

**ASSESSING GRADE 9 LEARNERS' ATTITUDE TOWARDS THEIR ACADEMIC
PERFORMANCE IN MATHEMATICS IN PINETOWN EDUCATION DISTRICT,
KWAZULU-NATAL**

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ABSTRACT

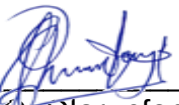
The world education system is faced with many challenges. Learners' performance in mathematics in particular is one of the main areas of concern. Over decades, Mathematics has become an indispensable tool in the march towards technological breakthrough. The use of Mathematics reveals how people deal with their various private, social, and civil lives. The indispensable implications of Mathematics in the society made it to become a compulsory subject in the primary and secondary education in most countries of the world. Nevertheless, despite its wide application of Mathematics in the society, there are still many learners particularly in secondary schools who struggle to achieve the best knowledge of Mathematics. As applicable to most countries of the world, the performance of learner in South Africa is not encouraging. For example, the performance of Grade 9 learners, Pinetown Education District in particular, is not improving. Attitude is one major factor identified among learners that gravely affects learner's performance in Mathematics. The study adopted qualitative approach which is rooted in interpretive paradigm to frame and focus the study. Interpretive paradigm is consistent with the assumption that experience of the world is subjective and best understood in terms of individuals' subjective meanings rather than the researcher's objective definitions. The sample included 15 participants (which include three Mathematics educators and twelve Grade nine learners) selected purposefully across three secondary schools, with attitudes and performance as inclusion criteria. Data were obtained through classroom observations and semi-structured interviews conducted with the selected Mathematics educators and learners of the selected schools to obtain their views on the impact of the attitudes of Grade nine learners on their performances in the subject. The study found that the learners perceived difficulty in Mathematics because of the information that was passed to them through their parents or guardians, seniors and peers who have negative attitudes towards Mathematics; their previous performances at early grades; the nature of Mathematics itself; and that learners were not well prepared from primary schools. It was also indicated that many learners have negative attitude towards Mathematics whose behaviours in the classroom affected others who would have loved to enjoy

Mathematics. The study also revealed that all stakeholders (the educators, school managements, policy makers and parents) have part to play in motivating the learners to engage more in Mathematics. Also the study found that qualified educators who will develop good and friendly classroom environment, employing a highly interactive teaching method and as well giving adequate homework and assignments to the learners are needed to teach Mathematics in secondary schools. The study revealed that learning resources are not made available to the learners. There study therefore potentially provides that, educators can help mould the learners with negative preset mind about Mathematics through their classroom behaviours. The study further provides that learning materials such as textbooks and other geometry tools be made available for the learners use at home. The study also, provides that consideration be given to Mathematics class in the morning hours. The study concluded by giving general recommendations for improving learners' participation and attitudes towards learning Mathematics.

Keywords: Attitudes, Academic performance, Mathematics, Learner

DECLARATION ON COPYRIGHT

I, the undersigned, S. Olayinka Olorunfemi, hereby declare that the dissertation is my own original work and that it has not been submitted, and will not be presented, at any other University for similar or any other degree award.



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DECLARATION ON PLAGIARISM

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SUPERVISOR'S STATEMENT

This dissertation has been submitted under my supervision and with my approval.

Professor E.O. Adu (Supervisor)

Date

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DEDICATION

This study is dedicated to my late mother, Elizabeth Oluwasola who set the groundwork for my education and also to my beautiful wife, Mrs. Titilayo Olorunfemi and to my wonderful children, Ayomide, Glory and Enoch Olorunfemi, who are the source of my joy and pillars of my strength.

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Chapter One

1 INTRODUCTION AND BACKGROUND

1.1 Introduction

This chapter serves as an introduction to the study. The chapter contextualises the study which assessed Grade 9 learners' attitude towards their academic performance in Mathematics in Pinetown Education District. The chapter also focus on the background of the study, statement of the problem, research questions, purpose of the study, research objectives, significance of the study, and the delimitations of the study. Definition of key terms and the dissertation outlines are also highlighted.

1.2 Background to the Study

The world education system is faced with many challenges. For instance, there is a constant struggle to produce graduates that are needed in industry, particularly in mathematics. Mathematics has an overwhelming wide range of applications. "its usefulness in science, mathematics and technological activities as well as commerce, economics, education and even humanities is almost at par with the importance of education as a whole" (Tella, 2008, p. 16). The use of mathematics reveals how people deal with their various private, social, and civil lives. The indispensable implications of Mathematics in the society made it to become a compulsory subject in the primary and secondary education in most countries of the world (Mensah, Okyere, & Kuranchie, 2013). However, despite its wide application in the society, there are still many learners particularly in high schools who struggle to achieve the best knowledge of Mathematics.

Achievement in Mathematics is recognized globally as one of the most dependable indicators for measuring national social, geographical, economic and political development (Lancaster, 2013). Governments and educational systems around the world recognize the need for learners to be skilled, creative and be confident users of a wide range of Information Communication Technology, of which the knowledge of Mathematics is required (Salman, 2010). This therefore, implies that, for the South African economy to be globally competitive, the government must develop a strategy for

improving the poor performance in Mathematics reported in schools.

1.2.1 Attitude and Performance in Mathematics Internationally

1.2.1.1 United States of America

The United States of America is the leading economy as well as most powerful politically among the developed countries of the world. While it has been expected greatly that the learner performance in the U.S. would have been equally impressive, the reverse is actually the case (Ryan, 2013). In a comparative study conducted by Ryan (2013) between the United States' learners with learners from the rest of the world concluded that, despite the high cost of education, the system failed to close the gap in academic performance particularly in Mathematics. The study also found that the rate of educational performance in the United States since 2000 has been fairly consistent, with little improvement. For example the U.S. learners scored below the Organization for Economic Cooperation and Development (OECD) average in almost every subject.

Furthermore, the study revealed that among the 34 OECD countries, United States was ranked 26th out of 34 in Mathematics; and statistically was not different from Norway, Portugal, Italy, Spain, Russian Federation, Slovak Republic, Lithuania, Sweden, or Hungary mathematically. In addition, about 25 percent of U.S. learners have been found to perform below the baseline mark of the Program for International Student Assessment (PISA) Mathematics performance level (Ryan, 2013), though other participating countries may not have included all learners in their sample, such as students with disabilities, English language learners, and high transient students, as United States does.

The National Center for Education Statistics (NCES) illustrated similar performance deficiencies in United States Mathematics scores. In 2013, 83% of fourth graders performed at or above the basic achievement level, 42% performed at or above the proficient level in Mathematics and at 12th Grade, 64% performed at or above basic (average) levels while only 26% performed at or above proficient levels (above

average) (National Center for Education Statistics, 2015). Research has indicated that as United States' learners get older, their Mathematics proficiency scores decline. Despite the fact that there has been some improvement on these measurement tests, they are nowhere near the level where they should have been (National Center for Education Statistics, 2015). While there are a number of ways in which school performance and student performance can be measured for national comparisons, the PISA (2015) indicates a similar level for poor performance, as it was illustrated in the OECD average comparison previously cited.

In a recent study, U.S. learners' academic achievement still lags behind that of their peers in many other countries. Desliver (2017) revealed that, data from international Mathematics and Science assessments indicate that U.S. students continue to rank at the middle of the pack, and behind many other advanced industrial nations. First, the international Mathematics and Science Assessments Tests was the Programme for International Student Assessment (PISA, 2015), which measures reading ability, Mathematics and Science literacy and other key skills among the age range of 15 years in many of developing and developed countries every three years. According to Desliver (2017), the most PISA results PISA (2015), USA was placed at an unimpressive position, that is, 38th out of 71 countries in Mathematics and 24th in Science; and among the 35 members of the Organization for Economic Cooperation and Development, which sponsors the PISA initiative. The U.S. ranked 30th and 19th in Mathematics and Science respectively. In a better assessment scale on a similar international assessment, the Trends in International mathematics and Science Study (TIMSS) 2015 indicates that 10 out of the total 48 countries had statistically higher average 4th grade Mathematics scores than the U.S. and 7 countries at the same time, scored higher than U.S. in Science. Likewise, in the 8th grade tests, 7 other countries scored higher in Mathematics than U.S. out of 37 participating countries and also 7 had higher scores in Science.

In a similar testing report, the 2015 Pew Research Center Report indicated that American's K-12 education in Science, Technology, Engineering and Mathematics (STEM) was ranked above average or the best in the world by only 29% of Americans. More critical to the American learners' poor performance, the scientists, in a companion survey of member of the American Association for the Advancement of Science, revealed that 16% referred to United State's K-12 STEM education the best or above average; 46% in contrast, said K-12 STEM in the United States was below average (Desliver, 2017).

Another assessment testing organisation according to Desliver (2017) is the National Assessment of Educational Progress (NAEP), a project of the United States Department of Education which attempted to recognize the reasons for the decrease in Mathematics achievements. It found that, the average score in Mathematics for 4th and 8th graders in 2015 suffered a decline. The report revealed that the average fourth-grade Mathematics score in 2015 was 240 (on a scale of 0 to 500), a drop from 242 in 2013, while the average eighth-grade score was 282 in 2015 compared with 285 in 2013 which was the lowest score since 2007.

Furthermore, the general perception of the Americans on their ability to do mathematics poses a challenge. Previous studies have found that about 30% of the Americans reported that doing Mathematics well is a challenge (Ogilvy, 2015). In his investigation to measure the Americans' attitudes towards their Mathematics skills, Ogilvy (2015) found that American learners were the more likely group of people to accept the truth that they struggle with Mathematics. For example people of ages between 18-24 years reported that they struggle to do Mathematics representing, 39% while 24-34 year olds experiencing similar challenge was at 36% (Ogilvy, 2015). The study further revealed that over and above one third of Americans (36%) at many times have admitted that they don't have confidence in their Mathematics abilities. In addition, Ogilvy (2015) also found that negative attitude towards mathematics is more prevalent among younger Americans, such that more than 50% of the young people in the U.S. have no confidence in their ability to do mathematics computations and 63% of the Americans reported that they have had some difficulty doing Mathematics including simple

operations such as estimating distances or weight.

In addition to their expression of negative attitude, the survey also showed that many Americans have feelings of anxiety and frustration toward Mathematics. About 30% of Americans indicated that, they would choose to clean bathroom rather than to engage in solving mathematics problem. For example, about 21% of Americans reported that they feel frustrated, 18% were anxious, 15% felt inadequate and 13% were worried in terms of Mathematics participation. (Ogilvy, 2015). Notwithstanding, some Americans report positive feelings when they have to do Mathematics according to Ogilvy (2015). For example, 36% felt confident, 34% were knowledgeable, 30% felt at ease and 20% were prepared: an overwhelming majority of Americans (93%) confirmed that to be successful in life, good Mathematics skills need to be developed; about 95% reported that mathematics will be useful for the next generation; about 90% said neglecting development of good Mathematics skills would impact negatively on future economy.

1.2.1.2 Nigeria

In Nigeria, over the past years, the performance of secondary schools learners in both internal and external examinations has remained consistently poor. This assertion was confirmed by The Sun News which reported that, Nigeria recorded the worst result in Mathematics in the last three years. According to The Sun News, in an article titled, 'Outrage trails students poor performance', reported that out of 1.6 million learners that wrote the 2014 May/June West African Senior School Certificate examination (WASSC), only 31.28% passed with a minimum requirement for admission into tertiary institutions (The Sun News, 2014). The Federal and the State governments recognized the need for good performance in school subjects particularly in Science and Mathematics, which prompted the government to make Mathematics a compulsory subject in both primary, junior secondary and senior secondary school levels. The government continues to invest a larger proportion of national budget into education sector so as to improve the teaching and learning outcomes in the subject (Federal Ministry of Education, 2013). Despite the commitments of the government and department of education, the achievement in this subject has not been encouraged.

