teach better than teachers who are permanently employed (Budge, 2006). This may be due to the fact that temporary teachers are afraid of losing their jobs. As a result, they work hard to protect their jobs.

However, the use of praise and feedback in teaching affects learners. This is supported in the praises (to appreciate learners with correct Mathematics solutions) which were not promoting a specific behavior in the subject development. The results (Burnett & Mandel, 2010) also indicated that inexperienced teachers use praises which were not developing interest in teaching Mathematics. As a result learners ended up hating praises as they did not help them in Mathematics performance. The literature (Fredenburg, Lee & Solmon, 2001) also asserts that learners who receive low appreciation and feedback in Mathematics are likely to perform badly in Mathematics. Task completion is determined by teachers' appraisal per task (Fredenburg, Lee & Solmon, 2001). It was also noted that general praise is not effective unless it is meant to improve mathematical performance (Gable, 2009; Hattie & Timperley, 2007). Ozgun-Koca (2002) reported those teachers' experience impacts on teachers' transformation of knowledge. Teachers' beliefs about Mathematics teaching and their attitudes towards teaching depend on their experiences. This means that sharing content knowledge is important for all teachers to have a common understanding of Mathematics concepts, while teachers' experience in Mathematics teaching determines not only what they think of the subject, but also how they teach (Ozgun-Koca, 2002). It is amazing to note the relationship between teaching experience and teaching knowledge, and the role played by teaching experience in teaching. For example, Burnett and Mandel (2010) investigated the use of praise and feedback in teaching and the result indicated that praise used by inexperienced teachers demotivate learners.

Fredenburg, Lee and Solmon (2001) studied the effect of praise and feedback on students' performance, and the result indicated that task completion depends on teachers' praise. It was also found that praises go hand-in-hand with subject development and learning (Hattie & Timperley, 2007). In short, all these studies (Burnett & Mandel, 2010; Fredenburg *et al*., 2001; Hattie & Timperley, 2007) convey a message that teachers have a fundamental role to play in learning. This means that teachers can use their teaching experience to motivate learners to learn Mathematics and develop a love for the subject. However, it does not matter whether the content topic is new or old; praise is meant to motivate and encourage learning (Fredenburg, Lee & Solmon, 2001).

2.5 LIST OF RESEARCH STUDIES FOR LITERATURE CONTROL IN THE REVIEW OF PREVIOUS WORK DONE IN THIS FIELD

AIM	AUTHOR AND YEAR	TITLE OF ARTICLE	PARTICIPANTS	SOURCE	RELEVANCE
ONE	Anthony, G. & Walshaw, M. 2007.	Policy implementation: Integrating the personal and social.	Mathematics Teachers	Mathematics Teachers Education and Development Special Issue	Gives information about problems faced by mathematics teachers in new curriculum
	Alder, J., Ball, D., Krainer, K., Lin, F. & Novotna, J. 2005.	Reflections on emerging field: Researching mathematics education.	Mathematics Teachers	Educational Studies in Mathematics	Provides information about teaching statistics
	Ayres, P. & McCormick, J. 2006.	Grade 12 mathematics teachers' views on curriculum in New South Wales.	Grade 12 Mathematics Teachers	Mathematics Teacher	Provides information about teachers' views on curriculum change
	Ayres, P., Mc Cormick, J. & Beechey, B. 2002.	Teachers' perceptions of the implementation of the New NSW High School Certificate.	High School Teachers	Australian Association for Research in Education Annual Conference	Talks about the implementation of new curriculum
	Bal, P. 2008.	The evaluation of new Mathematics Curriculum in terms of teachers' perspectives.	Mathematics Teachers	Journal of Cukurova University Institute of Social Sciences	Talks about teachers' beliefs about new curriculum
	Brady, P. & Bowd, A. 2005.	Mathematics anxiety, prior experience and confidence to teach Mathematics among pre-	Pre-service Education Students	Teachers and Teaching	Gives information about self-efficacy and teaching anxiety

		service education students			
	Brodie, K., Jina, Z. & Modau, S. 2009.	Challenges in implementing the new Mathematics Curriculum in Grade 10.	Grade 10 mathematics teachers	African Journal of Research in MST Education	Gives information about challenges in implementing grade 10 mathematics curriculum
	Burks, R., Heidenberg, A., Leoni, D. & Ratliff, T. 2009.	Supporting the motivators: A faculty development issue.	Education Institutions	Primus: Problems & Issues in Mathematics Undergraduate Studies	Provides information about changing teachers' beliefs of Mathematics and difficulty in planning resources that will help them teach Mathematics effectively
	Cheng, D.P. 2001.	Difficulties of Hong Kong teachers' understanding and implementation of play in the curriculum.	High school teachers	Teaching and Teachers Education	Gives information about the difficulty of implementing the new curriculum
	Flores, M. A. 2005.	Teachers' views on recent curriculum changes: Tensions and challenges.	Mathematics teachers and HODs	The Curriculum Journal	Provides information about teachers' concerns about curriculum change
	Garfield, J.B. 2003.	Assessing statistical reason.	Mathematics teachers	Research Journal of Statistics Education	Gives information about Teachers' concerns on statistics

	Garm, N. & Karlsen, G. 2004.	Teacher education reform in Europe: The case of Norway; trends and tensions in a global perspective.	Teachers	Teaching and Teacher Education	Talks about curriculum change in education
	Gelbal, S., Kelecioglu, H. 2007.	Teachers' proficiency perceptions about the measurement and evaluation techniques and the problems they confront.	Mathematics Teachers	Hacettepe University Journal of Education	Talks about Measurement and Evaluation in the Geometry Curriculum
	Gilley, J.W. 2000.	Understanding and building capacity for change: A key to school transformation.	Teachers	International Journal of Education Reform	Talks about teachers' attitudes towards change
	Giltin, A. 2001.	Bounded decision-making.	Language teachers	Educational Policy	Gives information about language difficulty
	Gokcek, T. 2009.	How mathematics teachers' concerns changed within the context of curriculum reform?	Grade 6 mathematics teachers	Procedia-Social and Behavioral Sciences	Provides information about teachers' problems in adapting new mathematics syllabus
	Goldblatt, P.F. & Smith, D. 2004.	Illuminating and facilitating professional knowledge through case work.	Education Institution	European Journal of Teacher Education	Talks about content knowledge development

	Grossman, G.M., Onkol, P.E. & Sands, M. 2007.	Curriculum reform in Turkish teacher education: Attitudes of teacher educators towards change in an EU candidate nation.	Teachers	International Journal of Education Development	Provides information about teachers' attitudes
	Grossman, G. & Onkol, P. 2006	Towards the Europeanization of Turkish teacher education: education reform and professional development in a new context. In: Terzis, N.P. (Ed.), Lifelong Learning in the Balkans.	Teachers	Publishing House Kyriakidis Brothers S.A., Thessaloniki, Greece	Talks about curriculum change in education
	Henderson, S. & Rodrigues, S. 2008.	Scottish Student Primary School Teachers' level of Mathematics competence and confidence for teaching Mathematics.	Student Primary School Teachers	Journal of Education for Teaching	Talks about Mathematics Teachers' competence in teaching Mathematics
	Idolphus, T. 2011.	Problems in teaching and learning of Geometry in Secondary Schools in Rivers State, Nigeria.	Mathematics Teachers	Internal Journal of Emerging Science	Provides information about teaching and learning problems
	Ignacio, N.G., Nieto, L.J. & Bar	The effective domain Mathematics learning	Mathematics Teachers	International Electronic Journal of Mathematics Education	Provides information about Mathematics Curriculum change in teaching and learning

	Johnson, R.M., Smith, K.H. & Carinci, S. 2010.	Pre-service Female Teachers self-concept and Mathematics anxiety: A longitudinal Study.	Pre-service Mathematics Teachers	Globalization, Comparative Education and Policy Research	Gives information teachers' anxiety as against changes in Mathematics Curriculum
	Junor Clarke, P.A., Thomas, C.D. & Vidakovic, D. 2009.	Pre-service mathematics teachers' attitudes and Developing Practices in the Urban classroom: Are they wining it?	Pre-service Mathematics Teachers	Research and Practice in Social Sciences	Talks about teachers' attitudes
	Kalhotra, S.K. 2013.	A study of students perception of classroom behavior of Mathematics Teachers.	Mathematics Students	Journal of Education and Practices	Talks about Mathematics Teachers' behavior in the classroom
	Kargar, M., Tarmizia, R.A., & Bayat, S. 2010.	Relationship between Mathematical thinking, mathematics anxiety and mathematics attitudes among University Students.	University Students	International Conference of Mathematics Research 2010 (ICMER 2010)	Gives information about attitudes towards curriculum change
	Khoboli, B. & O' Toole, J.M. 2011	. Learner-Centred Science in Lesotho: Adapting the ideal to adjust classroom practice.	Science Teachers	African Journal of Research in MST Education	Provides information about teaching and learning

	Marek, E.A. & Methaven, S.B. 19991.	Effect of the learning cycle upon student and classroom teacher performance	Teachers and Learners	Journal of Research in Science teaching	Talks about teaching and learning
	Ning, L. 2009.	Concerning the new mathematics curriculum: Pedagogic content knowledge of high school mathematics teachers.	High school Mathematics Teachers	Journal of Mathematics Education	Provides information about mathematics proficiency and content
	Nyaumwe, L. & Buzuzi,G. 2007.	Teachers' attitudes towards proofs of Mathematical results in the Secondary School Curriculum: A case of Zimbabwe.	Mathematics Teachers	Research Journal of Mathematics Education	Talks about teachers' attitudes
	Onwuegbuzie, A.J. 1998.	Teachers' attitudes towards statistics.	Mathematics Teachers	Psychological Reports	Talks about teachers' attitudes towards statistics
	Onwuegbuzie, A.J. 2003.	Modelling statistics achievement among graduate students.	Graduate Students	Educational Psychological Measurement	Provides information about mastering statistics
	Onwu, G.O.M. & Mogari, D. 2004.	Professional development for Outcome-Based Education implementation:	Education Institutions	Journal of Education for Teaching	Talks about teacher change and teacher preparation

		The Case of UNVEMALASHI, South Africa.			
	Peker, M. & Mirasyedioglu e, S. 2008.	Pre-service elementary school teachers' learning styles and attitudes towards mathematics.	Pre-service Mathematics Teachers	Eurasia Journal of Mathematics, Science & Technology	Provides information about teachers' attitudes and learning style
	Pfannkuch, M. 2006.	Comparing box plot distributions: A teachers' reasoning.	Mathematics Teachers	Statistics Education Research Journal	Talks teachers' statistical reasoning
	Prescott, A. & Cavanagh, M. 2006.	An investigation of Pre-service Secondary Mathematics Teachers' beliefs as they begin teachers training.	Pre-service Mathematics Teachers	Mathematics Research Group	Gives information about teachers' beliefs as they begin teacher training
	Randler, C. & Hulde, M. 2007.	Hand-on versus teacher-centred experiments in soil ecology.	Science Teachers	Research in Science & Technological Education	Provides information about effective teaching
	Richardson, V. & Placier, P. 2001.	Teacher change, in: V. Richardson (Ed.) Handbook of research on teaching.	Teachers	American Educational Research Association	Provides information about teacher change in curriculum
	Shulman, L. & Schulman, J. 2004.	How and what mathematics teachers learn?	Education Institutions	Journal of Curriculum Studies	Highlights the importance of teaching mathematics in English
	Van der Sandt, S. 2007.	Research framework on mathematics teacher behavior:	Pre-service Teachers	Eurasia Journal of Mathematics, Science & Technology	Provides information about teachers' attitudes in the geometry training

		Hoehlerand Grouws' framework revisited.			course
	Walczyk, J. & Ramsey, L.L. 2003.	Research framework on mathematics teacher behavior: Hoehlerand Grouws' framework revisited.	Pre-service Teachers	Eurasia Journal of Mathematics, Science & Technology	Provides information about teachers' attitudes in the geometry training course
	White, A.L., Way, J., Perry, B. & Southwell, B. 2005/2006.	Mathematical attitudes, beliefs and achievement in Primary Pre-service Mathematics Teacher Education.	Primary Pre-service Mathematics Teachers	Mathematics Teacher Education and Development	Gives information about attitudes of Primary Pre-service Mathematics Teachers
	Yilmaz, G. K., Alkan, S., Baron, D., Elmas, H. & Guven, B. 2011.	Mathematics teachers' views about measurement and evaluation dimension of new Turkish geometry curriculum.	Mathematics Teachers	Procedia- Social and Behavioral Sciences	Provides information about teachers' attitudes towards geometry concept
	Yu-peng, M., Chi-chung, L. & Ngai-ying, W. 2006.	Primary School Mathematics working in A Centralized Curriculum System: A case of Two Primary Schools in North East China.	Primary School Mathematics Teachers	Compare	Talks about curriculum change

	Anthony, G. & Walshaw, M. 2007.	Policy implementation: Integrating the personal and social	Mathematics Teachers	Mathematics Teachers Education and Development Special Issue	Talks about difficulty of choosing teaching methods
	Birgin, O. Tutak, T. & Turkdogan, A. 2009.	Primary school teachers' views about new Turkish primary school mathematics curriculum.	Primary School Teachers	e-Journal of New World Sciences	Talks about teaching competency in mathematics
	Bulut, M. 2007.	Curriculum Reform in Turkey: A case of primary school Mathematics Curriculum.	Primary School Mathematics Teachers	Eurasia Journal of Mathematics, Science & Technology	Provides information about difficulty of textbooks
	Feldman, A. 2007.	Teachers, responsibility and action research.	Teachers	Educational Action Research	Talks about training for teaching
	Fung, Y. 2000.	A constructivist strategy for developing teachers for change: A Hong Kong experience.	Education Institutions	Journal of In-service Education	Talks about training for teaching
	Flores, M. A. 2005.	Teachers' views on recent curriculum changes: Tensions and challenges.	Mathematics Teachers and HODs	The Curriculum Journal	Provides information about content knowledge of mathematics teachers
	Handal, B. & Herrington, A. 2003.	Mathematics teachers' beliefs and curriculum reform.	Mathematics Teachers	Mathematics Education Research Journal	Highlights problems in the policies of new mathematics curriculum

	Hudson, P. & Huson, P. 2008.	Changing Pre-service Teachers' attitudes for teaching in Rural Schools.	Pre-service Teachers	Australian Journal of Teacher Education	Highlights problems of teaching in Rural Schools
	Jegede, O. Taplin, M. & Chan, S. 2000.	Trainee teachers' perception of their knowledge about expert teaching	Trainee Teachers	Educational Research	Talks about different ways in teaching
	Kasanda, C., Lubben, F., Gaoseb,N., Kandjeo-Marenga, U., Kapenda, H. & Campbell, B. 2005.	The role of everyday contexts in learner-centred teaching: The practice Namibian Secondary Schools.	Secondary School Teachers	International Journal of Science Education	Talks about different ways in teaching
	Manouchehri, A. & Enderson, M.C. 2003.	The utility of case study methodology in Mathematics teacher preparation	Mathematics Teachers	Teacher Education Quarterly	Talks about ways of teaching and teacher preparation
	Mhlolo, M. K. & Venkant, H. 2009.	Curriculum coherence: An analysis of the National Curriculum Statement (NCSM) for Mathematics and the examplar papers at Further Education and Training (FET) level in South Africa.	Education institutions	African Journal of Research in MST Education	Provides information about policy problems , teaching and learning methods

	Molefe, N. & Brodie, K. 2004.	Teaching Mathematics in the context of curriculum change.	Mathematics Teachers	Pythagorous	Talks about difficulty of choosing teaching methods
	Muijs, D. & Reynolds, D. 2002.	Teachers' beliefs and behaviors: What really matters?	Teachers	Journal of Classroom Interaction	Talks about teachers behavior in teaching
	Mulford, B. 2003.	School leaders: Challenging roles and impact on teacher and school effectiveness.	School Teacher leaders	Training Policy for effective teachers	Talks about challenges in leading
	Ning, L. 2009.	Mathematics teachers Concerning the new mathematics curriculum: Pedagogic content knowledge of High School Mathematics Teachers.	High school Mathematics Teachers	Journal of Mathematics Education	Highlights some problems of textbooks as against new demands of the curriculum
	Onwu, G. & Stoffels, N. 2005.	Institutional functions in large under-resourced class: Perspectives of South African Teachers.	Education Institutions	Perspectives in Education	Gives information about resources for teaching
	Ronda, E. 2010.	What is mathematical investigation? Curriculum Reform.	Mathematics Teachers	**The Journal, {Online},** Htt://math4teaching.com	Gives information about difficulties in using mathematics text books

	Shulman, L. & Schulman, J. 2004.	How and what mathematics teachers learn?	Education institutions	Journal of Curriculum Studies	Highlights some problems of interpreting the new policies of mathematics curriculum
	Tirosh,D. & Graeber, A. 2003.	Challenges and changing mathematics teaching classroom practices.	Mathematics teachers	Springer International Handbook of Education	Provides information about teacher development needs
	White, S., Green, B., Reid, J., Lock, G., Hasting, W.& Copper, M. 2008.	Teacher Education for rural communities: A focus on incentives	Education Institutions	Australian Teachers Education Association	Gives information about difficulty of teaching in rural schools
	Azuka, B.F. 2013b.	Activity-Based Learning strategies in the Mathematics classroom.	Mathematics Teachers	Journal of Education and Practice	Provides information about Activity-Based Learning
	Becker, J.P. & Lin, C.Y. 2005.	Effects of a computational skills workshop on pre-service elementary teachers: Preliminary Report.	Pre-service Elementary Teachers	Paper presented at the Annual Meeting of the Mathematical Association of American and American Mathematical Society, Atlana, GA.	Talks about different calculation skills gained from the workshop of Mathematics Teachers
	Beyerbach, B., Walsh, C., Vannatta, R. 2001.	From teaching technology to using technology to enhance student learning: Pre-service	Teachers	Journal of Technology and Teacher Education	Talks about technology use in teaching

		teachers' changing perceptions of technology infusion.			
	Brodie, K.2007.	Dialogue in Mathematics classrooms: Beyond question and answer methods.	Mathematics Teachers	Pythagorous	Talks about sharing Mathematics ideas
	Brodie, K., Jina, z. & Modau, S. 2009.	Challenges in implementing the new mathematics curriculum in Grade 10.	Grade 10 Mathematics Teachers	African Journal of Research in MST Education	Highlights problems in mathematics tasks as against teaching goals
	Bullock, D. 2004.	Moving from theory to practice: An examination of the factors that pre-service teachers encounter as they attempt to gain experience teaching with technology during field placement experience.	Teachers	Journal of Technology and Teacher Education	Talks about using technology in teaching
	Chang, C.C. & Tseng, K.H. 2009.	Use and performances of web-based portfolio assessment.	Mathematics Teachers	British Journal of Education Technology	Gives information about teaching through technology
	Cuban, L., Kirkpatrick, H. & Peck, C. 2001.	High access and low use of technologies in High School classrooms: Explaining in an	High School Teachers	American Educational Research Journal	Talks about use of technology in teaching

		apparent paradox.			
	Deaney, Ruthven & Hennessy. 2003.	Pupil perspectives on the contribution of information and communication technology to teaching and learning in the Secondary school.	Secondary School Teachers	Research Papers in Education	Talks about use of technology in teaching and learning
	Di, X. 2000.	An integrated approach to instructional technology.	Teachers	Eurasia Journal of Mathematics, Science & Technology	Talks about use of technology in teaching and learning
	Doering, A. Huffman, D. & Hughes, J. 2003.	Pre-service teachers: Are we thinking with teaching?	Pre-service Teachers	Journal Research on Technology in Education	Highlights the importance of technology use in mathematics
	Drier, H.S, 2001.	Teaching and learning with mathematics with interactive spreadsheets	Mathematics Teachers	School Science and Mathematics	Highlights the importance of technology use in mathematics
	Earle, R.S. 2002.	The integration of instructional technology into public education: Problems and Challenges.	Teachers	ET Magazine	Talks about using technology in teaching
	Freitas, S. & Jameson, J.2006.	Collaborative e-support for lifelong learning.	Mathematics Teachers	British Journal of Educational Technology	Talks about the importance of using technology in the teaching of Mathematics
	Halat, E. & Peker, M. 2011.	The impact of mathematical representation through webquest	Pre-service Teachers	The Turkish Online Journal of Educational Technology	Highlights the importance of using technology in the teaching of

		and spreadsheet activities on the motivation of Pre-service elementary School Teachers.			Mathematics
	Hartsell, T., Herron, S., Fang, H. & Rathod, A. 2009.	Effectiveness of professional development in teaching mathematics and technology applications.	Mathematics Teachers	Journal of Educational Technology Development and Exchange	Talks about the importance of developing Mathematics Teachers to use technology in teaching mathematics
	Herbst, P.G. 2002.	Engaging students in proving: A double bind on the teacher.	Mathematics Teachers	Journal of Research in Mathematics Education	Talks about proof in Geometry section
	Hew, K.F., & Brush, T. 2007.	Integrating teaching into K-12 teaching and learning: Current knowledge gaps and recommendations for further research.	Education Institutions Students and Teachers	Education Technology Research and Development	Provides information about the use of real-life teaching resources
	Indoshi, F.C., Wagah, M.O. & Ogak, J.O. 2010	Factors that determine students' and teachers' Attitudes towards art and design curriculum.	Student Teachers	International Journal of Vocational and Technical Education	Talks about students' and teachers' attitudes towards teaching resources
	Isiksal, M. & Askar, P. 2005.	The effect of spread sheet and dynamic geometry software on achievement and	Grade 7 Teachers	Education Research	Gives information using computer spread sheet in teaching Geometry

		self-efficacy of 7th grade students			
	Knuth, E.J. 2002.	Proofs as a tool for learning Mathematics.	Teachers	Mathematics Teacher	Talks about using proofs in learning Mathematics
	Lyons, T., Cooksey, R. Pannizzon, D., Parnell, A. & Pegg, J. 2006.	The SiMERR national survey: National Centre of Science, ICT and Mathematics for Rural and Regional Australia.	Mathematics and Science Teachers	Journal of Education for Teaching	Talks about teachers' concerns in using Mathematics and Science resources in rural schools
	Martin, T.S., Mcrone, S.M.S., Bower, M.L.W. & Dindyal, J. 2005.	The interplay of teacher and student actions in the teaching and learning of Geometric proofs	Education Institutions	Educational Studies in Mathematics	Gives information about teaching and learning of Geometry
	Mbugua, Z. K. 2011.	Attitudes of secondary school students on use of scientific calculators in learning mathematics in Embu District Kenya.	Secondary School Students	International Journal of Humanities and Social Sciences	Highlights the importance of calculator in learning Mathematics
	McCauliff, E. 2004.	The calculator in the Elementary classroom: Making a useful tool out of an Ineffective Crutch.	Teachers	Villanova University	Talks about the use of calculator in the classroom
	Nelson, C.G. 2004.	The diversity challenge in rural education.	English Teachers	English Journal	Talks about challenges in teaching in rural school

	Niess, M.L., Ronau, R.N., Shafer, K.G., Driskell, S.O., Harper, S.R., Johnston, C., Ozgun-Koca, S.A. & Kersaint, G. 2009.	Mathematics teachers TPACK standards and development model.	Education institutions	Contemporary Issue in Technology and Teacher Education	Highlights some problems of allowing learners to use calculators in learning mathematics
	Ning, L. 2009.	Mathematics teachers Concerning the new mathematics curriculum: Pedagogic content knowledge of High School Mathematics Teachers.	High school Mathematics Teachers	Journal of Mathematics Education	Talks about human resource needs
	Nyaumwe, L.J. 2006.	Investigating Zimbabwean Mathematics Teachers' dispositions on the 'O' Level calculator syllabus.	Mathematics Teachers	South African Journal of Education	Talks about use of calculators in Mathematics
	Ocak, M.A. 2005.	Mathematics teachers' attitudes toward the Computers	Mathematics Teachers	Online Journal of Education Technology	Talks about teachers' attitudes towards computers
	Olkun, S., Altun, A. & Smith, G. 2005.	Computers 2D geometric learning on Turkish fourth and fifth graders.	Grades 4 and 5 Teachers	British Journal of Education Technology	Gives the importance of using computers in teaching 2D geometry concept