Several factors associated with the poor performance in Mathematics have been identified by researchers, which include, unavailability of qualified teachers, poor facilities, equipments and instructional materials for effective teaching (Yemi & Adeshina, 2013). As a matter of fact, Mathematics educators have been blamed for the students' achievements in Mathematics. According to Idowu (2015), educators are the main custodians of students because, they are expected to have the required knowledge necessary for teaching as well as ability to disseminate such knowledge appropriately; so that it will impact positively in the students' learning. Thus, the educators should be able to communicate this vital role clearly, informatively and concisely to their learners.

Therefore, for Nigeria to be able to consolidate its leadership role in Africa and establish itself as a significant player in the global economic and political arena as contained in the vision 2020 statement there is need to reverse the present trend of poor learners' performance in Mathematics. Anaduaka and Okafor (2013) revealed the effort put in place to improve performance of students in Mathematics in Nigeria in their review of literature aimed at "poor performance of Nigerian students in Mathematics in Senior Secondary Certificate Examination (SSCE): what is not working?" Such research efforts sought to find several factors influencing the teaching and learning of Mathematics and tackle the challenges of dismal performance of learners in the subject. Other significant bodies that are handy in improvement of Mathematics performances are; conferences and workshops on a regular basis by all stakeholders such as faculties of Education and some of their departments in Colleges of Education and Universities in Nigeria, Federal and State Ministries of Education among others.

1.2.1.3 Kenya

Since Kenya got independence from Britain in 1963, education policies in Kenya were designed to eliminating poverty, lack of knowledge and diseases (Mbugua, Kibet, Muthaa, & Nkonke, 2012). The greater part of the Kenyan society then sees Mathematics to be the basis of science and technological knowledge critical for accomplishment of social-economic development of the new Kenyan nation.

Mathematics became a compulsory subject at both primary and secondary school levels (Mbugua et al., 2012). This is not the case in South Africa where learners are allowed to choose between pure Mathematics and mathematical literacy in Grade 10. In Kenya, prestigious degree programmes and courses such as medicine, engineering and architecture to mention a few, according to Mbugua et al. (2012), require a pass in Mathematics. Thus, learners who do not have the required score in Mathematics at the final examination in secondary school would be barred from obtaining qualifications in the above-mentioned fields.

According to the study conducted by Mbugua et al. (2012), learners' attitude towards Mathematics, gender and economic factors were factors affecting poor performance in Mathematics. However, the study showed that, learners display positive attitude towards Mathematics. The conclusion drawn by these researchers were that, although both Educators and learners displayed positive attitude towards Mathematics, the performance of the learners could have been mainly negatively affected by other factors.

Further, Mbugua, et al. (2012) reported a variety of intertwined school-based factors such as teachers' attitude towards Mathematics, teachers' workload, teacher effectiveness and availability of teaching/learning materials which also affect learners' attitude and performance in Mathematics in Kenya. According to Mbugua, et al. (2012), Mathematics teachers in Kenya played a major role in determining the performance of learners in mathematics. For example, majority of the teachers remained positive that the situation would improve despite the fact that learners' poor performance in the subject in the majority of schools. Notwithstanding the difficulties experienced in Mathematics in Kenya, the teachers still demonstrate positive attitude towards mathematics. However, Mathematics teachers are mostly overloaded with workload in Kenya. Over-loaded teachers find it difficult to have enough time for individual learners for assistance in Mathematics most especially where struggling learners needed that assistance.

Another factor identified among learners contributing to the poor performance of learners in Kenya was socio-economic and cultural factors. Mbugua, et al. (2012) found that Kenyan Mathematics learners were affected by the parents' poor formal education level. According to Mbugua, et al. (2012), more than average of the parents in Kenya had attained only primary education level. The implication is that the learners are not receiving the necessary assistance or academic support from the parents outside the school, especially with regard to home work.

Poverty also played a major role in Mathematics performance. The majority of households where the learners came from in the Mbugua, et al. (2012) study were poor. The majority of the Learners' parents or guardians had their household income sources from primary informal agriculture which generated very little disposable income. Apart from the income being little and insufficient, the income was also inconsistent. Therefore, Mbugua, et al. (2012) concluded that the majority of learners' whose parents relied mainly on primary informal agriculture for a living were likely to receive inadequate support especially with regard obtaining learning resources such as stationary.

The authors added that cultural factors of the communities impacted on learners. For example, factors such as circumcision, certain beliefs, early marriages and household family income levels provided fundamental complexities and constraints to studying with regard to Mathematics. Furthermore, Mbugua, et al. (2012) argued that, the effects of socio-cultural practices such as cattle rustling, early marriages and female genital mutilation for example would manifest emotional problems at schools.

Finally, findings of Mbugua, et al. (2012) study identified that institutional-based factors is one of the factors affecting learners' attitude and performance in Mathematics among Kenyan learners. The result obtained shows that schools in Kenya lacked proper physical facilities suitable for the teaching and learning environment of Mathematics. Some schools lacked even basics materials such as textbooks.

1.2.1.4 South Africa

In South Africa, Mathematics is compulsory in primary school up to GET level and a pass in the subject is required for learners to be promoted from one class to the next. A study conducted by Monitoring Learner Achievement (MLA) project sponsored by United Nation International Child Education Fund (UNESCO/UNICEF, 2005) revealed that among Grade 4 African learners, South African learners ranked 4th with an average literacy score of 48.1% and last with respect to numeracy with a score of 30%. The report of the Department of Basic Education (DBE), on the National Senior Certificate Examination Results (NSCER), 2009 revealed that out of 298921 learners that wrote the Grade 12 Mathematics examinations in 2008, only 139945 (46.8%) achieved at 30% level and 89788 (30%) achieved at 40% level. The report further revealed that, in 2009 the number of learners that achieved at 30% level was 125075 (44%), while the performance at 40% level was 78784 (27.87%) out of 282699 participants. Moreover, the Minister of Basic Education announced that the pass rate for mathematics in matriculation examination was 46.3% and 47.4% in 2011 and 2010 respectively during a media conference held on the 4th of January 2012 in Pretoria, the South African Minister of Basic Education announced that the pass rate for Mathematics in matriculation examination was 46.3% in 2011 which show a decline from 47.4% in 2010 (Siyepu, 2013). This indicated that mathematics is still a challenge for learners in the country.

Furthermore, the report on the Trends in Mathematics and Science Study (TIMMS) 2015 Highlights of Mathematics and Science Achievement of grade 9 South African learners revealed the gloomy picture of the Mathematics achievement of the South African learners as compare with Grade 8 learners from other participating countries (Reddy, et al., 2016). The report revealed that among participating countries, Singapore learners came first with a mean score of 621 while South African and Saudi Arabia Mathematics learners came last with mean scores of 373 and 368 respectively with a centre point of 500. The report further revealed that South Africa is still one of the lower performing nations as compared to other participating countries with respect to Mathematics. Nevertheless, the country show its highest positive progress of all nations

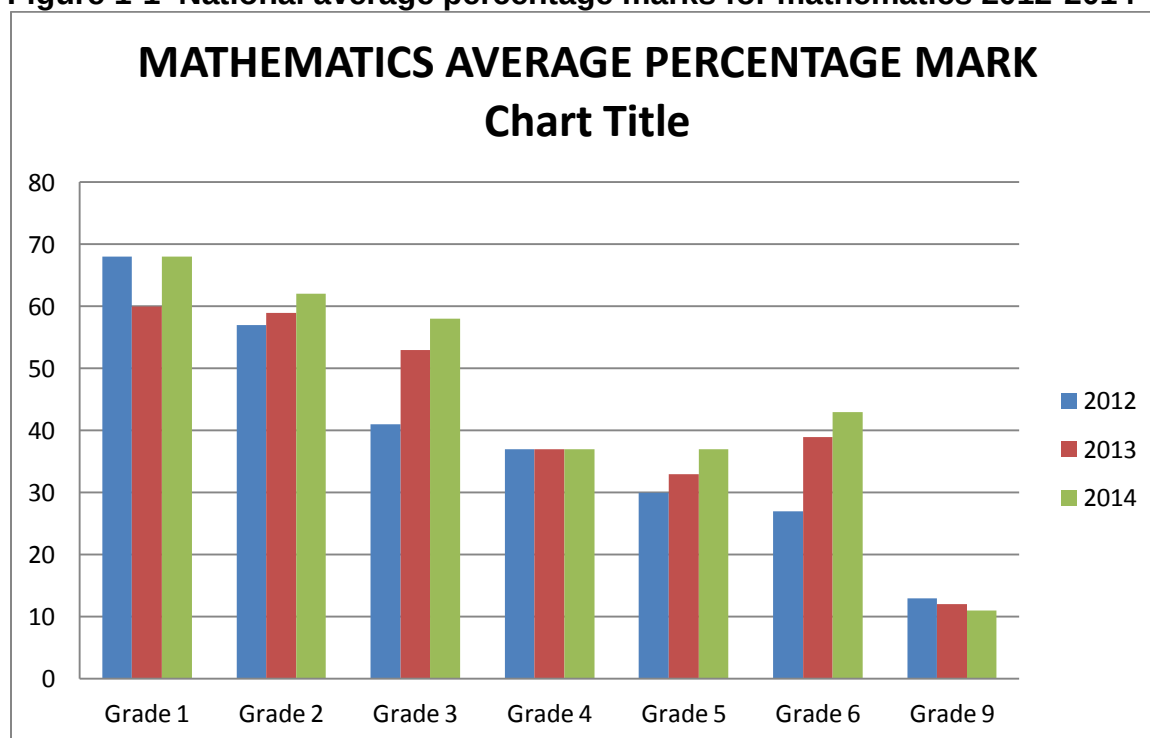
represented in both Mathematics and Science with 90 and 87 points respectively from 2003 to 2015 (Reddy et al., 2016).