	Rey, B.J. & Arbaugh, F. 2001.	Cleaning up the confusion over calculator use in Grades k-5.	Mathematics Teachers	Teaching Children Mathematics	Talks about the use of calculators in the classroom
	Rizza, M.G. 2000.	Perspectives on Pre-service Teachers' attitudes toward Technology.	Teachers	The Teacher Education	Talks about teachers' attitudes towards technology
	Rosenkoetter , S.E., Irwin, J.D. & Saceda, R.G. 2004.	Addressing personal needs for rural schools.	Teachers	Teacher Education and Special Education	Talks about problems of teacher shortages in rural areas
	Ruthven, K. & Hannessy, S. 2004.	A practitioner model of the use of computer-based tools and resources to support mathematics teaching and learning	Education Institutions	Educational Studies in Mathematics	Highlights the importance of computers in mathematics teaching and learning
	Ruthven, K. & Hannessy, S. 2002.	A practitioner model of the use of computer-based tools and resources to support Mathematics teaching and learning.	Mathematics Teachers	Educational Studies in Mathematics	Highlights the importance of computers in mathematics teaching and learning
	Shamatha, J.H., Peressini, D. & Meymaris, K. 2004.	Technology-supported mathematics activities situated within an effective learning environment theoretical	Mathematics Teachers	Contemporary Issues in Teacher Education	Talks about technology support in doing Mathematics activities

		framework.			
	Sinclair, M. 2004.	Working with accurate representations: The case of pre-constructed dynamic geometry sketches.	Education Institutions	Journal of computers in Mathematics and Science Teaching	Highlights the importance of computers in mathematics teaching and learning
	Tirosh,D. & Graeber, A. 2003.	Challenges and changing mathematics teaching classroom practices.	Mathematics teachers	Springer International Handbook of Education	Highlights some problems in human resource material
	Tarik, T. 2000.	The belief of pre-service elementary teachers towards Science and Science teaching.	Science Teachers	School Science and Mathematics	Talks about Mathematics and Science teaching
	Vagi, O. & Green, R. 2004.	The challenges in developing a mathematics curriculum for training elementary teachers in Papua New Guinea.	Education institutions	Early Child Development and Care	Talks about teaching aid and models
	Wang, Y. 2001.	Student teachers' perception and practice of the teachers' role when teaching with computers.	Student Teachers	Journal of Educational Computing Research	Talks about teaching with computers
	Williams, J.H. 2005.	Cross-national variations in rural Mathematics achievement: A	Mathematics Teachers	Journal of Research in Rural Education	Talks about Mathematics achievement in rural schools

		descriptive overview.			
	Windschitl M. & Sahl, K. 2002.	Tracing teachers' use of technology in a laptop computer school: The interplay of teacher beliefs, social dynamics and institutional culture.	Teachers	American Educational Research Journal	Highlights the importance of computers in mathematics teaching and learning
	Wright, D. & Osborne, J. 2007.	Preparation for teaching in rural schools.	Teachers	Paper presented at the British Educational Research Association Annual Conference, Institute of Education, University of London	Talks about difficulties for preparing to teach in rural schools
	Yara, P.O. 2010.	Teaching/Learning resources and academic performance in mathematics in secondary schools in Bondo District of Kenya.	Secondary school mathematics teachers	Procedia-Social and Behavioral Sciences	Provides information about teacher performance in using prescribed teaching resources

	Yildirim, S. 2000.	Effect of an educational computing course on pre-service teachers: A discussion and analysis of attitudes and use.	Teachers	Journal of Research on Computing in Education	Gives information about doing calculations
FOUR	Altunsoy, S., Cimen, O., Gokmen, A. & Ekici, G. 2011.	An analysis of candidate teachers' attitude towards learning.	Candidate teachers	Procedia-Social and Behavioral Sciences	Talks about gender differences on learning
	Azuka, B.F. 2013a.	Attitudes of Secondary School Mathematics Teachers towards teaching of Mathematics in Nigeria.	Secondary School Mathematics Teachers	Journal of Mathematical Sciences Education	Talks about gender differences in Mathematics teaching
	Bae, Y., Choy, S., Sable, J. & Snyder, T. 2000.	Trends in educational equity of girls and women.	Girls and Women	Education Statistics Quarterly	Talks about gender differences on learning
	BouJaoude, S. & Saad, R. 2012.	The relationship between teachers' knowledge and belief about Science and inquiry and their classroom practices.	Science teachers	Eurasia Journal of Mathematics, Science & Technology	Talks about teaching experience
	Burnett, P.C. & Mandel, V. 2010.	Praise and feedback in primary classroom: Teachers and	Primary school teachers and students	Australian Journal of Educational and Developmental Psychology	Talks about teaching experience

		Students' Perspectives.			
	Chang, C.P. & Teng, S.F. 2009.	Overview of Continuation vocational high school, students' learning attitudes disturbances.	High school students	Journal of International Management Studies	Talks about gender differences on learning
	DeHaven, M. A. & Wiest, L.R. 2003.	Impact of girls mathematics and technology program on Middle school girls attitudes towards mathematics	Girls doing mathematics	The Mathematics Education	Talks about gender differences on learning
	Festus, B., David, D., Orobosa, O.S. & Olatunji, J. 2013.	Attitudes of Primary School Mathematics Teachers towards the use of Activity-Based Learning methods in teaching Mathematics in Nigerian Schools.	Primary School Mathematics Teaches	International Journal of Education Learning and Development	Talks about Mathematics teaching experience and teaching through Activity-Based Learning
	Fredenburg, K. B., Lee, A.M. & Solmon, M. 2001.	The effect of argumented feedback on students' perceptions and performance.	Teachers and students	Research Quarterly for Exercise and Sport	Talks about teaching experience

	Gable, R.A., Hester, P.H., Rock, M.L. & Hughes, K.G. 2009.	Back to basic: Rules, praise, ignoring and reprimands revisited.	Education institutions	Intervention in school and clinic	Talks about teaching experience
	Hatti, J. & Timperley, H. 2007.	The power of feedback.	Education institutions	Review of Educational Research	Talks about teaching experience
	Jackson, C. & Lefferingweeell, R. 1999.	The role of instructors in creating mathematics anxiety in students from kindergarten through college.	Education institutions	The Mathematics Teacher	Talks about gender differences on learning
	National Center for Education Statistics. 2010.	Digest of Education Statistics.	Government	The Journal, {Online},htt:/nces.ed.gov/pubdsearch /pubid=2002130	Talks about gender differences on learning

2.6 CONCLUSION

Tensions and resistance brought about by the introduction of new chapters to the FET Mathematics Curriculum do not enable teachers to master the Mathematics Curriculum. This is as a result of the shortage of resources which makes it difficult for teachers to understand and unpack what the new curriculum requires of them. However, resources for teaching are not clear with the guidelines and regulations of the curriculum. On the other hand, teachers' age and experience impact either positively or negatively on teaching, depending on the belief of the teacher about the content. In the next chapter the research design will be discussed, providing the procedures that were applied in order to gather, analyze and interpret the data.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter outlines the methodology used in this study. The methodology section covers: research design, sampling design, research instrument, scoring of an instrument, relationship between the aims of the study and the research instrument, the pilot study; procedures for administration of the research instrument, entering data into the spreadsheet, and establishing validity and reliability of the instrument.

3.2 RESEARCH DESIGN

The present research uses a field study research design. This involved field study or quasi-experiments conducted in schools. This design is suitable for the study as the researcher aims to determine teachers' attitudes towards Mathematics teaching. The field study seeks to establish the attitudes of Mathematics teachers towards curriculum change. Many studies which investigate teachers' attitudes towards Mathematics used field study research design. Choudhry, Gujjar and Iqbal (2011) used a field study research design to determine teachers' attitudes towards pre-service teacher-training programs. The field study research design sets out to investigate the attitudes and perceptions of teacher educators towards Secondary School teacher-training programs. Field study research design helps the researcher to conduct field experiments (Atunsoy, Cimen, Gokmen & Ekici, 2011). The present researcher adopted this type of design since the present study requires an investigation to be conducted with Mathematics teachers in schools. This design has a competitive edge over other designs. These teachers have different attitudes as they are teaching in different Wards of schools.

3.3 SAMPLING DESIGN

Secondary Schools in the Maphumulo Circuit which offer Mathematics at FET level were studied. Maphumulo Circuit comprises four wards, namely, Lower Umvoti Ward, Intunjambili Ward, Balcombs Hill Ward and Imati Ward. These wards of schools are operating in the remote rural area. The researcher believes that different teachers have different attitudes with regard to curriculum change in general, and to the Mathematics Curriculum, in particular. The sample was drawn from the population of Secondary School teachers teaching at various schools from Maphumulo Circuit. There are thirty seven (37) Secondary Schools in Maphumulo Circuit. In the present study, the researcher used systematic random sampling design to select the participants. It assists the researcher to choose in an appropriate manner the set of participants to be used in the final study (Choudhry, Gujjar & Iqbal, 2011). This sampling design was chosen because the research is concerned with the relevance of the sample in such a way that only Secondary Schools offering the Mathematics Curriculum in Grades 10-12 were used. The sample consisted of one hundred (100) teachers who were drawn from the population of Secondary Schools in the Maphumulo Circuit. A list with 203 teachers from the Maphumulo Circuit was obtained. Every second element in the list was chosen for inclusion in the research sample. Choosing a bigger sample helps the researcher to achieve greater representativeness (Trochim, 2001).

3.4 RESEARCH INSTRUMENT

In this study the researcher developed a Likert 5-point scale questionnaire, checklist, open-ended questions and quantitative data analysis to proffer answers on the basis of the aims of the study. These tools were used to collect data from Secondary School teachers about their attitudes of teaching the selected challenges. The Likert 5-point scale questionnaire that was used, tested whether participants strongly agree (SA), agree (A), were neutral (N), disagree (D) and strongly disagree (SD) about statements regarding teachers' attitudes.

3.5 SCORING OF THE INSTRUMENT

The positively worded items were scored 5, 4, 3, 2, and 1 for strongly agree (SA), agree (A), neutral (N), disagree (D) and strongly disagree (SD), respectively. This scoring procedure was reversed for negatively worded statements.

3.6 RELATIONSHIP BETWEEN THE AIMS OF THE STUDY AND THE RESEARCH INSTRUMENT

3.6.1 Aim number one

To determine teachers' attitudes towards selected challenges brought about by additions or introduction of new chapters to the FET Mathematics learning content.

An attitude scale questionnaire with fixed response items was administered to measure teachers' attitudes towards the selected challenges. The attitude scale covers the following components: belief, feeling and action tendency.

Table 3.1 Distribution of items on the scale

COMPONENT	POSITIVE	NEGATIVE	TOTAL
Action	8	3	11
Belief	4	0	4
Feeling	4	3	7
TOTAL	**16**	**6**	**22**

3.6.2 Aim number two

To establish the relationship, if any, between teachers' biographical data and teachers' attitudes towards the selected challenges.

The researcher identified teachers' biographical details which could influence their attitudes. These included gender, age, academic qualification, professional qualification, teaching experience, post level and employment status (i.e. temporarily or permanently employed).

3.6.3 Aim number three

To establish the role played by status of resources in teachers' attitudes towards the selected challenges.

A checklist was designed to assess status of resources in schools. A category of resources required for teaching of selected challenges i.e. the introduction of new chapters in the FET Mathematics Curriculum was provided. Teachers were expected to indicate whether or not those resources were available in schools.

3.6.4 Aim number four

To mention reasons for teachers happiness or unhappiness with the newly introduced chapters in the FET Mathematics Curriculum.

An open-ended questionnaire was designed. In this section, teachers were expected to list things in order of importance to them, that make them happy or unhappy, in the teaching of Mathematics.

3.7 THE PILOT STUDY

A pilot study was conducted. At least fifty (50) Secondary Schools in the Lower Tugela Circuit (one of the Circuits in the Ilembe District) were used during the pilot run. The researcher chose five schools from township schools and two schools from outside township schools. The researcher wanted to check validity and reliability of the questionnaire identify problem areas in the questionnaire and select items for use in the final study. Each school was left with one questionnaire to be completed by any educator who was offering the Mathematics Curriculum in Grades 10-12. Fifty questionnaires were distributed in all fifty schools. All fifty questionnaires were collected by the researcher in person.

3.8 PROCEDURES FOR ADMINISTRATION OF THE RESEARCH INSTRUMENT

Permission to conduct research in the KZN Department of Education was obtained. As per instruction from the KZN Department of Education, once permission was granted, the researcher informed all Ward Managers of schools in the Maphumulo Circuit to be aware that the research was to be conducted. The researcher distributed letters of permission to conduct research to all Ward Managers of schools in Maphumulo Circuit. Ward Managers informed all relevant principals of schools to get ready for the research. At the sampled schools the researcher introduced himself to the principals and showed letters of permission for conducting the research. The principals of schools were requested to distribute the questionnaires to the teachers who offer the Mathematics Curriculum in Grades 10-12. The researcher personally collected the questionnaires on the agreed date in each school.

3.9 ENTERING DATA INTO THE SPREAD SHEET

The researcher collected all fifty questionnaires from the sampled wards of schools. The scoring of the results was done on the computer following the structure of the questionnaire. The raw data obtained from the questionnaire were converted to a quantitative form via coding of 16 statements that were positively worded and 6 statements that were negatively worded. The highest possible score is 110 (22x5), which indicates the most positive attitude, while the lowest positive score is 22 (22x1), which indicates the most negative attitude. This formula was used by the previous researcher in the study of attitudes (Choudhry, Gujjar & Iqbal, 2011). Data were analyzed by quantitative methods. After all the questionnaires were scored the data were analyzed by means of the computerized programme called Statistical Package for Social Sciences (SPSS).

3.10 ESTABLISHING VALIDITY AND RELIABILITY OF THE INSTRUMENT

3.10.1 Reliability

The pilot study was conducted in order to test the reliability of the questionnaire. This was intended to identify problem areas and to select the items for use in the final study. An internal consistency method of item analysis was used in a test run to check the reliability of the questionnaire. Internal consistency has to do with correlation among items.

Table 3.2 Reliability of the instrument

Cronbach's Alpha	Cronbach's Alpha Based Standardized Item	No. of Items
.652	.652	20

The reliability of the instrument was tested using Cronbach's Alpha correlation co-efficient formula, which was considered appropriate where the items are of changing point values. The degree of internal consistency as estimated by Cronbach's Alpha value obtained 0.652 for an attitude questionnaire for Mathematics teachers and was considered reliable (Cohen, Manio & Morris, 2007).

3.10.2 Validity of the instrument

For the result to be valid, the instrument must measure what it is supposed to measure in order for the findings of a research study to present a true and accurate picture of what is claimed to be described (Silverman, 1993).The existence of clusters of large correlation coefficients between subsets of variables suggests that those variables could be measuring aspects of the underlying dimensions. Those underlying dimensions are known as factors (Cohen *et al.*, 2007).

Table 3.3 Rotated factor loadings of 22 items

ITEMS	FACTOR LOADINGS			
	1	**2**	**3**	**4**
VAR00014	**.698**	-.296	-.223	-.276
VAR00015	**.625**	-.142	-.035	-.240
VAR00001	**.591**	-.198	.424	-.002
VAR00009	**.535**	-.329	.033	.380
VAR00013	**.458**	-.399	.246	.176
VAR00020	**.457**	.311	.038	.145
VAR00002	**.410**	.170	.278	.295
VAR00018	**.403**	.381	-.247	.005
VAR00022	.162	**.639**	-.047	-.461
VAR00017	.170	**.597**	.036	-.047
VAR00016	.503	**.523**	-.218	-.177
VAR00007	.010	.022	-.004	-.056
VAR00003	.056	-.207	**.667**	.019
VAR00019	.305	-.233	**-.588**	.355
VAR00008	.079	.280	**.582**	.156
VAR00012	.073	.488	**.489**	.073
VAR00010	.254	-.244	**.414**	-.017
VAR00005	.298	-.188	-.190	**-.607**
VAR00021	.103	.055	-.381	**.563**
VAR00004	.452	.280	-.079	**.540**
VAR00006	.300	-.208	.003	**-.491**
VAR00011	.194	-.053	.185	-.271

Bold type indicates item highest loading on factor

Table 3.3 showing factor loadings, contains correlation coefficients between factor and items. These coefficients represent factor loadings of the items on the component. In Table 3.3, the first column contains item numbers. The second column contains loadings between factor 1 and each item in turn. The third column contains loadings between factor 2 and each item in turn. The fourth column contains loadings between factor 3 and each item in turn.

Table 3.3 shows that items 14, 15, 1, 9, 13, 20, 2 and 18 have relatively high loadings on the first factor. Item numbers 22, 17 and 16 have relatively high loadings in the second factor. Item numbers 3, 19, 8, 12 and 10 have relatively high loadings in the third factor. Item numbers 5, 21, 4 and 6 have relatively high loadings in the fourth factor.

Using .30 as a cut-off point, two items (7 & 11) were discarded because they were below .30.

3.11 CONCLUSION

This chapter focused on the research procedure employed in order to determine teachers' attitudes towards the selected challenges, i.e. the introduction of new chapters in the FET Mathematics Curriculum. Data Presentation, Data Analysis and Interpretation based on four aims of the study will be dealt with in the next chapter.

CHAPTER FOUR

PRESENTATION, ANALYSIS AND INTERPRETATION OF DATA

4.1 INTRODUCTION

This chapter details presentation, analysis and the interpretation of data obtained from the field work. The hypotheses formulated in Chapter One of this study are tested in this chapter.

Table 4.1 Distribution of subjects in the final study (N=100)

CRITERIA	LEVELS						N=100
Gender	**Male**		**Female**				
	62		38				100
Age (in yrs)	**20-29**		**30-39**		**40-49**		
	33		30		37		100
Academic	**Honours**		**Degree**		**Matric**		
Qualification	31		49		20		100
Professional	**B Ed**		**NPDE**		**PGCE**	**STD**	
Qualification	48		13		23	16	100
Post Level	**Principal**		**D/ Principal**		**HOD**	**Teacher**	
	7		24		28	41	100
Teaching	**0-2**	**3-4**	**5-9**	**10-19**			
Experience	25	21	34	20			100
Employment	**Permanent**		**Temporary**				
Status	72		28				100

Table 4.1 shows teachers' biographical response in the study.

4.2 ANALYSIS AND RESULTS OF THE FINAL STUDY

In the analysis of data, hypotheses are tested and the results are presented in tables. The reiteration of hypothesis to be tested comes before the presentation of data in the form of tables. There are two hypotheses that are tested in this study and each hypothesis is reiterated. The other two aims are analyzed qualitatively.

A total score for each individual was obtained by summing all his/her scores to individual items. There were twenty items altogether. A general mean score was obtained by adding the total scores for the participants and dividing this sum by the number of participants.

From the aims stated in Chapter One, the following research hypotheses were formulated:

There will be no difference in teachers' attitudes towards selected challenges (introduction of new chapters in the FET Mathematics Curriculum) brought about by the addition or introduction of new chapters to the FET Mathematics learning content.

There will be no relationship between teachers' biographical data and teachers attitudes.

To test these hypotheses, the Chi-Square test will be used. The assumptions (Cohen, Manion & Morries, 2007; Trochim, 2001) underlying the use of the Chi-Square test are:

- We have nominal data.
- We are dealing with non-parametric measures.
- We have frequencies and statistics (samples).

4.2.1 Reiteration of hypothesis number one

There will be no difference in teachers' attitudes towards selected challenges (Introduction of new chapter in the FET Mathematics Curriculum) brought about by additions or introduction of new chapters to the FET Mathematics learning content.

Table 4.2 Distribution of participants along positive and negative continuum (N=100)

	Attitude	
	Positive	Negative
Frequency	49	51
Percentage	49	51

Chi-square=12.432 df=2 p<.05

A Chi-square of 12.432 at df=2 is highly significant (p<.05). A Chi-square value exceeds the tabled value at the level of significance 0.05(5.991). We reject the Ho hypothesis. As we have significant results, it implies that the research hypothesis has not been confirmed. We conclude that there are significant differences in teachers' attitudes towards the selected challenges i.e. the introduction of new chapters in the FET Mathematics curriculum.

Teachers hold negative attitudes towards teaching the newly introduced chapters in the FET Mathematics Curriculum. The results mean that teachers are not exposed to the newly introduced chapters in the FET Mathematics curriculum.

4.2.2 Reiteration of hypothesis number two

There will be no relationship between teachers' biographical data and their attitudes towards the selected challenges i.e. introduction of new chapters in the FET Mathematics Curriculum.

Table 4.3 Relationship between gender and teachers' attitudes towards the selected challenges (N=100)

	Attitude	
Gender	Positive	Negative
Male	36	26
Female	15	23

Chi-square =3.258 df=2 p<.05

A Chi-square of 3.258 at df=1 is significant p≤.05). A Chi-square value is equal to the tabled value at level of significance 0.05(3.841). We reject the null hypothesis. The conclusion is that there is a relationship between gender and teachers' attitudes towards the newly introduced chapters in the FET Mathematics curriculum.

Male teachers hold positive attitudes while females hold negative attitudes towards teaching the newly introduced chapters in the FET Mathematics curriculum. There is an association between gender and attitudes.

Table 4.4 Relationship between age and teachers' attitudes towards the selected challenges (N=100)

	Attitude	
Age in years	Positive	Negative
20-29	19	14
30-39	7	23
40-49	7	30

Chi-square=12.794 df=2 p<.05

A Chi-square of 12.794 at df=2 is highly significant (p<.05). A Chi-square value exceeds the tabled value at the level of significance 0.05(5.991). We reject the Ho hypothesis. We conclude that there is a relationship between teachers' age and attitudes towards the introduction of new chapters in the FET Mathematics curriculum.

Young teachers hold positive attitudes while old teachers hold negative attitudes towards teaching the new Mathematics chapters. This result means that with increase in age, teachers become disinterested in teaching ever-changing curricula.

Table 4.5 Relationship between academic qualifications and teachers' attitudes towards the selected challenges (N=100)

	Attitude	
Academic qualifications	Positive	Negative
Honours	15	16
Degree	27	22
Matric	9	11

Chi-square=.703 df=2 p>.05

A Chi-square of .703 at df=2 is not significant (p>.05). A Chi-square value does not exceed the tabled value at the level of significance 0.05(5.991). We cannot reject the null hypothesis. We conclude that there is no relationship between teachers' academic qualifications and attitudes towards the introduction of new chapters in the FET Mathematics curriculum.

Teachers with degrees hold positive attitudes while those with no degrees hold negative attitudes towards teaching the newly introduced topics in the FET Mathematics curriculum. Even though we group the three categories of academic qualifications, we do not see any difference in teachers' attitudes.

Table 4.6 Relationship between professional qualifications and teachers' attitudes towards the selected challenges (N=100)

	Attitude	
Professional qualification	Positive	Negative
B.Ed	21	26
NPDE	8	5
PGCE	16	7
STD	6	11

Chi-square=6.245 df=2 p<.05

The Chi-square value of 6.425 at df=3 is not significant (p>.05). A Chi-square value does not exceed the tabled value at the level of significance 0.05(7.815). We cannot reject the null hypothesis. We can conclude that there is no relationship between teachers' professional qualifications and their attitudes towards the newly introduced topics in the FET Mathematics curriculum.

Teachers with National Diploma in Education (NPDE) and Post Graduate Certificate in Education (PGCE) hold a positive attitude towards teaching the newly introduced topics. When we group the four categories of professional qualifications, we do not see any difference in teachers' attitudes.

Table 4.7 Relationship between post level and teachers' attitudes towards the selected challenges (N=100)

	Attitude	
Post Level	Positive	Negative
Teacher	26	15
HoD	9	19
Deputy Principal	9	15
Principal	7	0

Chi-square=14.989 df=3 p<.05

The Chi-Square value of 14.989 at df=3 is highly significant (p<.05). A Chi-square value exceeds the tabled value at the level of significance 0.05(7.815). We reject the Ho hypothesis. We conclude that there is a relationship between teachers' Post level and their attitudes towards the newly introduced topics in the FET Mathematics curriculum.

Teachers in promotional posts hold negative attitudes towards teaching the newly introduced topics in the FET Mathematics curriculum. When we group the four levels of post there is an association between post level and teachers' attitudes.

Table 4.8 Relationship between teaching experience and teachers' attitudes towards the selected challenges (N=100)

	Attitude	
Teacher Experience	Positive	Negative
0-2	16	9
3-4	13	18
5-9	12	22
10-19	10	10

Chi-square =6.054 df=3 p>.05

The Chi-square value of 6.054 at df=3 is not significant (p>.05). A Chi-square value does not exceed the tabled value at the level of significance 0.05(7.815). We cannot reject the null hypothesis. We conclude that there is no relationship between teaching experience and teachers' attitudes towards the newly introduced topics in the FET Mathematics curriculum.

Teachers between 0-4 years in the teaching field hold positive attitudes towards teaching the newly introduced topics in the FET Mathematics curriculum. With increase in teaching experience, we do not see any difference in teachers' attitudes.

Table 4.9 Relationship between employment status and teachers' attitudes towards the selected challenges (N=100)

	Attitude	
Teacher Experience	Positive	Negative
Permanent	33	39
Temporary	18	1

Chi-square=2.747 df=1 p>.05

The Chi-square value of 2.747 at df=1 is not significant (p>.05). A Chi-square value does not exceed the tabled value at the level of significance 0.05

(3.841). We cannot reject the null hypothesis. We can conclude that there is no relationship between employment status and teachers' attitudes towards the newly introduced topics in the FET Mathematics curriculum.