The achievement in Mathematics up to date did not meet the 2010 achievement goal set by the Department of Education (Department of Basic Education, 2014). The Department established that the nation's education sector is facing challenges in not delivering the expected improvement against the targets set by the Department of education in 2010. As a matter of facts, grade nine learners' performance in mathematics, in particular is not showing improvement (Department of Basic Education, 2014). Across all provinces in South Africa, learners' performance in Mathematics has considerably dropped a few percentage points as revealed in table 1-1 and figure 1-1 (Department of Basic Education, 2014, p. 9):

Table 1-1 National average percentage marks for mathematics 2012-2014
(Source: Department of Education: ANA Report, 2014)

Grade	2012	2013	2014
1	68	60	68
2	57	59	62
3	41	53	58
4	37	37	37
5	30	33	37
6	27	39	43
9	13	12	11

Figure 1-1 National average percentage marks for mathematics 2012-2014

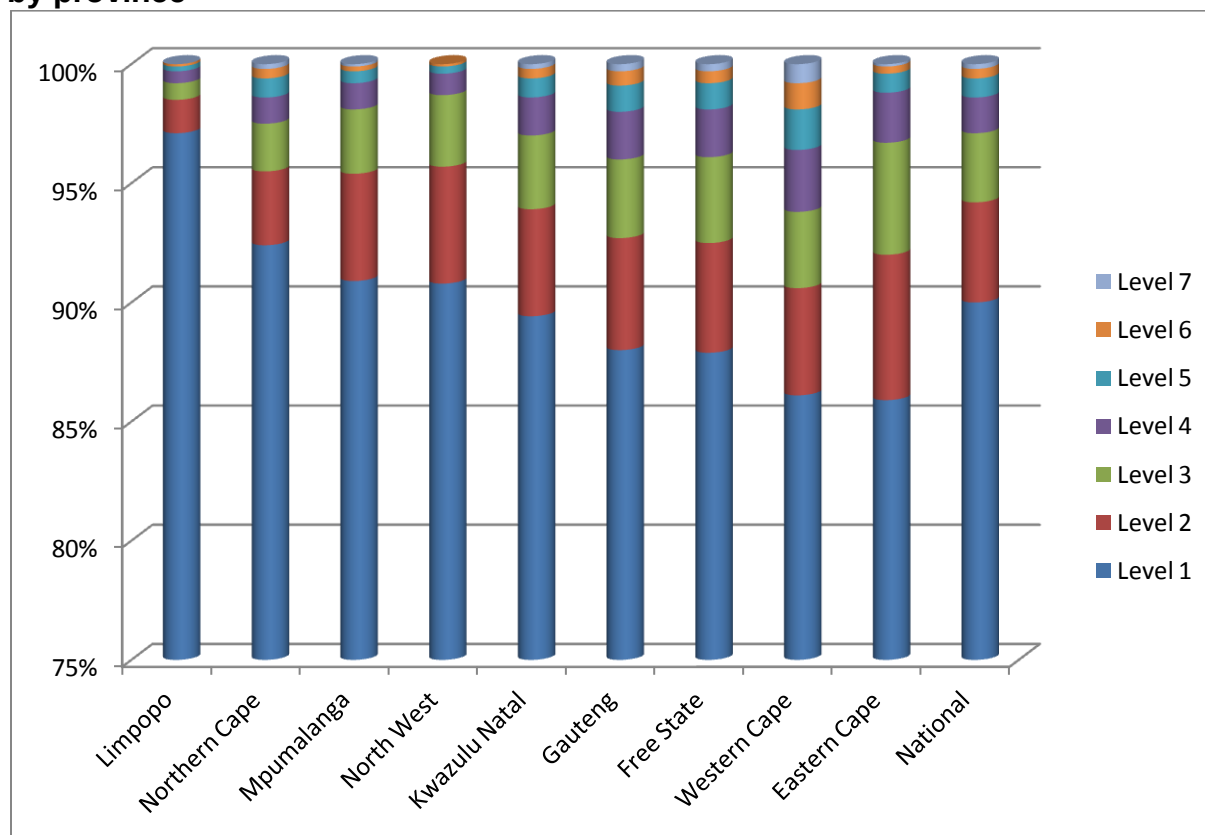


Furthermore, the report of the Department of Basic Education on the 2014 Annual National Assessment (ANA) also revealed dismal performance of Grade 9 learners on achievement level (Level 1-7) across all the 9 provinces of the country (see Table 1-2 and Figure 1-2 below).

Table 1-2 Percentage of grade 9 learners in achievement levels in Mathematics by province

PROVINCE	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7
Limpopo	97.2	1.4	0.7	0.5	0.2	0.1	0.0
Northern Cape	92.4	3.1	2.0	1.1	0.8	0.4	0.2
Mpumalanga	90.9	4.5	2.7	1.1	0.5	0.2	0.1
North West	90.7	4.9	3.0	0.9	0.3	0.1	0.0
Kwazulu- Natal	89.6	4.5	3.1	1.6	0.8	0.4	0.2
Gauteng	88.0	4.7	3.3	2.0	1.1	0.6	0.3
Free State	87.8	4.6	3.6	2.0	1.1	0.5	0.3
Western Cape	86.1	4.5	3.2	2.6	1.7	1.1	0.8
Eastern Cape	85.9	6.1	4.7	2.1	0.8	0.3	0.1
National	90.0	4.2	2.9	1.5	0.8	0.4	0.2

Figure 1-2: Percentage of Grade 9 learners in achievement levels in mathematics by province



The report shows that the majority (about 90%) of Grade 9 learners that took part in 2014 ANA achieved at level 1 (i.e. achievement below 20 percent).

Generally, poor performance in Mathematics is identified as a major challenge in schools particularly the ones from disadvantage communities (Maree, Fletcher, & Sommerville, 2011). Study indicated that learners' performances in Mathematics may be influenced by attitude towards the subject. Among learners, according to Mata, Monteiro, and Peixoto (2012), attitude is a major factor that relates to mathematics performance. Factors such as teacher, peer and family attitudes towards Mathematics, according to Mutodi and Ngirande (2014), may affect learners' confidence in Mathematics positively or negatively. It is therefore, curtail to analyze the factors that affect the attitudes and attitudes of learners in Mathematics at secondary schools in South Africa. The continuous under-performance in this subject poses an unending question which both the government and academics are trying to answer.

A number of investigations undertaken so far have revealed a number of factors contributing to poor performance or underperformance in Mathematics. Among many researchers, Ndlovu (2011) and Van der Walt (2008) claimed that some of the factors contributing to poor performance of South African learners in Mathematics include general poverty of school environment, poor learners' socioeconomic background, of learners, low parental involvement in monitoring performance in Mathematics, and general poor quality of teachers and teaching. Other factors include lack of motivation and subject knowledge, language of instruction since many learners migrated to schools where teaching and learning language is different from the home language of the learners and an inadequate study orientation.

This, notwithstanding, the Department of Education blamed poor performance in Mathematics on poor retention strategy of personnel: in a report, the department pointed out that the education sector is unable to hold on to the majority of its employees, particularly at school level, which is the core delivery point of education (Department of Basic Education, 2014). For example, employees continue to improve themselves in other skills and soon leave the sector as soon as they are qualified for other professions. Such officials leave critical teaching areas such as science and Mathematics for other high paid science-related jobs outside education. In fact, it may be that retention strategies are neither attractive nor in place to retain skills in the system (Department of Basic Education, 2014, p. 18). The Department of Basic Education (DBE) implemented the following interventions among others in 2014 to improve learners' performance based on the aforementioned and to promote the teaching and learning of Mathematics (DBE 2014, p18):

- i. to provide stability in the sector by presenting educators with clear guidelines on content, pedagogy and assessment aligned with CAPS
- ii. generation of diagnostic report and framework for improvement to address some challenges in certain mathematics topics, which in many cases, were reasons for ineffective teaching methods
- iii. partnering with Sasol-Inzalo Foundation to develop good quality Mathematics workbooks that are aligned to the CAPS

- iv. consolidates Dinaledi and Technical schools into a new Mathematics, science and technology schools improvement grant
- v. sustain Multi-Grade schools to improve learners' performance in areas of teacher and Subject Advisor

Conversely, while the Department of Education blamed the cause of poor performance on poor retention strategy of personnel, the South African Democratic Teachers Union (SADTU) lays the blame to the attitude of the learners towards the subject (South African Democratic Teachers Union, 2013). Researchers established that social forces are the basis for attitudes towards Mathematics. For instance, educators' and parents' attitudes towards Mathematics, and, explicitly, their attitudes toward children as learners of Mathematics influence the children's own perceptions of their abilities and interest. Adu and Olatodun (2007) indicated that educators are human resources who should possess exceptional personality, attitudes and character which therefore have good effect on learners which constitute strategic factor in education sector. In a matter of fact, they determine the smooth functioning of any education system, their accessibility and adequacy influence competence and high productivity (Adu & Olatodun, 2007).

ANA (2014) holds the view that the policies put in place by government in the teaching and learning of Mathematics is not helping the students. Teachers are also to be blamed for this dismal performance in mathematics in the country as well as unavailability of teaching resources for Mathematics in the high schools (Department of Basic Education, 2014).

The continuous poor performance in mathematics calls for a determined effort on the measures that will make the present situation to get better. According to Makgato and Mji (2006), there is need to provide adequate solutions to the challenge of learners' dismal performance by conducting studies that will help inform stakeholders. It is important for researchers to conduct investigations on reasons why learners perform poorly in mathematics so as to provide solution to it. Some factors that can be associated with the low number of learners take Mathematics and Physical Science at

school even those who chose to do them do not perform well in these subjects. The reason may not far from, for instance, that learners are not motivated enough to study these subjects, especially, amid high failure rate that may scare them off (Makgato & Mji, 2006).

Taylor (2011) in his review commissioned by the National Planning Commission lists the following aspects as priorities to address the crisis in South Africa's Education and Training sector. According to him, high priority should be given to advance the pass rates in the FET phase (grade 10-12), helping learners who move at end of grade 9 into more useful options in the FET colleges and the workplace. In addition, Taylor (2011) also show the need to raise the number NSC passes by improving the school management and instruction quality and at the same time improve the quality of passes not just of Mathematics and Science, but also in languages and language of instruction.

The learner attitudes and performance in Mathematics at high schools in South Africa has not been heartening, this situation continues from year to year despite unabated effort of the Department and researchers. Hence, there is need to undertake a further research into the possible causes of the problem and bring possible resolute to the challenge of unwillingness and learners' poor performance.

1.3 Statement of the Problem

The South African economy depends mainly on the availability of human capital; and education sector is the portal from which required skills be obtained in key subjects particularly Mathematics and Science drive the advancement of a healthy economy. The situation at hand is that the quality of education in South Africa is poor considerably. Mathematics teaching and learning in South Africa is in a bad shape and a lot of learners are not performing well in the subject and consequently developed negative attitude for it (Department of Basic Education, 2014). This gravely impacted on meaningful employment, earning potential and career mobility for the learners (Mkhabela, 2009). This, itself limits the South African economic growth; hence, there is pressure on the education sector to bring solution to the problem by improving performances in scarce skills subjects such as Mathematics, Science and Technology.

This is because Mathematic has become globally recognized as the key subject needed for attainment of scientific and technological knowledge and expertise that is crucial in obtaining meaningful socio-economic development blueprint (Mbugua, Kibet, Muthaa, & Nkonke, 2012).