Temporarily employed teachers hold positive attitudes in teaching the newly introduced topics in the FET Mathematics curriculum. With employment status, we do not see any differences in teachers' attitudes.

4.2.3 ANALYSIS OF AIM NUMBER THREE

To establish the role played by the status of resources in teachers' attitudes towards the selected challenges.

Table 4.10 Checklist on availability or non-availability of resources in schools

Mathematics Topic	Required Resources	Frequency of Yes *	Frequency of No *	Totals
Project Work/ Investigation	Computer	2	49	51
	Textbook	15	6	21
	Library	4	36	40
	Calculator	2	37	39
		n=23	**n=128**	**n=151**
Data Handling And Probability	Spreadsheet	7	12	19
	Textbook	3	0	3
	Calculator	16	40	56
	Model	7	4	11
	Question Paper	36	0	36
		n=69	**n=56**	**n=125**
Financial Mathematics	Calculator	20	14	34
	Library	4	69	73
	Textbook	36	6	42
	Question Paper	1	0	1
		n=61	**n=89**	**n=150**
Euclidean Geometry	Model	23	41	64
	Textbook	30	3	33
	Calculator	6	14	20
	Computer	5	11	16
		n=64	**n=69**	**n=133**

* Yes means available.* No means not available.

Table 4.10 reveals that the “NO RESPONSE” category has higher frequency than the “YES RESPONSE” category. The picture created by this table is that teachers know the resources for teaching the selected topics, but schools do not have these resources. It may be inferred that shortage of teaching resources in schools impacts the developing attitudes towards teaching the newly introduced topics in the FET Mathematics Curriculum.

4.2.4 ANALYSIS OF AIM NUMBER FOUR

To mention reasons for teachers' happiness or unhappiness with the newly introduced chapters in the FET Mathematics curriculum .

Table 4.11 Frequency of teachers endorsing happiness or unhappiness in the teaching of Mathematics (N=100)

Reasons for happiness or unhappiness	Frequency	
	Happy	**Unhappy**
When learners cannot work independently in problem-solving	0	77
High pass percentage of learners	81	0
When learners are not motivated to learn Mathematics	0	67
When there is no support from the School Management Team and parents	0	72

Table 4.11 reveals that reasons identified by the teachers influence their attitudes towards the newly introduced chapters in the FET Mathematics Curriculum. The picture created by Table 4.11 is that many teachers are generally not happy with the process of operation in the teaching of Mathematics. Factors identified by teacher's impact negatively on teaching the selected challenges i.e. the introduction of new chapters in the FET Mathematics curriculum.

4.3 CONCLUSION

This chapter was concerned with the presentation, analysis and interpretation of data. The hypothesis that there will be no differences in teachers' attitudes towards selected challenges (the introduction of new chapters in the FET Mathematics curriculum)brought about by addition or introduction of new chapters to FET Mathematics learning content, was rejected. This means that teachers hold negative attitudes towards teaching the newly introduced chapters in the FET Mathematics curriculum. The hypothesis that there will be no relationship between teachers' biographical data and attitudes towards the selected challenges i.e. the introduction of new chapters in the FET Mathematics curriculum, was also rejected. It means that the hypothesis was not confirmed. There is a relationship between teachers' biographical data and attitude.

In the next chapter, a detailed discussion of the findings, recommendations, avenues for future research, implications of findings and limitations of the study, is presented.

CHAPTER FIVE

SUMMARY AND DISCUSSION OF FINDINGS

5.1 SUMMARY

5.1.1 The problem statement

The study was designed to investigate teachers' attitudes towards newly introduced topics in the teaching of Mathematics in grades 10-12, namely, to find out whether or not they hold positive or negative attitudes.

5.1.2 The aims of the study

5.1.2.1 To determine teachers' attitudes towards the selected changes brought about by the additions or introduction of new chapters to the FET Mathematics learning content.

5.1.2.2 To establish the relationship, if any, between teachers' attitudes and the following variables: gender, age in years, academic qualifications, professional qualifications, post level, teaching experience in years and employment status.

5.1.2.3 To establish the role played by status of resources in influencing teachers' attitudes towards the selected changes i.e. introduction of new chapters in the FET Mathematics Curriculum.

5.1.2.4 To mention reasons for their happiness or unhappiness with the newly introduced chapters in the FET Mathematics curriculum.

5.1.3 The formulation of hypotheses

The following hypotheses were then formulated:

5.1.3.1 There will be no difference in teachers' attitudes towards the selected Challenges brought about by the additions or introduction of new chapters to the FET Mathematics learning content.

5.1.3.2 There will be no relationship between teacher attitudes and the following variables: gender, age in years, academic qualifications, professional qualifications, post level, teaching experience in years and employment status.

5.1.4 Organization of chapters

Chapter one consisted of motivation for the study in this field, while Chapter Two comprised a review of previous work done in this field. Chapter Three detailed the method used in this study. The measuring instrument was a Likert 5-point scale questionnaire constructed and validated by the researcher. Chapter Four contained the data analysis and Chapter Five provided a summary and discussion of findings.

5.2 FINDINGS OF THE PRESENT STUDY

5.2.1 Findings with regard to aim number one

The first aim of the study was to determine teachers' attitudes towards the selected challenges brought about by the additions or introduction of new chapters to the FET Mathematics learning content. The findings of the study reveal that Mathematics teachers are negatively inclined towards the selected topics. This finding supports the previously held belief that Mathematics teachers hold negative attitudes towards the teaching of Mathematics learning content (Ning, 2009; Ogunniyi & Ogawa, 2008). One reason for this result could be that teachers are not constantly helped by the curriculum advisors. As a result, they sometimes find themselves without direction for teaching the selected challenges.

5.2.2 Findings with regard to teachers' biographical data and attitudes towards teaching Mathematics

The aim of the study was to establish the relationship between teachers' biographical data and attitudes towards the selected changes, i.e. the introduction of new chapters to the FET Mathematics Curriculum. The hypotheses that there will be no relationship between teachers' biographical data and attitudes towards the selected changes were tested.

5.2.2.1 Association between teachers' gender and attitudes

The findings with regard to attitudes and gender reveal that male teachers are more positively inclined towards teaching the new topics in Mathematics than female teachers. This finding supports the existing theory that there are gender differences in teaching Mathematics(De Haven & Wiest, 2003; Altunsoy, Gokcek & Ekici, 2011). One reason for this could be that female teachers are not given opportunities to lead the Mathematics Curriculum. As a result, they lose interest in teaching.

5.2.2.2 Association between teachers' age and attitudes

The findings with regard to the relationship between teachers' age and attitudes reveal that young teachers are positively inclined towards teaching the new topics in the Mathematics Curriculum. This finding supports the previously held belief that older teachers have difficulty in adapting to curriculum changes (Bou Jaoude & Saad, 2012; Choudhry, Gujjar & Iqbal, 2011). One reason for this could be that young teachers have an advantage of understanding the new topics in Mathematics and teach them better as they are still fresh from tertiary institutions. These are topics taught during training at tertiary institutions. Older teachers only receive workshops on these topics for one or two days, which is insufficient.

5.2.2.3 Association between teachers' academic qualifications and attitudes

The findings with regard to the relationship between teachers' attitudes and academic qualifications reveal that teachers who hold degrees are more positively inclined towards teaching the newly introduced topics than those with no degrees. This finding refutes the previously held belief of similar attitudes among differently qualified teachers (Choudhry, Gujjar & Iqbal, 2011). These are topics covered during training at tertiary institutions.

5.2.2.4 Association between teachers' professional qualifications and attitudes

The findings with regard to the relationship between teachers' attitudes and professional qualifications reveal that teachers with National Diploma in Education (NPDE) and Post Graduate Certificate in Education (PGCE) are more positively inclined towards teaching the newly introduced topics than those with other professional qualifications. This finding refutes the existing belief that all professionally qualified teachers hold a positive attitude towards Mathematics teaching (Choudhry, Gujjar & Iqbal, 2011, Liakopaulou, 2011). The reason for this result could be that teachers with diplomas in education are given a long period of Practice Teaching in schools, while those with degrees in education visit schools for only one month, twice a year, which is insufficient for them to understand all key areas for teaching Mathematics.

5.2.2.5 Association between teachers' post level and attitude

The findings with regard to the association between attitudes and teachers' post levels, reveal that teachers who do not hold promotional posts, compared with those who do, are more positively inclined towards teaching the newly introduced topics. This finding supports the previously held belief that teachers who hold promotional posts have problems in Mathematics teaching (Budge, 2006). The reason for this could be that teachers who hold promotional posts are doing extra work (including monitoring teachers' files and managing teachers), which makes it difficult for them to improve their Mathematics teaching.

5.2.2.6 Association between teachers' experience and attitude

The findings with regard to the connection between attitudes and teaching experience reveal that teachers with 0-2 years of teaching experience are positively inclined towards Mathematics teaching. This finding supports the previously held belief that teachers who have been teaching for a number of years have difficulty in adapting to curriculum changes (Bou Jaoude & Saad, 2012; Choudhry, Gujjar & Iqbal, 2011). One reason for this could be that newly appointed teachers are still enthusiastic to teach and they want to prove themselves.

5.2.2.7 Association between teachers' employment status and attitude

The findings with regard to the association between attitudes and teachers' employment status reveal that temporarily versus permanently employed teachers are more positively inclined towards teaching the newly introduced topics in Mathematics. This finding supports the previously held belief that temporarily employed teachers perform their duties despite the difficulties in teaching (Liakopoulou, 2011). One reason for this could be that temporarily employed teachers are protecting their contracts with the Department of Education as their contacts are renewed on the basis of teaching performance.

5.2.3 Findings with regard to status of resources and teachers' attitude

The aim of the study was to establish how teachers feel about availability and unavailability of resources in schools. The findings show that teachers have serious problems on matters related to the shortage of teaching resources. Teachers know which resources are required in the teaching of Project Work/ Investigation, Euclidean Geometry, Financial Mathematics and Probability. The findings reveal that schools do not have relevant resources for teaching Mathematics. The present findings confirm the existing knowledge that schools lack teaching materials or aids (Vagi & Green, 2004). One reason for this could be the problem of Government supply of teaching and learning aids.

5.2.4 Findings with regard to reasons for teachers' happiness or unhappiness about teaching Mathematics

The aim of the study was to identify factors influencing teachers' happiness or unhappiness with regard to Mathematics teaching. The findings reveal that teachers are not happy if learners cannot work independently. Teachers indicated that they are not happy if they do not get full support from the curriculum advisors and School Management Team (SMT). They also indicated that the failure rate in Mathematics Senior Certificate examinations is their cause for concern. The present findings confirm the existing belief that there are few learners who pass Mathematics in the National Senior Certificate Examinations (Brodie, Jina & Modau, 2009). Teachers use their discretion in teaching the various sections of the syllabus in Mathematics.

5.3 IMPLICATIONS OF FINDINGS

We have found that curriculum change brings about different feelings for Mathematics teachers. This means that teachers worry about curriculum change. It is important that the Department of Education facilitates the introduction of new topics which teachers can teach. We have also found that although teachers are visited regularly by curriculum advisors, it is important that the Department of Education monitors school visit programmes so that teachers can be assisted regularly. The findings of the present study reveal that there is a shortage of resources for teaching the selected challenges. It is important that the Department of Education monitors finances for textbook allocation so that teachers can implement new topics.

5.4 LIMITATIONS OF THE STUDY

A small sample was used. There are few teachers of Mathematics; hence few teachers have provided information. The use of powerful statistics with small samples is another limitation. Sampling was done in a small area of KwaZulu-Natal.

5.5 RECOMMENDATIONS

The Department of Education should take note of the following:

- To enhance positive attitudes and to sustain quality teaching, workshops should be conducted on matters related to the teaching of Project Work/ Investigations, Euclidean Geometry, Financial Mathematics and Probability. Each topic should be conducted for at least three days, but preferably for a longer period.

- To make sure that teachers are assisted regularly, intervention programmes to support teachers must be monitored.

- A follow up on the use of finances for textbooks must be made so that resources for teaching the new topics are provided in schools.

5.6 AVENUES FOR FUTURE RESEARCH

a) We need further extension of this study by increasing the sample.

b) A comparative study between Districts in KwaZulu-Natal necessary so as to confirm the findings of the present study.

c) Do new topics in different subjects evoke reactions similar to those we observe in Mathematics Teachers?

d) Since this study was conducted in remote rural areas, there is a need for a similar study in urban areas.

5.7 CONCLUSION

School Management Team should maintain conducting class visits and Curriculum Advisors should maintain doing visits to give support; ensuring that Mathematics teaching is effectively taught. In terms of teachers' attitudes towards selected challenges; teachers are negatively inclined towards teaching the selected topics. Teachers' biographical data influence their attitudes towards teaching the selected topics. However, teachers know which resources are required for teaching each content topic but, schools do not have resources. Furthermore, teachers become happy if they are fully supported by the School.

5.8 REFERENCES

Alder, J., Ball, D., Krainer, K., Lin, F. & Novotna, J. (2005). Reflections on an. emerging field: Researching mathematics teacher education. *Educational Studies in Mathematics, 60,* 359-381.

Altunsoy, S., Cimen, O. Gokmen, A. & Ekici, G. (2011). An analysis of candidate teachers' attitudes towards learning. *Procedia Social and Behavioral Sciences, 15,* 2564-2568.

Anthony, G. & Walshaw, M. (2007). Policy implementation: Integrating the personal and social. *Mathematics Teacher Education and Department Special Issue, 8,* 5-20.

Ayres, P. & McCormick, J. (2006). Grade 12 Mathematics teachers' views on Curriculum Reform in New South Wales: University of New South Wales.

Ayres, P., Mc Cormick, J. & Beechey, B. (2002). Teachers' perceptions of the implementation of the New NSW Higher School Certificate, *Paper presented at the Australian Association for Research in Education Annual Conference, Brisbane 2nd December 2002. (http:// www.aare.edu.au/02pap/ary0261.htm) accessed March, 31, 2006.*

Azuka, B.F. (2013a). Attitudes of Secondary School Mathematics Teachers towards teaching of Mathematics in Nigeria. *Journal of Mathematical Sciences Education, 2(1),* 181-191.

Azuka, B.F. (2013b). Activity-Based Learning strategies in the Mathematics classrooms. *Journal of Education and Practice, 4(13),* 8-14.

Bae, Y., Choy, S., Sable, J. & Snyder, T. (2000). Trends in educational equity of girls and women*. Education statistics Quarterly, 2(2),* 115-120.

Bal, P. (2008). The evaluation of new mathematics curriculum in terms of teachers' perspectives. *Journal of Cukurova University Institute of Social Sciences, 17(1),* 53-68.

Becker, J.P. & Lin, C.Y. (2005). Effects of a computational skills workshop on pre service elementary teachers. Preliminary report. Paper presented at the Annual Meeting of the Mathematical Association of American and the American Mathematical Society, Atlanta, GA.

Benken, M. (2008). Integrating candidates' conception of Mathematics. *Teaching and Learning, 562,* 985-4798.

Bennie, K. & Newstead, K. (1999). Obstacles to implementing a new curriculum. In M.J. Smit & AS Jordaan (Eds). *Proceedings of the National Subject Didactics Symposium* (pp.150-157). Stellenbosch: University of Stellenbosch.

Beyerbach, B., Walsh, C. & Vannatta, R. (2001). From teaching technology to using technology to enhance student learning: Pre-service teachers' changing perceptions of technology infusion. *Journal of Technology and Teacher Education, 9(1),* 105-127.

Birgin, O., Tutak,T. &Turkdogan, A. (2009). Primary School teachers' views about new Turkish Primary School Mathematics Curriculum. *e-Journal of New World Sciences Academy, 4(2),* 1306-3111.

BouJaoude, S. & Saad, R. (2012). The relationship between teachers' knowledge and beliefs about Science and inquiry and their classroom practices. *Eurasia Journal of Mathematics, Science & Technology, 8(2),* 113-128.

Brodie, K. (2007). Dialogue in mathematics classrooms: Beyond question and answer, *Pythagorous, 33,* 3-13.

Brodie, K., Jina, Z. & Modau, S.(2009). Challenges in implementing the new

Mathematics Curriculum in Grade 10.*African Journal of Research in MST Education, 13(1),* 19-32.

Budge, K. (2006). Rural leaders, Rural Places: Problem, Privilege and Possibility. *Journal of Research in Rural Education,* 21(13).

Bullock, D. (2004). The integration of instructional technology into public education: *Problems and Challenge. ET Magazine, 4(1),* 5-13.

Bulut, M. (2007). Curriculum Reform in Turkey: A Case of Primary School Mathematics Curriculum*. Eurasia Journal of Mathematics, Science & Technology, 3(3),* 203-212.

Burks, R., Heidenberg, A. Leoni, D. & Ratliff, T. (2009). Supporting the motivator: A faculty development issue. *Primus: Problem Resources & Issues in Mathematics Undergraduate Studies, 19(2), 127-145. doi: 10. 1080/10511970802409115*

Burnett, P. C. & Mandel, V. (2010). Praise and feedback in the primary classroom : Teachers' and Students' Perspectives. *Australian Journal of Educational & Developmental Psychology, 10,* 145-154.

Brady, P.& Bowd, A. (2005). Mathematics anxiety, prior experience and confidence to teach Mathematics among pre-service education students. *Teachers and Teaching, 11(1), 37-46. doi: 101080/1354060042000337084*

Cavanagh, M. (2006). Mathematics Teachers and working mathematically: Responses to curriculum change. http://www.merga.net.au/publications/counter.pap/? bub=bub_

Chang, C.C. & Tseng, K.H. (2009). Use and performances of web-based portfolio assessment. *British Journal of Educational Technology, 40(2),* 358-370.

Chang, C. P. & Teng, S. F. (2009). Overview of continuation vocational Secondary School students' learning attitudes and disturbances. *The Journal of International Management Studies, 4(1),* 41-49.

Choudhry, A.H., Gujjar, A.A. & Iqbal, J. (2011). A Study of Attitudes of the Teacher Educators towards Pre-service Teacher Education Programme in Pakistan. *International Journal of Business and Social Science, 2(16).*

Cheng, D.P. (2001). Difficulties of Hong Kong teachers' understanding and implementation of play in the curriculum. *Teaching and Teacher Education, 17,* 857-869.

Choudhry, A.H., Gujjar, A.A. & Iqbal, J. (2011). A Study of the Attitudes of the Teacher Educators towards Pre-Service Teacher Education Programme in Pakistan. *International Journal of Business and Social Science, 2(16).*

Cohen, L., Manion, L. & Morris, K. (2007). Research methods in education (6th ed). London : Routledge.

Cuban, L., Kirkpatrick,H.& Peck,C. (2001). High access and low use of technologies in high school classrooms: Explaining an apparent paradox. *American Educational Research Journal, 38(4),* 813-834.

Dagnew, A. (2011). Attitude of teachers towards the use of active learning methods. *Retrieved February 5, 2013 from Vetrieducational.com/wp-contents/uploads/2011/12/Journal-Volume-N0.4.*

Deaney, R. Ruthven, K. & Hennessy, S. (2003). Pupil perspectives on the contribution of information and communication technology to teaching and learning in the secondary school. *Research Papers in Education, 18(2),* 141-165.

De Haven, M. A. & Wiest, L. R. (2003). Impact of Girls Mathematics and Technology program on Middle School Girls' attitudes towards Mathematics. *The Mathematics Educator, 13(2),* 32-37.

Department of Education (2010). *Curriculum and Assessment Policy Statement for Mathematics (Grades 10-12).* Pretoria. National Department of Education, South Africa.

Department of Education (2003). *National Curriculum Statement for Mathematics (Grades10-12).* Pretoria. National Department of Education, South Africa.

Di, X. (2000). An integrated approach to instructional technology. *Eurasia Journal of Mathematics, Science & Technology Education, 4(2),* 135-142.

Doering, A., Huffman, D. & Hughes, J. (2003). Pre-service teachers: Are we thinking with technology*? Journal Research on Technology in Education, 35.*

Dogan, M. B. (2010). Primary trainee teachers' attitudes to and use of computer and technology in Mathematics: The case of Turkey*. Educational Research and Review, 5(11),* 690-702.

Dries, H.S. (2001). Teaching and learning mathematics with interactive Spreadsheets. *School Science and Mathematics, 101(4),* 170-179.

Earle, R.S. (2002). The integration of instructional technology into public education: Problems and Challenges. *ET Magazine, 4(1),* 5-13.

Ernest, P. (1989). The knowledge, belief and attitudes of mathematics teacher: A model. *Journal of Education for Teaching, 15(1),* 13-33.

Feldman, A. (2007). Teachers, responsibility and action research. *Educational Action Research, 15(2),* 239-252.

Flores, M.A. (2005). Teachers' view on recent curriculum changes: Tensions and challenges. *The curriculum Journal, 16(3),* 401 - 413.

Festus, B., David, D., Orobosa, O.S. & Olatunji, J. (2013). Attitudes of Primary School Mathematics Teachers towards the use of Activity-Based Learning Methods in teaching Mathematics in Nigerian School. *International Journal of Education Learning and Development, 1(1),* 22-36.

Fredenburg, K. B., Lee, A. M. & Solmon, M. (2001). The effect of argumented feedback on students' perceptions and performance. *Research Quarterly for Exercise and Sport, 72(3),* 232-242.

Freitas, S. & Jameson, J.S. (2006). Collaborative e-support for lifelong learning. Changing variables using spreadsheet templates. *Arithmetic Teacher, 37(2),* 40-44.

Frykholm, J. (2007). A missing piece in Secondary mathematics teacher's education. *Focus in learning problems in mathematics, 22(1),* 27 – 44.

Fung, Y. (2000). A constructivist strategy for developing teachers for change: A Hong Kong experience. *Journal of In-service Education, 26(1),* 153-167.

Gable, R. A., Hester, P. H., Rock, M. L. & Hughes, K.G. (2009). Back to basics: Rules , praise, ignoring and reprimands revisited. *Intervention in School and Clinic, 44(4),* 195-205.

Garfield, J.B. (2003). Assessing statistical reasoning. *Research Journal of Statistics Education, 2(1),* 22-38.

Garm, N.& Karlsen, G. (2004). Teacher education reform in Europe: the case of Norway; trends and tensions in a global perspective. *Teaching and Teacher Education, 20,* 731-744.

Gelbal, S. & Kelecioglu, H. (2007). Teachers' proficiency perceptions of about the measurement and evaluation techniques and the problems they confront. *Hacettepe University Journal of Education, 33,* 135-145.

Gilley, J.W. (2000). Understanding and building capacity for change: A key to school transformation. International Journal of Education Reform, 9(2), 109-119.

Giltin, A. (2001). *Bounded decision-making. Educational Policy, 21,* 178-223.

Gokcek,T. (2009). How Mathematics teachers' concerns changed within the context of curriculum reform. *Procedia Social and Behavioral Sciences, 1,* 1052-1056.

Goldblatt, P.F. & Smith, D. (2004). Illuminating and facilitating professional knowledge through case work. *European Journal of Teacher Education, 2793),* 335-354.

Grosman, G. & Onkol, P. (2006). Towards the Europeanization of Turkish teacher education: Education reform and professional development in a new context. In: Terzis, N.P. (Ed.), Lifelong Learning in the Balkans. Publishing House Kyriakidis Brothers S.A., Greece, pp.337-357.

Grossman, G.M., Onkol, P.E. & Sands, M. (2007). Curriculum reform in Turkish teacher education: Attitudes of teacher educators towards change in an EU candidate nation. *International Journal of Education Development, 27,* 138-158.

Halat, E. & Peker, M. (2011). The impact of Mathematical representations developed through webquest and spreadsheet activities on the motivation of pre-service elementary school teachers. *The Turkish Online Journal of Educational Technology, 10(2).*

Handal, B. & Herrington, A. (2003). Mathematics teachers' beliefs and curriculum reform. *Mathematics Education Research Journal, 15(1),* 59-69.

Hartsel, T., Herron, S., Fang, H. & Rathod, A. (2009). Effectiveness of professional development in teaching Mathematics and technology applications. *Journal of Educational Technology Development and Exchange, 2(1),* 53-64.

Hattie, J. & Timperley, H. (2007). The power of feedback .*Review of Educational Research, 77(1),* 81-112.

Henderson, S. & Rodrigues, S. (2008). Scottish students primary teachers' level of mathematics competence and confidence for teaching mathematics: Some implications for national qualifications and initial teacher education. *Journal of Education for Teaching, 34(2), 93-107. doi: 10. 1080/02607470401979533*

Herbst, P.G. (2002). Engaging students in proving: A double bind on the teacher. *Journal of Research in Mathematics Education, 333(3),* 176-203.

Hew, F. & Brush, T. (2007). Integrating technology into K-12 teaching and learning: Current knowledge gaps and recommendations for future research. *Education Technology Research and Development, 55(3),* 223-252.