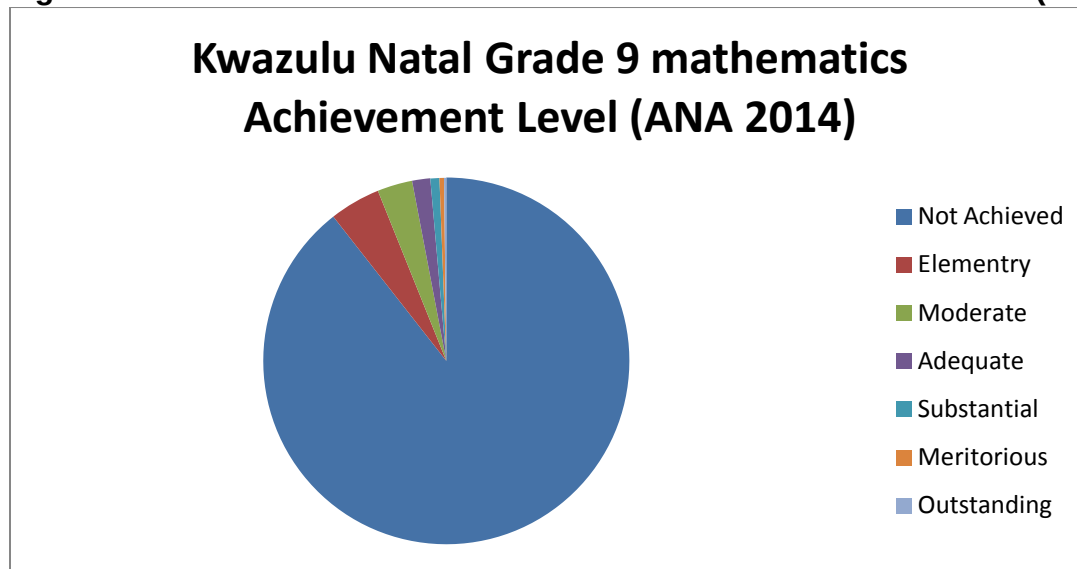
The 2014 Annual National Assessment (ANA) report painted a glooming picture of the performance of Grade 9 learners particularly in Kwazulu-Natal. Data from Table 1-3 below indicate that Grade 9 learners from Kwazulu-Natal performed poorly in the 2014 ANA test. The report revealed that only 10.4% of the participants achieved at 30%. This indicates performance in Mathematics in the province is still a challenge. Furthermore, the average mark obtained by grade 9 learners from Pinetown Education District stood at 15% and 10.8% in 2013 and 2014 respectively (Department of Basic Eucation, 2014). The report therefore concluded that the result of 2014 confirmed to the sector's combined commitment to quality education and performance enhancement. ANA 2014 overall performance indicated an increase trend. The performance of learners in Mathematics in the intermediate and senior phase is cause for concern. The Department also indicated that the presidential target of acceptable achievement at 60% is encouraging that learners exceeded this bench mark in both language and mathematics at the Grade 3 level. However, the target is exceeded only in Home Language but the result showed that learners were still below target in Mathematics (Department of Basic Eucation, 2014)

The continuous poor performance in Mathematics is a problem which several studies largely blamed on negative attitudes of educators, parents and learners themselves. Since learners' engagements in Mathematics activities are affected by external and internal influences on their perceptions and attitudes towards Mathematics, it necessitate that an investigation into the relationship between attitude toward mathematics and performance in mathematics in South Africa. Hence, the purpose of this study was therefore to investigate the effects of the Grade 9 learners' attitude on their academic performance in mathematics in Pinetown Education District.

Table 1-3: Kwazulu-Natal Grade 9 Mathematics Achievement Level (ANA 2014)

Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7
89.6	4.5	3.1	1.6	0.8	0.4	0.2

Figure 1-3: Kwazulu-Natal Grade 9 Mathematics Achievement Level (ANA 2014)



1.4 Research Questions

The main research question for this study is:

How does the Grade 9 learners' attitude affect their academic performance in mathematics in Pinetown Education District in KwaZulu-Natal Province?

The sub-research questions are:

1. Why Mathematics as a subject seems difficult for Grade 9 learners in relation to other subjects?
2. What are the expected roles of educators in the development of learners' attitude to study of Mathematics?
3. What is the possible policy directions needed to motivate learners' interest in the study of Mathematics?

1.5 Research Objectives

The study endeavoured to achieve the following objectives:

1. To examine some of the factors associated with why Mathematics as a subject seems difficult for Grade 9 learners in relation to other subject.
2. To examine the role of educators in learners' attitude and performance in Mathematics.
3. To identify policy directions to develop the interest of learners in Mathematics education.

1.6 Purpose of the Study

The purpose of this study was to assess how the attitudes of the Grade 9 learners affect their academic performance in Pinetown Education District in Kwazulu-Natal. The attitudes of learners from Pinetown Education District in Kwazulu-Natal province towards Mathematics were examined so as to establish the effect of their attitude towards learning Mathematics and academic performance in the subject.

1.7 Significance of the Study

This study examined how Grade 9 learners' attitude impact on their academic performance in Pinetown Education District in Kwazulu-Natal province. The study is significant in helping to identify possible cause of learners' unwillingness to show interest to participate in Mathematics.

The findings of this study might also help to identify the role of educators in learners' attitude and performance in Mathematics in order to address them accordingly. Recommendations and suggestions from the study would be of benefit to all stakeholders (government, teachers, parents, students and general public) in the education sector to bring the desired changes.

The study could make direct inputs, general guidance or new insights indirectly into the decision-making process. This research study could also be an opener for further researches in educational policy making and implementation.

1.8 Delimitation of the study

The study focused on the factors that affect Grade 9 learners' attitude and performance in Mathematics in Pinetown Education District. The study was conducted at the Mafukuzela circuit, Pinetown Education District in Kwazulu-Natal and may not be generalizable to the rest of other Education Districts of South Africa. Three secondary schools were targeted for this study. Learners from Grade 9 and their respective Mathematics educators participated in the study.

1.9 Research approach

The study adopted qualitative approach. Lichtman (2013) stressed that qualitative research is about the conditions or relationships that exist, beliefs and attitudes that are held, affects that are being felt and developed trends. Crossman (2017) among others posited that qualitative research is to examine the meanings that people attribute to their behaviour, actions, and interactions with others. Qualitative approach is appropriate for this study because it enables the researcher with the responses to the questions in the study. The researcher attempts to gain a clear understanding of the situations which learners experience when participating in learning of Mathematics and thus, generate information about the learner's attitude and performance in Mathematics.

1.10 Research Design

Research design is defined as a plan outline of how the topic will be explored. Lichtman (2013) posited that a research design is a blueprint, a detailed design, a map of different elements of research and how they relate to each other. This study adopted a case study research design. Creswell (2014) submits that case studies are a study of inquiry used by researchers to develop in-depth analysis of a case, program, event or process. Case study design enabled me to acquire an in-depth understanding of the factors affecting learners' attitudes and performance in Mathematics.

1.11 Population

Population is a group of people, objects or item where samples are taken for measurements (Okeke, 2015). Due to the nature of research design, this study adopted case study design. Three secondary schools were selected purposefully from all the secondary schools in Pinetown Education District in Kwazulu-Natal. The target population of the study consisted of all the learners from all learners from the three selected secondary schools.

1.12 Sampling and Sampling Procedure

Sampling can be referred to the process of selecting the sample from the population in order to obtain information regarding a phenomenon in a way that represents the population (Bush, 2013). The goal of sampling is to select a sample that is broad enough to allow the researcher to speak about a population, large enough to allow the researcher to conduct the desired analysis, and small enough to be manageable (Punch, 2011). Convenience purposeful sampling method was used in this study whereby participants willingly volunteered to participate in the study. A total of fifteen samples which comprised of twelve (12) learners and three (3) educators were selected purposefully from Grade 9 of the three selected schools.

1.13 Data Collection and Instrument

Data collection is defined as the collection of information to be used in the investigation. This study adopted interview and observation methods to collect data.

1.13.1 Interviews

An interview is a two-way conversation in which the interviewer asks the respondents questions learn about the ideas, views, beliefs, opinion and behavior of the respondents (Babour, 2012). It is the best way to have an accurate and thorough communication of ideas between the people from whom the researcher gathered information (Patton, 2015). In qualitative research, interviews tend to be more flexible. There are two main types of interviews; structured and semi-structured interviews (Cohen, Manion, &

Morison, 2007). In structured interviews, questions and the order in which they asked are determined in advance. In semi-structured interview, the interviewer does not follow any structure at all, but covers as much on a given topic (Cohen et al., 2007). A semi-structured interview was used in this study. The purpose of the interview was the individual to obtain the views of the individual learners that were selected. A semi-structured interview was used to generate answers to the research questions.

1.13.2 Observation

Observation is the systematic process of recording the behavioral pattern of participants, object and occurrences without necessary questioning or communication (Bush, 2013). This is why participant observation was one of my data collection approaches as I believe it provided first hand data on what the teacher actually does in the classroom with regards to creating an intellectually safe classroom. It also provided evidence on the non-verbal responses of the Mathematics educators and show how they interact with the learners and how they influence the learners' attitude in learning Mathematics.

1.14 Data Analysis

Qualitative analysis is a systematic process of selecting, categorizing, comparing, synthesizing and interpreting the data to provide a description of the phenomena of interest (Lichtman, 2013). Also, Marriam (2009) stated that the process of bringing order, structure and meaning to the mass of data collected can be referred to data analysis. Denzin (2014) contended that analyzing qualitative data demands the application of content analysis, which is analyzing the content of the interview in order to identify the main themes emerging from the process. The data collected from the participants through interviews and observations was analysed using thematic approach of developing themes from the research questions after transcribing and coding it.

1.15 Credibility and Trustworthiness

It is very important that research study be credible and trustworthy and that the readers should be able to believe and trust the information reported. Credibility in qualitative research is defined as the extent to which the data and data analysis are believable and trustworthy (Swanson, 2011). To ensure credibility and trustworthiness; the study used transferability, dependability and confirmability. Member checking used to enable the researcher to share the information collected from participants back for verification and confirmation.

1.16 Ethical considerations

In research, data can also be collected from people and about people. Researchers are therefore consequently to adhere to ethical demands. The researcher supposed to protect participants, develop trust with them, promote integrity and guard against misconduct and inappropriate use of data that will divulge private lives of participants (Creswell, 2009). Therefore, important issues of ethics were followed, namely, informed consent, confidentiality, anonymity, avoiding harm to participants and permission.

1.16.1 Informed Consent

To ensure informed consent in this study, the researcher shared with the participants what the study was all about and it sought to find out. Participants' informed consent was sought before commencing the study to avoid frustrations of both parties. The participants were requested to sign forms of informed consent before data collection process.

1.16.2 Confidentiality

In this study, the participants were assured that no unprofessional ways will be used to collect information from them. Likewise the assurance that the gathered data was only to be used for the purpose of this study was given.

1.16.3 Anonymity

Information about the participant will not be shared with any person, relative or any person who will demand to know about the participants be it an educator or parent. If shared, it should be on specific consent related to the research. Code numbers were used as the only means of identification in the study. The keys linking the code numbers to the names will only be accessible to the investigator. The educators and learners that are willing to participate as well as their parents were requested to sign consent forms.

1.16.4 Avoiding harm to participants

The benefit and risks of this investigation were explained to the principals of the schools, learners and their parents. There were no anticipated risks in this study.

Participants were informed that, their decision to participate in this study would not affect their study in any form. They were also informed that they were free to withdraw from the study at any point. They were reassured about confidentiality. In order to ensure confidentiality, participants were assigned code numbers.

1.16.5 Permission

Before carrying out the study, clearance certificate was sought from the Faculty of Research Ethics Committee and Institutional Research Ethics Committee of the University of Fort Hare, Department of Education in Kwazulu-Natal and the principals of the schools where the study was to be carried out.

1.17 Definition of key terms

Attitude

According to Swanepoel, Erasmus & Schenk (2008) attitude is a degree of positive or negative feeling an individual has towards a particular object such as place, thing, situation or other person. Attitude is a psychological orientation developed as a result of one's experiences that contributes to how a person views situations, objects or people,

and how he appropriately responds to them. (Mensah, Okyere, & Kuranchie, 2013). The response may be positive or negative, favourable or unfavourable, neutral or ambivalent. Therefore attitude towards Mathematics can be defined as a disposition towards an aspect of Mathematics that has been acquired by an individual through his or her beliefs and experiences but which could be changed (Eshun, 2004). Attitude in this study will refer to either negative or positive feelings Grade 9 learners show towards learning Mathematics.