Howie, S.J. (1999). *Third International Mathematics and Science Study Repeat. Executive Summary :*http://www.hsrc.ac.za. (Accessed 8 October 2011).

Hudon, P. & Hudson, S. (2008). Changing Pre-service Teachers' Attitudes for Teaching in Rural Schools. *Australian Journal of Teacher Education, 33(40).*

Hsu, Y.S., Wu, H.K. & Hwang, F.K. (2007). Factors Influencing Junior High School Teachers' Computer-Based Instruction Practices Regarding Their Instructional Evolution Stages. *Educational Technology & Society, 10(4),* 118-130.

Idolphus, T. (2011). Problems of Teaching and Learning of Geometry in Secondary schools in Rivers State , Nigeria. International Journal of Emerging Science, 1(2), 143-152.

Ignacio, N.G., Nieto, L.J. & Barona, E.G. (2006). The affective domain in mathematics learning. *International Electronic Journal of Mathematics Education, 1(1),* 16-36.

Indoshi, F. C., Wagah, M. O. & Ogak, J. O. (2010). Factors that determine students' and teachers' attitudes towards art and design curriculum. *International Journal of Vocational and Technical Education, 2(1),* 9-17.

Isiksal, M. & Askar, P. (2005). The effect of spreadsheet and dynamic Geometry software on achievement and self-efficacy of 7th-Grade students. *Education Research, 47(3),* 333-350.

Jackson, C. & Leffingwell, R. (1999). The role of instructors in creating math enxiety in students from kindergarten through college. *The Mathematics Teacher, 92(7),* 583-586.

Jegede, O., Taplin, M. & Chan, S. (2000). Trainee teachers' perception of their knowledge about expert teaching. *Educational Research, 42(3),* 287-308.

Johnson, R.M., Smith, K.H. & Carinci, S. (2010). Pre-service female teachers' mathematics self-concept and mathematics anxiety: *A longitudinal study. Globalisation, Comparative Education and Policy Research, 12(2),* 169-181.

Junor Clarke, P.A., Thomas, C.D. & Vidakovic, D. (2009). Pre-service Mathematics teachers' attitudes and Developing Practices in the Urban classroom: *Are they wining it? 5(1*), 22-43.

Kalhotra, S.K. (2003). A study of students perception of class room behavior of Mathematics teachers. *Journal Education and Practices, 13(4).*

Kargar, M., Tarmizia, R.A. & Bayat, S. (2010). Relationship between mathematical thinking, mathematics anxiety and mathematics attitudes among University students. *International Conference of Mathematics Research 2010 (ICMER 2010), 8(2010),* 537-542.

Kasanda, C., Lubben, F., Gaoseb, N., Kandjeo-Marenga, U., Kapenda, H. & Campbell, B. (2005). The role of everyday contexts in learner-centred teaching: The practice in Namibian secondary schools. *International Journal of Science Education, 27(15),* 1805-1823.

Kersaint, G., Horton, B. Stohl, H. & Garofalo, J. (2003). Technology beliefs and practices of the mathematics education faculty. *Journal of Technology and Teacher Education, 11(4),* 549-577.

Khoboli, B. & O'Toole, J. M. (2011). Learner-Centred Science in Lesotho: Adapting the ideal to adjust classroom practice. *African Journal of Research in MST Education, 15(1),* 80-90.

Knuth, E.J. (2002). Proof as a tool for learning mathematics. *Mathematics Teacher, 95(7),* 486-490.

Latu, V.F. (2005). Language factors that affect mathematics teaching and Learning of Pasifika students. University of Auckland. New Zealand.

Liakopoulou, M. (2011). The Professional Competence of Teachers: Which qualities, attitudes, skills and knowledge contribute to teachers' effectiveness? *International Journal of Humanities and Social Science, 1(21).*

Lin, C. (2008). Beliefs about using technology inn the Mathematics classroom: Interviews with pre-service elementary teachers. *Eurasia Journal of Mathematics, Science & Technology Education, 4(2),* 135-142.

Lin, C. (2008b). A Study of pre-service teachers' attitudes about computers and mathematics teaching. *The International Journal for Technology in Mathematics Education, 15(2),* 45-57.

Lyons, T., Cooksey, R., Pannizzon, D., Parnell, A. & Pegg, J. (2006). The SiMERR national survey. National Centre of Science, ICT and Mathematics Education for Rural and Regional Australia: University of New England. *Retrieved 6 October, 2007, http://www.une.edu.au/simerr/nationalsurvey/Report/*

Manouchehri, A. & Enderson, M.C. (2003). The utility of case study methodology in mathematics teacher preparation. *Teacher Education Quarterly, 30(1),* 113-135.

Marek, J., Ball, D., Krainer, K., Lin, F. 7 Novotna, J. (2005). Effect of the learning cycle upon student and classroom teacher performance. *Journal Research in Science Teaching, 28(1),* 41-53.

Martin, T.S., Mcrone, S.M.S., Bower,M.L.W. & Dindyal, J. (2005). The interplay of teacher and student actions in the teaching and learning of geometric proof. *Educational Studies in Mathematics, 60(1),* 95-124.

Masinga, A., Mhlongo, M. & Luneta, K.(2007). Implementing Curriculum change: Addressing poverty, gender equity and optimizing learning. University of Witwatersrand. Johannesburg.

Mbugua, Z. K.(2011). Attitudes of Secondary School students on use of Scientific calculators in learning Mathematics in Embu District in Kenya. *International Journal of Humanities and Social Sciences, 1(13),* 131.

McCauliff, E. (2004). The calculator in the Elementary Classroom: Making a Useful Tool out of an Ineffective Crutch. Villanova University. 1-10th October 2009 fromhttp://www.publications.villanova.ed./concept/2004/The%20Calculator%20in%20the%.

Mhlolo, M.K. & Venkant, H. (2009). Curriculum coherence: An analysis of the National Curriculum Statement for Mathematics (NCSM) and the exemplar papers at Further Education and Training(FET) level in South Africa. *African Journal of Research in MST Education,* 13(1), 33-49.

Molofe, N. & Brodie, K. (2010).Teaching Mathematics in the context of curriculum change. *Pythagoras*, 71, 3-12.

Muijs, D. & Reynolds, D. (2002). Teachers' beliefs and behaviors: What really matters? *Journal of Classroom Interaction, 37(2),* 3-15.

Mulford, B. (2003). School leaders: Challenging roles and impact on teacher and school effectiveness. A paper commissioned by the Education and Training Policy Division, OECD, for the Activity Attracting, Development and Retaining Effective Teachers. *Retrieved 23 August, 2007, from http:/www.oecd.org/dataoecd/61/61/2635399.pdf*

National Center for Education Statistics. (2002). Digest of education statistics, 2001. RetrievedMay2,2002, fromhtt:/nces.ed.gov/pubsearch/pubsinfo.asp? pubid=2002130.

Nelson, C.G. (2004). The diversity challenges in rural education. English Journal, 93(6), 22.

Niess, M. L., Ronau, R. N., Shafer, K. G., Driskell, S. O., Harper, S. R., Johnston, C., Browning, C., Ozgun-Koca, S. A. & Kersaint, G. (2009). Mathematics teacher TPACK standards and development model. Contemporary Issues in Technology and Teacher Education, 9(1).

Ning, L. (2009). Concerning the new Mathematics Curriculum: The Pedagogic content knowledge of Secondary School Mathematics Teachers. *Journal of Mathematics Education, 2(1),* 131-144.

Nyaumwe, L. & Buzuzi, G. (2007). Teachers' attitudes towards proofs of Mathematics results in the Secondary School Curriculum: The Case of Zimbabwe. *Research Journal of Mathematics Education, 19(3),* 21-32.

Ocak, M.A. (2005). Mathematics Teachers' Attitudes toward the Computers. *Turkish Online Journal of Education Technology, 4(3),* 11.

Ogunniyi, M, & Ogawa, M.(2008). The prospects and challenges of South African and Japanese educators to enact an indigenized science curriculum. *South African Journal of Higher Education,* 22(11), 177-192.

Olkun, S., Altun, A. & Smith, G. (2005). Computers and 2D geometric learning on Turkish fourth and fifth Graders. *British Journal of Educational Technology, 36(2),* 317-326.

Onwu, G.O.M. & Mogari, D. (2004). Professional development for Outcomes-Based Education implementation: The case of UNVEMALASHI, South Africa. *Journal of Education for Teaching, 30(2),* 160-177.

Onwu, G. & Stoffels, N. (2005) Instructional functions in large, under-resourced classes: Perspectives of South African Teachers. *Perspective in Education*, 23(30, 79.

Onwuegbuzie, A.J. (1998). Teachers' attitudes towards statistics*. Psychological Reports, 83,* 1008-1010.

Onwuegbuzie, A.J. (2003). Modelling statistics achievement among graduate students. *Educational and Psychological Measurement, 63,* 1020-1038.

Ozgun-Koca, S. A. (2002). What are pre-service Mathematics teachers' attitudes towards Mathematics and beliefs about teaching Mathematics, and their teacher preparation programmes? *The Mathematics Teacher, 22,* 118-125*.*

Peker, M. (2009). Pre-service teachers' teaching anxiety about Mathematics and their learning styles. *Eurasia Journal of Mathematics, Science & Technology Education, 5(4),* 335-345.

Peker, M. & Mirasyedioglue, S. (2008). Pre-service elementary school teachers' learning styles and attitudes towards mathematics. *Eurasia Journal of Mathematics, Science & Technology, 4(1),* 21-26*.*

Pfannkuch, M. (2006). Comparing box plot distributions: A teachers' reasoning. *Statistics Education Research Journal, 5(2),* 27-45.

Prescott, A. & Cavanagh, M. (2006). An investigation of pre-service Secondary Mathematics teachers' beliefs as they begin teacher training. In P. Grootenboer, R. Zevenbergen & M. Chinnappan (Eds.), *Identities, cultures and Learning Spaces (Proceedings of the 29th annual conference of the Mathematics Education Research Group of Austlalasia, Sydney (Vol. 2, pp. 424-431). Sydney: MERGA.*

Randler, C. & Hulde, M. (2007). *Hand-on versus teacher-centred experiments in soil ecology. Research Journal in Science & Technological Education, 25(3),* 329-338.

Reys, B.J. & Arbaugh, F. (2001). Cleaning up the Confusion over Calculator Use in Grades k-5. *Teaching Children Mathematics, 8(2), 90-94.* Retrieved on 10th September 2009 from http://www.ejmste.com/03206/d5.pdf

Richardson, V. & Placier, P. (2001). Teacher change, in: V. Richardson (Ed.) Handbook of research on teaching (4th ed.) (Washington, DC, American Research Association), 905-947.

Rizza, M.G. (2000). Perspectives on Pre-service Teachers' Attitudes Toward Technology. *The Teacher Educator, 36(2),* 132-147.

Ronda, E. (2010).What is mathematical Investigations? Curriculum Reform. 1-4. http://math4teaching.com (access 8 October 2011).

Rosenkoetter, S.E., Irwin, J.D. & Saceda, R.G. (2004). Addressing personnel needs for rural schools*. Teacher Education and Special Education , 27(3),* 276-291.

Ruthven, K. & Hennessy, S. (2002). A practitioner model of the use of computer-based tools and resources to support Mathematics teaching and learning. *Educational Studies in Mathematics, 49(1),* 47-88.

Segall, A. (2004) Revisiting pedagogical content knowledge: The pedagogy of content/the content of pedagogy. *Teaching and teacher education, 20,* 489-504.

Shamatha, J.H., Peressini, D. & Meymaris, K.(2004).Technology-supported mathematics activities situated within an affective learning environment theoretical framework. *Contemporary Issues in Teacher Education, 3(4),* 362-381.

Shulman, L. & Shulman, J. (2004). How and what teachers learn: A shifting perspective. *Journal of Curriculum Studies, 36(2),* 257-271.

Silverman, D. (1993). Reading in School Based Curriculum development. London: Sage Publications.

Sinclair, M. (2004). Working with accurate representations: The case of pre-constructed dynamic Geometry skethes. *Journal of Computers in Mathematics and Science teaching, 23(2), 191-208.*

Trochim , W.M.K. (2001). *The research methods knowledge base* . Cincinnati : Atomic Dog Publishing .

Tirosh, D. & Graeber, A. N. (2003). Challenges and changing Mathematics teaching classroom practices*. Springer International Handbook of Education, 10,* 643-687.

Vagi, O. & Green, R. (2004). The challenges in developing a Mathematics Curriculum for training elementary teachers in Papua New Guinea. *Early Child Development and Care, 174(4),* 313-319.