Academic Performance

Academic performance represents performance outcomes that indicate the extent to which a person has accomplished specific goal that was the focus of activities in instructional environment, schools in particular (Ryan, 2009). In a school context, academic performance includes the role of students' engagements and participation in school academic activities. In this study academic performance will be used as the outcome of Grade 9 learners' participation in learning Mathematics.

Mathematics

Mathematics, according to Department of Basic Education (2011), is a language that makes use of symbols and notions for describing numerical, geometric and graphical relationships. It is a human activity that involves observing, representing, presenting and investigating patterns and qualitative relationships in physical and social phenomena and between mathematical objects themselves. It helps to develop mental processes that promote logical and critical thinking, accuracy and problem solving that will contribute in decision-making.

Learner

Tsanwani (2009) defined as persons who learn, person preparing for a particular subject, persons who through lengthy and systematic study attain a high degree of expertise, skill and efficiency, and persons who possess these characteristics: curiosity, perseverance, initiative, originality, creativity and integrity. These characteristics are precisely those that are regarded as necessary for achievement in Mathematics.

1.18 Chapter Outline

The study will consist five chapters.

Chapter One

This chapter covers the background to the study, the research questions, objectives, purpose of the study, significant of the study, delimitation of the study and definition of key terms.

Chapter Two

This chapter provides the theoretical framework and review of related literature which informed the research topic. Diverse intersecting factors that influence learner attitude and their experience of Mathematics and performance are highlighted.

Chapter Three

This chapter focuses on the research methodology and research design of the study..

Chapter Four

Chapter four focussed on data presentation, analysis and discussion of the findings

Chapter Five

This chapter presents the summery of findings, conclusions and recommendations.

1.19 Chapter Summery

This chapter served as introduction and orientation to the study. The statement of the problem, the research questions, the research objectives, the purpose, the significance and the delimitation of the study has been presented. The important concepts of the study were defined and the research methodology was briefly highlighted as well as demarcation of the chapters. Chapter two will focus on the theoretical framework and the review of literature on the attitudes of learners towards Mathematics in relation to their academic performance.

Chapter Two

2 THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1 Introduction

The previous chapter dealt with the introduction and background to the study. The first section of this chapter covers the theoretical framework that guided the study and the second part covers the review of various related literature sources on the effects of learner attitudes towards Mathematics academic performance in the subject. The review explored various research findings and views related to Grade 9 learners' attitudes and performance towards Mathematics. Research indicated that the variable attitude is a major factor to be considered when trying to deal with the construct 'learner's academic performance' (Singh, Granville, & Dika, 2002). According to Mouton (2001) literature review is the analysis of existing body of knowledge that enables the reseachers to engage with the work of other scholars.

The study was guided by the Albert Bandura's social learning theory of 1977 and the theory of attribution. The literature review focused on the importance of Mathematics, attitudes, and some factors associated with learners' attitude which in turn impact on their academic performance in Mathematics.

2.2 Theoretical Framework

2.2.1 The Social Learning Theory

Albert Bandura's social learning theory of 1977 stated that learning is obtainable through direct experience with the object, subject, thing, issue or an idea. Bandura indicated that, the interaction of people with their environment shapes the behaviour of the individual and vice versa. This eventually calls attention to the social context in which an individual's judgement of other people's behaviour determines their own behaviours. According to Eagly and Chaiken (2007) attitude is a psychological predisposition which is expressed through evaluating a particular entity with some degree of favour or disfavour. Attitude is an inclination to respond positively or negatively towards a certain idea, object, person, situation or an attitude object. In

general, attitudes are either positive or negative views about a person, place, thing or event that are referred to as the attitude object (Zelley, Mariane, & Elaine, 2005). Fiske, Gilbert, and Lindzey (2010) viewed attitude as a “mental and neutral state of readiness organised through experience, exerting a directive or dynamic influence upon the individual’s response to all objects and situations with which it is related” (p. 356). Implicitly, attitude is a psychological predisposition built up from the experience of someone that influences how a person views situations, objects or people, and how he responds to them either positively or negatively; favourably or unfavourably; neutrally or ambivalently. The tendency to respond systematically to some particular object, situation, person, or a group of people is therefore known as attitude. For example, Mathematics could be considered as either favourable or unfavourable towards the future of the learner.

Therefore, one chooses models he deems similar to himself, whose behavior he will follow. In the same vein, the learner, through observation, determines the behavior adopt and which to reject. The extent to which an individual will persist in any task which will results in either success or failure in a task to be achieved is a function of the individual’s decisions and perceptions. Therefore, attitudes are learnt experiences as a result of the observations, modeling and imitation of the subjects in the environment or other’s behavior. According to Bandura, some changes in behaviour can be mediated through modification of the model itself, role modeling, reinforcement, rewards and persuasion. Pajares and Schunk (2010) indicated that an individual must value the observed outcome and perceive it as successful in order to adopt a modeled behaviour.

It should be noted that problems are resultant from opportunities when attitudes become negative or hostile whereby other people are alienated or infuriated. Learners with negative attitudes towards Mathematics, for example, will not write tasks such as homework and class work. Mathonsi (2006) revealed that people having positive attitudes holds a point of view that allows them to draw positive elements from each situation. Attitude depends on what we think, what we feel and they are the outcome of a related belief and value (Jones, 2006). For instance, an individual will show positive attitude towards an aspect he has knowledge and understanding about. Therefore, if a

learner values his or her future (value), knowing and fully understand the importance of Mathematics (belief), the learner will possess a favourable attitude towards Mathematics (attitude). Most of the time attitudes influence people's behaviour towards some objects, person or group. For instance, a learner with a positive attitude towards Mathematics will be influenced to be diligent and perform in Mathematics at school.

Further, the behavioural aspect of attitudes, as indicated by Mathonsi (2006), is the individual's intentions to behave in a specific way towards an event and these intentions are related to affective component. This theory is helpful in identifying the learners' view, response and participation in Mathematics.

2.2.2 Attribution Theory

The theory of attribution suggests that people attempt to understand the behaviour of others by attributing feelings, beliefs and intention to them. Attribution comes from a tradition within motivational research that stresses learners' beliefs about competence and control (Schunk & Zimmerman, 2008; Wigfield & Cambria, 2010). The theory of attribution is based on the postulation that individuals want to understand and explain the events or outcomes in their lives, coupled with what happens to academic settings (Weiner, 1985). Attribution theory explains how people recognise reasons or casual attributions for explaining their academic achievements, specifically unexpected outcomes and failures.

Harvey and Martinko (2010) put the term 'attribution' as a casual explanation for an event or behaviour. For example, if a learner perceives that he or she performs poorly in a Mathematics task, he or she tends to form an attribution explanation for the behaviour. The learner may attribute his or her failure to insufficient skill on the part of his or her teacher. Likewise, people form attribution for their own action or outcome. For example, a learner might attribute his or her performance in Mathematics to hard work or consistent study and practices. Therefore, attribution theory, according to Harvey and Martinko (2010) is defined as the judgment of the outcomes of an activity in relation to the perception of an individual's own actions.

Further, the nature of these casual attributions varies in respect of locus, stability, and controllability. Locus explains whether the reason of an outcome is internal, or a function of the individual; against external or directly related to the environment. Stability on the other hand, explains the extent that the casual attribution will consistently be presented and affect outcomes in similar situations. Last, controllability explains the extent to which the individual perceives themselves as been able to influence a particular cause.

Specific causal attributions, according to Weiner, 1985 (as cited in Harvey and Martinko, 2010), is characterized in terms of emotional, motivational, and behavioural implications. For example, it is often argued that attributing failure to more stable, internal, and uncontrollable outcomes, ultimately help to shape emotional and behavioural responses (e.g., innate ability). This type of attributions is thought to lead to a more hopeless emotional response and may discourage future effort (Cook & Artino Jr, 2016). At the other hand, it is often seen as more beneficial for later motivation to attribute failure to more unstable but controllable causes (e.g. effort or strategy use). This type of attribution provides the potential for change and at the same time it provides for greater hopefulness and higher expectations for success on subsequent tasks. The connection between specific causal attributions (e.g., innate ability, effort) and subsequent motivational, behavioural and emotional outcomes is a function of individuals' beliefs or perceptions. Some learners, for example, view ability as more fixed, whereas others perceive it to be more amenable to change or improvement (Dweck, 2012; Howell, 2016)

Therefore, the factors that students perceive as contributing to their success or failure in Mathematics, Middleton and Jansen (2011) discussed them in terms of attribution theories. In their study, they show that, attribution theories identify causal factors such as difficulty and luck, known as unstable factors, and ability and effort, known as stable factors that learners use to explain their performance in Mathematics. Furthermore, Atkinson (1965) suggests that success is not a universal motivator and that the learner's explanation of his success does not necessarily lead to a motivated learner. For example, if the learner believes that his success was because of the simplicity of

the task as opposed to the effort that he made, then he is less likely to be motivated by it. Similarly, if a learner attributes his failure to lack of ability rather than to lack of effort then he is less likely to be motivated to make an effort in the future. This is an attribution trait leading to failure.

Learners' attribution of their performance in Mathematics affects their attitude towards the subject. Attribution theories deal with how the individual perceives his/her own contribution to the performance and how this is used to evaluate the outcomes of an activity in terms of the effort and ability put into the task and the level of difficulty of the same (Middleton & Jansen, 2011). Teacher perceptions of learners affect learners' attributions of their own ability. For example, if learners who have been performing well in Mathematics perform poorly; the teacher may attribute it to laziness while the main cause may be that, the required cognitive level of the learner is too high. This impression implies that the teacher failed to see the actual attribute of the performance of the learner and is therefore unable to act in the best interest of the learner (Timmermans, de Boer, & van der Werf, 2016). Attribution theories are regarded as being significant in helping learners make appropriate judgments of their performance (Schunk & Zimmerman, 2008). Attribution theory is helpful to the researcher in identifying the factors that students perceive as contributing to their success or failure in Mathematics.

2.2.3 Components of Attitude

There are three different components of attitude; the cognitive, affective and behavioural components (Maio & Haddock, 2010).

2.2.3.1 Cognitive component

The cognitive component of attitude has to do with our thoughts, beliefs, and ideas about something. It involves knowledge and beliefs about the process. An individual will develop a positive attitude towards an aspect he has knowledge and understands completely (Mathonsi, 2006). For example, a learner will be able to immediately take hold of the new issues when he is given free-flowing information about Mathematics for

example. Consequently, because they have a better chance of understanding of what is expected of them, they will feel more confident. Therefore, the thinking or belief about attitude object is known as the cognitive component. For instance, an individual might think that snake is a dangerous reptile.

2.2.3.2 Affective component

Positive and negative feelings, according to Mathonsi (2006), are associated with attitudes which are primarily the evaluative element in an attitude (i.e. feelings and emotions) which the attitude holder judges, for example, Mathematics to be good or bad. The affective component of attitude can be seen as the feelings or emotions which an individual relates with the attitude object. For instance, seeing a snake may evoke the feeling of fear in the individual. Feelings and emotions are irrationally affected by the affective component of attitude. It could however be said that, attitudes are often subconscious and are not based on rational explanation.

2.2.3.3 Behavioural component

Behavioural attitude is a tendency or disposition to act in a certain ways to the attitude object. Wetherell (1996) cited in Mathonsi (2006) indicated that the behavioural component of attitude entails an individual's intentions to act in a certain way towards an event and these intentions are related to affective component. The tendency to react in a certain way to the attitude object explains behavioural aspect of attitude. If a person, for an instance, chose to run away or scream after seeing a snake, is an example of behavioural attitude. The learner who is emotional towards Mathematics might be presumed to act in this manner.

Summarily, the cognitive, affective and behavioural components of attitude are connected and related to one another.

2.2.4 Formation of Attitude

Attitude formation is experimental. People form attitudes through life experiences. According to Mensah et al. (2013) attitudes are psychological experiences built up as a result of individual's orientations that affect one's view of people, objects or situations and how to respond to them either positively or negatively or favourably or unfavourably. Hogg and Vaughan (2005) revealed that attitudes are group of beliefs, feelings and behavioural tendencies towards an object. Also, attitudes may be positive or negative views about a person, object, situation or idea that affects individual choice of action and reaction to challenges (Zelley, Mariane, & Elaine, 2005). Social psychology indicates interrelated qualities or components of attitudes which change in direction and degree or strength which are: emotional components that reveal how we feel; a cognitive component that explain our thoughts and beliefs; and a behavioural components which explain action and experiences (Maio & Haddock, 2010).

The Bandura social learning theories Indicated that people form attitude by observing, imitating and modelling the behaviour of others. They form their attitudes through direct experience with models, object or idea they interact with. Studies have shown that people behave according to their attitudes with the conditions that; the attitudes are the outcome of their experience; that an individual is expecting a favourable result or where the model is attractive, popular or successful (Schunk & Zimmerman, 2008). Learners form or develop positive attitude towards Mathematics as they learn to associate positive experience with it. In the same vein, positive reinforcements give opportunity for positive attitude formation towards Mathematics (Mensah et al., 2013).

Finally, people develop attitude through observation of people around them particularly those they have a high regard for. Learners therefore do observe the attitude of their parents and educators and at the end draw a lot of lessons from them. Thus, this resonates with the Bandura's social learning theory which explain that, behaviours may be attained by observing another or the model that performs the behaviour (Yara, 2009).

2.3 Review of Related Literature

2.3.1 The Nature of Mathematics

The reason as to why so many learners dislike Mathematics as compared to other subjects has been linked to the fact that some parents and educators hold the view that Mathematics itself does not offer much to be liked. This is acknowledged by the assumption that Mathematics is not like the other subjects. For example, while Mathematics presents itself with different terminology, Humanities and Sciences introduce new materials in the same language. Even foreign languages, despite various pronunciations, will at least use the same notation as other subjects. The unique language, notation and syntax of Mathematics pose some difficulty for learners and as research indicates, it may be the communication and not the process involved in Mathematics that is the challenge (Ashby, 2009). Due to such early emphasis on the language of Mathematics, it is easy to understand how learners may misunderstand overall picture of Mathematics and relate their belief with the language instead. The frustration learners experience is mostly as a result of failure to successfully and consistently understand the given task.

One of the most widely held misconceptions by the average Mathematics learners is that, not only is there only one right answer, but that there is also only one correct way to solve a mathematical problem (Devlin, 2014). This supposed nature of Mathematics is a contributing factor to negative attitudes and anxiety in Mathematics. In a recent research, Pale (2016) indicated that 58% of the learners see Mathematics as a memorization of formulas and rules, whereas, less than 50% found Mathematics enjoyable. This belief is most likely to affect learners' motivation to engage in mathematical tasks and interfere with their ability to rehearse and play with the subject. These factors definitely contribute to poor performance and link themselves to other source of negative attitudes towards Mathematics.

2.3.2 Mathematics appreciation

All over the world, emphasis has been laid on the provision of good quality mathematics education in the society (Igbokwe, 2010). As a result, it is crucial that every person has a good understanding and appreciation of mathematical procedures and methods of reasoning to be carried along. Achievement in Mathematics is a reliable indicator for measuring national, social, geographic, economic and political developments (Archer, Osborne, & DeWitt, 2012). In addition, Betiku (2009) acknowledged that Mathematics is the bedrock of Science and it is very important for studying other subjects, such as, physical science and technology education. Physical Science is necessary for technological and industrial development.

Ifamuyiwa and Rosanwo (2016) stated that the knowledge and the use of mathematics spread through all facets of life including national development. They further acknowledged that the knowledge of mathematics encourages the habit of accuracy, logical, systematic and orderly arrangement of facts in individual learner. It as well encourages the habit of self-reliance and enables learners to think and solve their problem on their own. As a matter of fact, the knowledge of mathematics empowers individuals with the necessary skills to work out a wide range of practical tasks and challenges they may encounter in life. Further, the study of Mathematics assists the mind to reason and organize complex situations into simple, clear and logical steps (Anaduaka & Okafor, 2013). They also indicated that, those who can simplify complicated situations for everyone to understand in the society are required for high paying jobs. They concluded therefore that, more knowledge on Mathematics will give the learner the competitive advantage they need to acquire high paying jobs.

The new South African National Curriculum Statement coupled with its earlier white paper on science and technology, confirmed that adequate knowledge and skills of mathematics are good component of successful contemporary life and socio-economic development (Department of Basic Education, 2011). In addition to the economic importance and better economic advantage of the knowledge of Mathematics, it prepares people for the numeracy demands of modern work place and raising the

overall skill levels of the workforce. Manoah, Indoshi, and Othuon (2011) added that there are social benefits that may improve access for greater population to post-school education and training opportunities to prepare stronger and better foundation to skills for lifelong learning.

Further, Mathematics is a body of knowledge needed for national scientific and technological development. Anaduaka and Okafor (2013) added that the level of mathematical attainment and ingenuity is the main basis of difference between the developed and underdeveloped nations. According to these researchers, Mathematics has become an undisputable agent of national development and wealth creation. In addition, Clark-Wilson, Oldknow and Sutherland (2011) stated that nations that promote Mathematics, Science and Technology enjoy better standard of living and self-reliance.

Further, it is crucially important that learners own a functioning knowledge of Mathematics which will empower them to thrive in the society (Department of Basic Education, 2011). An appreciation of the subject itself is made possible through a pertinent range of mathematical process, skills and knowledge. It further guarantees access to an extended study of mathematical sciences and a range of career paths. Therefore, Mathematics is very important for learners who intend to pursue a career in physical, mathematical, computer, life earth, space and environmental sciences or in technology. The knowledge of Mathematics influence personal development through a deeper understanding and successful appreciation of its knowledge and skills, while maintaining appropriate values and attitudes (Department of Basic Education, 2011). Amplitude in Mathematics gives access to rewarding activity and adds to personal, social, economic and scientific development. Adequate knowledge of Mathematics helps learners to communicate appropriately through; interpretations of graphs, symbols, tables, diagrams and figures; application of mathematical process skills to identify and solve problems and clearly identify, organize, interpret and manage authentic activities in substantial mathematical methods that show responsibility and sensitivity to personal and broader societal concerns, able to work collaboratively in terms and groups to enhance Mathematics understanding, collect, analyze and organize quantitative data to assess and review conclusions and engage responsibly

with quantitative arguments relating to local, national and global issues (Department of Basic Education, 2011).

The implications of access to mathematics learning and the role of mathematics literacy in facilitating growth in the quantity and quality of Science, Technology, Engineering, and Mathematics Education (STEME) including Information Communication Technology (ICT), is that, the more mathematically literate students are, the capable of performing in mathematics at high level, the more the chances of the candidates having access to tertiary institutions, and the more the country would have human capital development in different fields of human endeavour, especially in the Science related fields (Musa & Dauda, 2014). It is therefore critically important both to the nation and to the individual that, every learner benefit from a quality mathematics education. Mathematics is also appreciated as a basic requirement for studying Science, Technology and Accounting in higher learning and as well as an essential ingredient in the education of every child all over the world.

2.3.3 Learners' Attitude and Performance in Mathematics

Researchers have claimed that attitudes are significant factors to be considered when attempting to understand and explain variability in student performance in Mathematics (Effandi & Normah, 2009; Kandemir & Gur, 2009; Mapolelo, 2008; Mato & Torre, 2010; Mohamed & Waheed, 2011). Attitudes towards Mathematics play an important role in teaching and learning processes of the subject (Furinghetti & Pehkonen, 2002). Learners, educators, the social group with which the individual learner relates, are affected in one way or the other by 'attitude'. Consequently, attitude affects learners' academic performance in Mathematics. Learners acquire attitude due to some kind of learning experiences by simply following their parent, teacher or friends' actions or opinions (Standslause, Maito, & Ochiel, 2013). This implies that, the learners draw from their educators' disposition to form their own attitude, which in turn affects their academic performance. In the observational theory propounded by Albert Bandura, people develop behaviours by watching models (i.e. educators, parents, mentors and friends) that perform the behaviour. The model displays the behaviour while the learner

observes and then tries to do the same.

Studies have indicated that positive attitudes towards Mathematics lead to learners' success in Mathematics (Effandi & Normah, 2009; Mohd & Mahmood, 2011). According to Effandi and Normah (2009) learners' attitudes towards Mathematics are very much correlated to their attitude towards problem solving in general. These researchers further pointed out that the incidence of negative attitudes among learners need to be overcome, so as to safeguard students from suffering from poor problem-solving skills in future. In collaboration with the above submission, Mohd and Mahmood (2011) revealed that for learners to perform well, they have to show positive attitude towards problem solving in Mathematics. Mohd and Mahmood (2011) also found that the level of persistence, patience, perseverance and willingness to accept risks are very important indicators for effective problems solving to achieve good result in Mathematics, while Mato and Torre (2010) in a study with secondary school learners claimed that, those learners with better academic performance have more positive attitudes towards Mathematics than those that performed poorly. Mato and Torre (2010) asserted that there is a relationship between learner attitude and their performance in Mathematics. Cobb, Yackel, & Wood (2006) also found link between beliefs and mathematics learning and that learners align their beliefs of Mathematics to problem solving.

Attitudes towards Mathematics may be either positive or negative. Positive attitude reflects positive emotional disposition towards the subject and vice versa (Zan & Martino, 2008). These emotional dispositions affects the individual's behaviour, as he is trying to achieve better in the subject that he enjoys, has confidence in or find it useful (Mata, Monteiro, & Peixoto, 2012). Since positive attitude contributes to individual's willingness to learn, they are therefore desirable for learners and also the benefits they derive from mathematics instruction.

A number of authors have shown relationship between learner attitude towards Mathematics and achievements (Fraser & Kahle, 2007; Ma & Kishor, 2003; Mahmud, 2001; Mato & Torre, 2010; Mohamed & Waheed, 2011). For example, the study carried out by Mahmud (2001) indicated that excellent learners pose high level of willingness to solve mathematics problems contrary to the average and low performing learners. Moreover, Tooke and Lindstrom (2008) view show that learners with high level of positive attitude towards Mathematics will definitely have high level of success in life. “Students’ attitudes about the value of learning Mathematics may be considered as both an input and outcome variables because their attitudes towards the subject can be related to academic achievement in ways that reinforce higher or lower performance” (Ogembo, Otanga, & Yaki, 2015, p. 39). It therefore indicates that, those learners who perform well in a subject will have positive attitudes towards the subject and those with positive attitude in a subject will do better in the subject (Olatunde, 2009).