Van der Sandt, S. (2007). Research framework on Mathematics teacher behavior: Hoehler and Grouws' framework revisited*. Eurasia Journal of Mathematics, Science & Technology Education, 3(4),* 343-350.

Van der Walt, M. & Maree, K. (2007). Do Mathematics facilitators implement metacognitive strategies? *South African Journal of Education*, 27(2), 223.

Wang, Y. (2001). Student teachers' perception and practice of the teachers' role when teaching with computers. *Journal of Educational Computing Research, 24(4),* 419-434.

Walczyk, J. & Ramsey, L. L. (2003). Use of learner-centred instruction in college Science and Mathematics classrooms. *Journal of Research in Science Teaching, 40(6),* 566-584.

White, A.L., Way, J., Perry, B. & Southwell, B. (2005/2006). Mathematics attitudes, beliefs and achievement in Primary pre-service mathematics teacher education. *Mathematics Teacher Education and Development, 7,* 33-52.

White, S., Green, B., Reid, J., Lock, G., Hasting, W. & Cooper, M. (2008, July). Teacher education for rural communities: A focus on incentives: Paper presented at the Australian Teachers Education Association (ATEA) Conference, Sunshine Coast, Australia.

Windschitl, M. & Sahl, K. (2002). Tracing teachers' use of technology in a laptop computer school: The interplay of teacher beliefs, social dynamics and institutional culture. *American Educational Research Journal , 39(1),* 165-205.

Williams, J.H. (2005). Cross-national variations in rural mathematics achievement: A descriptive overview. *Journal of Research in Rural Education, 20(5), 1-1.*

Wright, D. & Osborne, J. (2007, September). *Preparation for teaching in rural schools.* Paper presented at the British Educational Research Association Annual Conference, Institute of Education, University of London.

Yara, P. O. (2010). Teaching/Learning resources and performance in Mathematics in Secondary Schools in Bondo District of Kenya. *Asran Social Science, 6(12).*

Yildirim, S. (2000). Effects of an educational computing course on pre-service and in service teachers: A discussion and analysis of attitudes and use. *Journal of Research on Computing in Education, 32(4),* 479-495.

Yilmaz, G. K., Alkan, S., Baran, D., Elmas, H. & Guven, B. (2011). Mathematics teachers' views about measurement and evaluation dimension of new Turkish Geometry curiculum. *Procedia Social and Behavioral Sciences, 15,* 2678-2683.

Yu-peng, M., Chi-chung, L. & Ngai-ying, W. (2006). Chinese Primary School Mathematics working in A Centralized Curriculum System: A Case Study of Two Primary Schools in North East China. *Compare, 36 92 0,* 197-212.

ANNEXURE A

P.O. Box 756
Stanger
4450
Cell: 083 433 4652/074 21746

Email:vcmaphumulo@gmail.com

23 July 2013

Dear Colleague

QUESTIONNAIRE ON TEACHERS` ATTITUDES TOWARDS SELECTED CHALLENGES IN THE TEACHING OF MATHEMATICS.

This is an enquiry about challenges facing Further Education and Training mathematics teachers. We are constantly researching to improve teaching, learning and teacher development. Your opinion in this regard will be highly appreciated. Please note:

(I) **that this questionnaire has five sections (A,B,C,D&E) that have to be completed.**

(ii) **your participation is totally voluntary and you are not required to write your name on the questionnaire.**

(iii) **confidentiality and anonymity are ensured regarding your participation.**

I welcome this opportunity to thank you in advance for your kindness in completing this questionnaire.

Yours Sincerely
Vukani Cleopas Maphumulo

PLEASE MAKE SURE THAT YOU ANSWER ALL QUESTIONS

SECTION A : BIOGRAPHICAL INFORMATION

Please place an X in the block to mark information applicable to you.

(Do not, write your name and name of your school in the questionnaire)

1. Gender:

Male	Female

2. Age in years:

20-29	30-39	40-49	50-59	60+

3. Academic Qualification:

Doctorate	Masters	Honours	Degree	Matric

4. Write Highest Teachers Qualification:

5. Current Post Level:

Teacher	HOD	Deputy Principal	Principal	Other(Specify):

6. Teaching Experience:

0-2 years	3-4 years	5-9 years	10-19 years	20+ years

7. Type Of Employment:

Permanent	Temporal	Other(Specify):

SECTION B:TEACHERS' ATTITUDES TOWARDS MATHEMATICS TEACHING

Please indicate by means of an X, marked in one box in each row, the extent to which you agree or disagree with the feeling expressed in each statement as it concerns you:

SA = Strongly Agree
A = Agree
N = Neutral
D = Disagree
SD =Strongly Disagree

No.	STATEMENT					
1.	I believe Euclidean geometry is the most interesting section of mathematics to teach.	**SA**	**A**	**N**	**D**	**SD**
2.	I enjoy teaching Data Handling and probability because they enrich my decision-making process.	**SA**	**A**	**N**	**D**	**SD**
3.	Teaching Euclidean geometry is burdensome to me.	**SA**	**A**	**N**	**D**	**SD**

4.	Helping learners to solve problems on their own is satisfying to me.	**SA**	**A**	**N**	**D**	**SD**
5.	With or without teaching aids hate teaching Euclidean geometry.	**SA**	**A**	**N**	**D**	**SD**
6.	I am competent in teaching Euclidean geometry problems.	**SA**	**A**	**N**	**D**	**SD**
7.	Teaching financial mathematics is fun for.	**SA**	**A**	**N**	**D**	**SD**
8.	Using teaching aids and models in teaching Euclidean geometry makes my teaching fascinating.	**SA**	**A**	**N**	**D**	**SD**
9.	Teaching mathematics using project work/investigations is time consuming.	**SA**	**A**	**N**	**D**	**SD**
10.	I find pleasure when I use project work/investigations in teaching mathematics.	**SA**	**A**	**N**	**D**	**SD**
11.	Teaching Euclidean geometry gives me a feeling of satisfaction.	**SA**	**A**	**N**	**D**	**SD**
12.	It is time consuming to teach Euclidean geometry using teaching aids and models.	**SA**	**A**	**N**	**D**	**SD**
13.	Teaching Data Handling and probability is not a worthwhile undertaking.	**SA**	**AA**	**N**	**D**	**SD**
14.	Prestige and status are important goals achieved through the knowledge of financial mathematics.	**SA**	**A**	**N**	**D**	**SD**
15.	I find the use of project work/investigations in	**SA**	**A**	**N**	**D**	**SD**

	teaching mathematics amazing.					
16.	The inclusion of a section of Data Handling and probability to FET mathematics enriches knowledge of the learners.	**SA**	**A**	**N**	**D**	**SD**
17.	The best employment opportunities are part and parcel of mathematics knowledge.	**SA**	**A**	**N**	**D**	**SD**
18.	The chief aim of project work/investigations teaching is to enable one to acquire knowledge.	**SA**	**A**	**N**	**D**	**SD**
19.	Knowledge of Euclidean geometry makes teaching problem-centred and not teacher-centred.	**SA**	**A**	**N**	**D**	**SD**
20.	It is not upsetting to be denied the opportunity of applying project work/investigations in teaching mathematics.	**SA**	**A**	**N**	**D**	**SD**

SECTION C : STATUS OF RESOURCES

Please provide information on resources required to teach each topic in FET mathematics curriculum.

No.	**Mathematics Topic**	**Required Resources**	**Indicate yes or no if the resource is available or not available**	
			YES	**NO**
1	Project method/investigation	1.. 2... 3... 4... 5...	1................... 2................... 3................... 4................... 5...................	1........................ 2........................ 3........................ 4........................ 5........................
2	Data Handling And Probability	1... 2... 3... 4... 5...	1................... 2.................. 3................... 4................... 5...................	1........................ 2........................ 3........................ 4........................ 5........................
3	Financial mathematics	1... 2... 3... 4... 5...	1................... 2................... 3................... 4................... 5...................	1........................ 2........................ 3........................ 4........................ 5........................
4	Euclidean geometry	1... 2... 3... 4... 5...	1................... 2................... 3................... 4................... 5...................	1........................ 2........................ 3........................ 4........................ 5........................ .

SECTION D: WHAT MAKES YOU HAPPY IN TEACHING MATHEMATICS ?
LIST THESE IN ORDER OF IMPORTANCE TO YOU.

1...

2. …..

3...

4...

5...

6...

7..

8..

9..

10...

SECTION E: WHAT MAKES YOU UNHAPPY IN THE TEACHING OF MATHEMATICS ? LIST THESE IN ORDER OF IMPORTANCE TO YOU.

1...

2. …..

3...

4...

5...

6...

7...

8...

9...

10...

ANNEXURE B

P.O. Box 756
Stanger
4450
23 July 2013

Ilembe District Institutions
Maphumulo Circuit
Department of Science

Dear Educator

REQUEST FOR EDUCATOR PARTICIPATION IN RESEARCH PROJECT

I am a Masters student at the University of Zululand in the department of Mathematics, Science and Technology. One of the fundamental requirements of this degree is to conduct research and write a dissertation. The topic of my research is: **A STUDY OF TEACHERS' ATTITUDES TOWARDS SELECTED CHALLENGES IN THE TEACHING OF MATHEMATICS.**

To complete my research project I need to get information from teachers who are offering mathematics curriculum in grades 10-12. The research project intends to find out teachers' attitudes towards selected challenges brought about by addition of new chapters to FET mathematics learning content, factors influencing teachers' attitudes towards the selected challenges, role played by status of resources in selected challenges, and the relationship between teachers' biographical data and teachers' attitudes towards the selected challenges. I therefore request you to participate in this project **by completing a questionnaire.**

It is important to understand that the researcher adheres to the ethics of the research. Therefore the information gathered in this regard will be treated with confidentiality and anonymity. Furthermore note that your participation is voluntary, which means that no educator will be forced to complete the questionnaire.
I will appreciate your co-operation in this regard.

Yours Faithful

V.C. Maphumulo (Researcher)

EDUCATORS' CONSENT
If you agree to participate please indicate by filling in your details below:

PERSAL NO	**SIGNATURE**
…………………………..	…………………………………..

ANNEXURE C

education

Department:
Education
PROVINCE OF KWAZULU-NATAL

Enquiries: Sibusiso Alwar | Tel: 033 341 8610 | Ref.:2/4/8/418

Mr Vukani Cleopas Maphumulo
P. O. Box 756
STANGER
4450

Dear Mr Maphumulo

PERMISSION TO CONDUCT RESEARCH IN THE KZN DoE INSTITUTIONS

Your application to conduct a pilot and research entitled: **A Study of Teachers' Attitudes Towards Selected Challenges in the Teaching of Mathematics,** in the KwaZulu-Natal Department of Education Institutions has been approved. The conditions of the approval are as follows:

1. The researcher will make all the arrangements concerning the research and interviews.
2. The researcher must ensure that Educator and learning programmes are not interrupted.
3. Interviews are not conducted during the time of writing examinations in schools.
4. Learners, Educators, Schools and Institutions are not identifiable in any way from the results of the research.
5. A copy of this letter is submitted to District Managers, Principals and Heads of Institutions where the intended research and interviews are to be conducted.
6. The period of investigation is limited to the period from 01 June 2013 to 30 June 2015.
7. Your research and interviews will be limited to the schools you have proposed and approved by the Head of Department. Please note that Principals, Educators, Departmental Officials and Learners are under no obligation to participate or assist you in your investigation.
8. Should you wish to extend the period of your survey at the school(s), please contact Mr. Alwar at the contact numbers below.
9. Upon completion of the research, a brief summary of the findings, recommendations or a full report / dissertation / thesis must be submitted to the research office of the Department. Please address it to The Director-Resources Planning, Private Bag X9137, Pietermaritzburg, 3200.
10. Please note that your research and interviews will be limited to the schools and institutions in the following District/s of the KwaZulu Natal Department of Education:
    Ilembe District

Nkosinathi S.P. Sishi, PhD
Head of Department: Education
24 June 2013

KWAZULU-NATAL DEPARTMENT OF EDUCATION
...dedicated to service and performance beyond the call of duty
POSTAL: Private Bag X 9137, Pietermaritzburg, 3200, KwaZulu-Natal, Republic of South Africa
PHYSICAL: Office G25, 188 Pietermaritz Street, Pietermaritzburg, 3201. Tel. 033 3418610 Fax : 033 341 8612
EMAIL ADDRESS: sibusiso.alwar@kzndoe.gov.za; CALL CENTRE: 0860 596 363;
WEBSITE: www.kzneducation.gov.za