Nevertheless, some studies revealed that learners have a relatively positive attitude towards Mathematics (Yilmaz, Altun, & Olkun, 2010; Tezer & Karasel, 2010). Their findings were supported by the study of Nicolaidou and Philppou (2003) which showed a significant relationship between attitudes and academic performance. The study revealed that learners having positive attitudes performed better than those having negative attitudes.

Moreover, the research undertaken by Mato and Torre (2010) among secondary school learners likewise revealed that higher achievers pose more positive attitudes with respect to Mathematics than those with poorer performance. The results were collaborated with the study of Mata et al. (2012) in the research concerning attitudes towards Mathematics among 1719 Portuguese students from Grade 5 to Grade 12. Furthermore, Mata et al. (2012) also identified a weak relationship between learner’s attitudes towards Mathematics and their academic performance and these relationships depended on variety of variables such as sample size, grade, ethnic background, to mention but a few. These relationships were stronger among Grade 7 to 12 than compared to the lower grades.

The continuous under performance of learners in mathematics tasks are the outcomes of negative attitudes of the learners towards Mathematics (Mata et al., 2012), which eventually become relatively permanent. A number of factors have imperatively been found in the formation and development of a learner's attitude towards Mathematics. Such factors include the learning environment, teacher and teaching methods (Larsen, 2013; Prendergast & O'Donoghue, 2014). However, factors from the home environment and society can also be influential to why learners show negative attitudes towards Mathematics as a subject (Mohamed & Waheed, 2011). Such factors include the over demanding task, pressure to perform well, uninteresting lessons, parental or guardian involvement and educators' negative attitudes (Nicolaidou & Philppou, 2003). For example Prendergast and Hongning (2016) have shown that students' attitudes towards Mathematics are linked with their parents' perception of the subject. This can have both positive and negative consequences.

As a matter of fact, Mohamed & Waheed (2011) identify three groups of factors that play a vital role in influencing student attitudes in a study aimed at understanding attitudes and the influences on their development in relation to differences between students. Such factors among others include: factors associated with the learners themselves (e.g., mathematical achievement, anxiety, self-efficacy and self-concept, motivation, and experiences at school); factors associated with the school, teacher, and teaching (e.g., teaching materials, classroom management, teacher knowledge, attitudes towards Mathematics, guidance, beliefs); and finally factors related to home environment and society (e.g., educational background, parental expectations).

2.3.4 Learners' Attitudes and School Grades

The repeated poor performance of learners in Mathematics and mathematical related tasks contributes to reasons learners show negative attitudes towards Mathematics (Mata et al., 2012). Research has shown that, attitude change according to grade level (Idil, Narli, & Aksoy, 2016; K"o"gece, Yıldız, Aydın, & Altında, 2009; Taşdemir, 2009). In their studies, these authors indicated that there are significant differences between younger and older learners' attitudes towards Mathematics particularly with Grade 8

learners having lower attitudes than Grade 6 learners. They argue that learners usually have positive attitudes towards Mathematics at earlier grades. Consequently, as they progress to higher grades in school, their attitudes towards Mathematics gradually become less positive and later negative.

2.3.5 Learners' Perception and Performance in Mathematics

Mathematics is an important subject and the level of learners' engagement in Mathematics classes and attitude towards Mathematics has been a global concern to researchers. In South Africa, learners' perception of Mathematics is that the subject is a difficult as compared to other subjects and accessible only to a selected few. Literature on the subject on learners' participation in or choice of Mathematics revealed an interrelated factor that affects learner participation and attitudes. Mendick (2005) argued that, it is crucial for researchers and stakeholders to examine why some learners opt for Mathematics as a subject to study.

Research indicated that learners opted out of Mathematics because they perceived it as difficult, boring and of little or no use to them (Kyriacou & Goulding, 2006). A number of studies on some factors contributing to learners' motives for discontinuing with Mathematics, revealed that perceived difficulty, lack of confidence, dislike for Mathematics and perception that the subject lacked relevance influenced students' decision not to participate in Mathematics (Brown, Brown, & Bibby, 2008; Gafoor & Kurukkan, 2015; Sam, 2002). Additionally, Ercikan, McCreith, and Lapointe (2005), as a matter of fact, found that learner attitude towards Mathematics, parents expectations, gender differences, home environment, educator's expectations and anxiety were the factors associated with Mathematics achievement and participation. According to Mutodi and Ngirande (2014), many learners are scared of Mathematics and feel powerless in the presence of mathematics ideas and they regarded Mathematics as difficult, cold, abstract and in most cultures it is a largely male dominant subject. Thus, these indications clearly revealed that learners perceive and admit that Mathematics is a difficult subject in relation to other subjects and often admit to not being good at it.

The perception that Mathematics learning is difficult could be passed on to learners by their parents (Furner & Duffy, 2002; Prendergast & Hongning, 2016). Gates and Vistro-Yu (2003) and Harari, Vukovic, and Bailey (2013) argued that, despite the effort to encourage Mathematics among learners, it is one of the subjects that evoke strong feelings of aversion, anxiety, incompetence and low confidence.

The learner achievement in Mathematics is also largely affected by how learners perceived their educators in the classroom. For example learners tend to develop a positive attitude towards Mathematics when the educator is perceived to be reasonable, friendly and helpful.

2.3.6 Mathematics Anxiety and Attitude towards Mathematics

Mathematics depends not only on cognitive components but also on emotional factors. Researchers have shown that emotional factors may also play a major role in performance in Mathematics, with mathematics anxiety playing a particularly large role (Bekdemir, 2010; Dowker, Bennett, & Smith, 2012; Soni & Kumari 2015; Sparks, 2011). According to Dowker, Bennett, and Smith (2012) “one possible reason for the negative association between mathematics anxiety and actual performance is that, people who have higher levels of mathematics anxiety are more likely to avoid activities and situations that involve mathematics, and thus, have less practice” (p. 1). Learner’s mathematics anxiety is a vital variable influencing their performance towards Mathematics. Negative feelings associated with mathematics anxiety influence learner’s confidence to learn Mathematics and perform well in the subject (Bekdemir, 2010). In corroboration to this, Sparks (2011) claimed that mathematics anxiety can also initiate negative emotions while performing mathematical tasks.

In addition, learners that show mathematics anxiety according to Soni and Kumari (2015) have also been observed to have limited command of Mathematics, less eloquent in computation and limited knowledge to figure out any special approach in Mathematics field. In addition, Soni and Kumari (2015) also found negative relationship between mathematics anxiety and performance in Mathematics across all grades. The view of Soni and Kumari (2015) seems to be that learner’s mathematics anxiety

negatively affects mathematics achievements and learner's mathematics attitude positively affects their mathematics performance.

Furthermore, according to Zakaria and Nordin (2008), learners that were high in mathematics anxiety perform lower in Mathematics tests compared with learners who have moderate or low mathematics anxiety. Learner's attitude towards Mathematics highly influences the learner perception of their competence in Mathematics tasks. Researches has found significant relationship between mathematics attitude and mathematics performance (Schenkel, 2009), and a positive attitude towards Mathematics will translate to high performance in Mathematics (Soni & Kumari, 2015). It is well documented that a positive attitude towards problem solving plays a key role in mathematics achievement (Mohd, Mahmood, & Ismail, 2011). According to Pajares and Schunk (2010), the continuous underperformance of scores of learners in Mathematics is due to lack of positive self-beliefs. For example, the belief the learners' exhibit towards Mathematics that, it is an exceptionally difficult and tedious subject was the major reason for underperformance or high drop rate in the subject (Moses, Kudzai, & Emily, 2011).

Furthermore, other factors such as poor mathematical attainment may also affects the relationships between mathematics anxiety and performance as a result of repeated underperformance experiences. Maloney and Beilock (2012) pointed out that the development of mathematics anxiety is likely to be due to both social factors, such as exposure to teachers who themselves suffer from mathematics anxiety, and to pre-existing difficulties in numerical cognition, and that those with initial mathematical difficulties are also likely to be more vulnerable to the negative social influences. Apart from personal factors enumerated above, environmental factor such as parental mathematics anxiety also affects learners' performance in Mathematics.

2.3.7 Attitudes and Gender towards Mathematics

In general, literature in academic studies has featured gender differences severally in the studies and with regards to Mathematics in particular. Mostly, Mathematics as a subject is often regarded both in terms of attitude and self-concept to be an area which boys perform better than the girls (Mata et al. 2012). However, Lindberg, Hyde, Petersen and Linn (2010) and Scafidi and Bui (2010) undermined the position that boys perform higher than the girls and show that performance in Mathematics and school grades are not different between boys and girls. In the meta-analysis study carried out by Lindberg et al. (2010) with data from 242 studies representing 1,286,350 people highlights a similarity in performance of the males and females learners, and found no different in gender.

Notwithstanding, there are other studies that have found differences in the beliefs held by males and females. For example, Mata et al., (2012) when reviewing literature, indicated that male learners have higher Mathematics self-concept than their female counterparts. As a matter of fact, research has shown that self-concept is more pronounced than gender differences in attitudes. Asante (2012) found significant difference in the attitudes of boys and girls with regards to Mathematics. However, some studies demonstrated that these variances does not exist (Georgiou, Stavriniades, & Kalavana, 2007; K'õ'gce et al.; 2009; Mohamed & Waheed, 2011; Nicolaidou & Philippou, 2003). A study conducted by Mata et al. (2012) indicated that gender difference in learner attitudes toward Mathematics was insignificant. Their results indicated that male learners show more positive attitude than their female counterparts. On the other hand, the studies have also demonstrated that in the research conducted in elementary school, female learners had more positive attitudes than male learners, while for Grades 9 to 12 the results revealed that boys had more positive attitude than the girls. Asante (2012) supported and justified the view that, small gender effect may grow among secondary school learners with girls having more negative attitudes than boys. He further stated that, comparing girls with boys, "girls lack of confidence had debilitating casual attribution patterns, and perceived Mathematics as a male domain, and were anxious about Mathematics" (p. 2).

Similarly, the study undertaken by Asante in Ghana revealed that male learners demonstrated more positive attitudes towards Mathematics than female learners. The study conducted by Beilock, Gunderson, Ramirez, and Levine (2010) with learners from North American, found significant gender differences in eighth grade learners' attitudes towards Mathematics. The study indicated that American boys showed more interest in Mathematics than girls, but girls perceived Mathematics as more important than boys. Girls also indicate higher difficulties with problem solving in Mathematics. Asante (2012) claimed that factors such as school environment, parents' and educators' attitudes, developmental changes in gender identity and beliefs towards Mathematics affects the differences identified between boys and girls in their attitude towards Mathematics.

Conversely, research also indicates that gender does not affect attitudes towards Mathematics (Georgiou, Stavriniades, & Kalavana, 2007; K'õ'gce, et. al., 2009; Mohamed & Waheed, 2011). Ma and Kishor (2003) meta-analysis when studying the effects of gender with 113 studies concluded that, gender did not have much effect on the relationship between attitude and performance in Mathematics, since a different analysis by gender indicated similar amount of effect. Studies revealed that, there is much difference in gender and learner attitudes towards problem solving in Mathematics (Manoah, Indoshi, & Othuon, 2011; Mohd, Mahmood, & Ismail, 2011). For example, Mohd et al. (2011) indicated that gender does not affect learner's attitude in solving problems in Mathematics, while the study conducted by Manoah et al. (2011) indicated that both boys and girls showed neutral attitude towards Mathematics curriculum. Georgiou, Stavriniades and Kalavana (2007) demonstrated that there was no gender difference both in performance in Mathematics and mathematics attitudes. It is worth noting therefore, that gender does not influence learners' attitude towards problem solving in Mathematics.

However, Mato and Torre (2010) concluded that boys and girls that performed well, regardless of putting in consideration Mathematics as an attractive subject, differed in the explanations given for their performances. Since the ability attribution of boys were greater, there is belief that their grades were as a result of their intelligence more

consistently than girls did.

2.3.8 Peer Influence on learners' academic performance

Another important factor that affects learners' achievement and participation in learning is peer influence. For example, Ampadu (2011) and Willis (2010) explored into peer influence on learners' academic performance and found that peers influence learners' academic performance. According to Willis (2010), learners learn Mathematics better through physical, psychological, emotional involvements in the teaching and learning process through which they explore, discover and create new knowledge. This is where they learn from their mistakes and misconceptions to develop new knowledge. In addition, research also indicates that learners' mistakes and misconceptions are more often neglected despite the vital role that they play in building new knowledge (Ampadu, 2011; Willis, 2010). The previous studies have also found that the kind of feedback that learners get from their colleagues affect their level of their willingness to participate in the class. Moreover, peer influence also impacts positively or negatively on learners' response and attitude toward school, Mathematics and overall participation in learning (Sullivan, Tobias, & McDonough, 2006). These researchers concluded that the classroom culture and peer influence play a vital role in the individual learner participation and engagement than the curriculum and other related factors.

Further, research revealed that learners who exhibit high-ability do well when associating with high-ability peers, while lower-ability learners benefit from interaction with learners in the middle of the ability distribution (Burke & Sass, 2011). In another study, Kiwanuka, Damme, Noortgate, Anumendem, and Namusis (2015) agreed that learners perform better when they are influenced positively by their colleagues. Kaahwa (2012) established that peer support should manifest in form of discussion, study group, advice and encouragement. In other words, they prefer constructivist methods, which promote group work. Further, learners talk and discuss ideas when they are together which may at the end influence the choices they make. For example, Pajares and Schunk (2010) found that peer groups promote motivational socialisation. This social motivation will be influenced by the type of group with which a learner is associated. If

learners affiliate with highly motivated groups according to these authors, they tend to act in a positive way and this will continue throughout their school careers. It should be therefore noted that Mathematics educators should create a classroom culture whereby learners positively support each other to improve Mathematics performance.

2.3.9 Educators' Attitude and Learner's Academic Performance

Research indicates that educators' attitude reflects on the how they teach and this invariably affects learner academic performance negatively or positively (Edomwonyi-otu & Aava, 2011; Ogembo, Otanga, & Yaki, 2015). Thus, arguably teacher attitude towards Mathematics is directly proportional to learner academic learning outcomes (Yara, 2009). The perception of attitude is connected with how individual think, act and behave, and these have a serious affect for the learner, the educator, the immediate social group with which the individual learner relates, and the school system at large. Learners form attitudes due to learning experience they go through (Mensah et al., 2013). In this view, the learner draws from his educator's attitude to form his own attitude, which may likely affect his learning outcomes (Mensah et al. 2013; Yara, 2009). In their study of "the influence of teacher attitude on learners' attitudes towards the learning of Mathematics", Mensah et al. (2013) found a positive and significant correlation between educators' attitude and learners' attitudes. They therefore, concluded that there is a significant positive relationship that exists between the educators' attitude and learner attitude towards Mathematics.

The study also indicated that, if the educator positively conditions their learners towards Mathematics, they will have positive predilection for the subject. They went further and concluded that, if the educators exhibit positive behaviour and give good utterances about Mathematics, learners will imitate the educator's behaviour and hence build positive attitude towards the study of Mathematics. The study of Yara (2009) was in agreement with the research conducted by Mensah et al. (2013) in that, educators with positive attitude towards Mathematics will be aligned to steer favourable attitudes in the learners. In other words, learners that have devoted educators will possess courage and determination to engage difficulties in Mathematics. However, Mensah et al. (2013)

also found no significant correlation between the educators' attitude and learner's academic performance in Mathematics. They however, concluded that, it could be as a result of the fact that the performance of learners depend on a combination of factors rather than just educator's attitude. This invariably puts the educator as one whose attitude, expressed in his or her actions, has a guiding effect on the learners.

The efficacy of learning process in education depends on the learner ability to demonstrate the expected behaviour or response. Kibe, Odhiambo, and Ogwel (2008) argued that both the teacher and learner have to be motivated for teaching and learning of Science to be interesting and stimulating so as to ensure the development of positive attitude and thereby resulting in high academic performance. Research indicates that teachers teach Science in a way that merely requires the pupils to listen, read and regurgitate (Standlause, Maito, & Ochiel, 2013). This shows negative attitude to teaching.

According to Olatunde (2009), attitude of teachers and their methods of teaching influence learners' attitude. In other words, the teacher method of teaching Mathematics and his personality to a great extent is responsible for the students' positive or negative attitude towards Mathematics and that, without interest and personal effort in learning Mathematics (self-efficacy) by the students; they can hardly perform well in the subject. On the other hand, Obadara (2008) undermined the position that there is link between educators' attitude to teaching and the learner academic performance.

Furthermore, Mohammed and Waheed (2011) in the study conducted focusing at understanding attitudes and effects on their development in relation to difference between learners, identified three groups of factors that affect learners' attitudes: factors associated with the learners themselves (for example, mathematical achievement, anxiety, self efficacy and self-concept, motivation and experiences at school; factor associated with the school, teacher and teaching method (for example, teaching materials, classroom management, teachers knowledge, attitude towards Mathematics, beliefs); and finally factors from the home environment and society

(examples include educational background, parental expectations).

Teacher's attitude towards Mathematics is an indicator of the emotional response towards Mathematics (affective), beliefs about Mathematics (cognitive), as well as behaviour (Mensah et al., 2013). In other words, attitudes and practices of teaching and learning of Mathematics are seriously affected by emotions, beliefs, social context and content knowledge (Clarke, Thomas, & Vidakovic, 2009). Researchers have indicated that teachers' emotional responses toward Mathematics are the 'like' and 'dislike' of Mathematics, mathematics anxiety and self confidence in Mathematics (Henderson & Rodrigues, 2008; Mensah et al., 2013). Learner's achievement in Mathematics has been affected by these emotional aspects of attitudes.

Further, Henderson and Rodrigues (2008) examined educator's self-esteem towards Mathematics and found that about half of the respondents (pre-service highly qualified educators) lacked self-esteem in relation to Mathematics. In their view, Agah, Eugene and Okhide (2016, p. 10206) showed that when "teachers' exhibition of self-confidence when teaching Mathematics motivates students to greater achievement in Mathematics". The learner form his or her attitude from the disposition of the educator which may affect his or her learning outcomes

The educators' beliefs about Mathematics such as the use, the learning process, the complexity or ease of Mathematics as well as beliefs and gender ability, also impact their attitudes towards the subject and impact on learners' performance. The beliefs of educators about the use of Mathematics correlate with either a more positive or negative attitudes towards Mathematics (Mensah et al., 2013). It should be noted that an educator who does not acknowledge the usefulness of Mathematics and believes that learning Mathematics should be a set of rules and algorithms will definitely require his or her learners to memorize mathematical procedures and rules without meaning. Such practice will make the learners to develop negative attitude towards the subject. In the same vein, an educator who believes that girls usually have difficulty with Mathematics is most likely to impact negative attitude to female learners who will begin to believe that girls are poorer in Mathematics and thereby unable to engage properly in

the subject.

Further, educator's behaviour in relation to Mathematics is another aspect of educators' attitudes towards Mathematics. The behaviour such as avoidance of Mathematics, pursuit of Mathematics and classroom instructional behaviour, impact on learners' attitudes and performance. More often than not, how Mathematics is presented in the classroom and perceived by learners, even when the educator believes he is presenting it in authentic and context dependent way stands to distance many learners from Mathematics (Farooq & Shah, 2008). Moreover, educators' enthusiasm, educators' resourcefulness, thorough knowledge of the subject-matter and ability to help and making Mathematics interesting are factors that can promote learners' positive attitude towards Mathematics (Yara, 2009). Reasonably, Ministry of Education, Ontario (2004) indicated that the educator can foster in the learners a positive attitude towards Mathematics that will build confidence through:

- i. promoting the belief that everyone can do Mathematics through emphasizing effort but not innate ability;
- ii. modelling enthusiasm for teaching and learning Mathematics;
- iii. addressing learners' learning styles by providing a variety ways for learners to understand complex concepts;
- iv. motivate learners to acknowledge importance of Mathematics in their lives; and
- v. carefully choosing activities that will make learners be challenged and at the same time successful.

2.3.10 Parental Role and Learner's Performance in Mathematics

Among the home factors that contribute to learner attitudes and impact on the learner academic performance is the role parents play. In regard to learner attitude towards Mathematics and academic performance, parents pose an important determinant. Research has indicated the roles of parent in relation to attitude towards Mathematics and academic performance (Cruz, 2012). For example, Cruz (2012) claimed that parental support and encouragement is positively linked to learners' academic

performance in Mathematics. The involvement of parents in their children school work has direct impact on children's academic performance (Cheung & Pomerantz, 2012; Quilliams & Beran, 2009). Further, Quilliams and Beran (2009) indicated that the more parents involvement in their children's school work and actively promote learning at home, the higher the performance of the child. The view of Cheung & Pomerantz (2012) also revealed that parent's attitude towards Mathematics also affects academic performance and behaviour of the learners.

Further, the study of Aunola, Nurmi, Lerkkanen, and Rasku-Puttonen (2003) on the 'beliefs of parents in learner's Mathematics competency' established that learner's behaviour and performance in mathematics is positively related to their parent's belief towards Mathematics. According to Standsause et al. (2013) and Prendergast and Hongning (2016), the parent's attitudes toward Mathematics impact significantly more on their children's attitudes and performance than their own past abilities and performance in the subject. This emphasizes that, the height of value the parents place on Mathematics has much impact on their children's Mathematics performance. In other words, if a parent does not value Mathematics, their children are also not likely to value Mathematics. For example, Jacobs, Davis-Kean, Bleeker, and Malanchuk (2004) found that knowledge of the parents about the importance of Mathematics greatly influences the motivation of their children to pursue mathematical and scientific related courses in the future. This is to say that learners whose parents have positive attitude towards Mathematics will likely love to engage in mathematical tasks.

2.3.10.1 Parent's mathematics anxiety

A number of studies have investigated the effects of parental mathematics anxiety on learner's mathematics anxiety and attitudes toward Mathematics (Gunderson, Ramirez, Levine, & Beilock, 2012; McLeod, Wood, & Weisz, 2007; Soni & Kumari, 2015). For example, Soni & Kumari (2015) predicted that parent's mathematics anxiety is negatively liked to the attitude of their children towards Mathematics and the attitudes of parents towards mathematics negatively influences the children's mathematics anxiety. In fact, they also cited that parental mathematics anxiety is negatively related to the

performance of their children in Mathematics. Although McLeod et al. (2007) claimed that parenting practices has no significant effect in the development of children's anxiety disorder-related behaviours. In fact, the way and the manner in which parents translate knowledge about Mathematics to their children are as well likely to be affected by their personal feelings about Mathematics (Gunderson et al., 2012). Furthermore, Ounda, Poipoi, and Were (2014) assert that parents' attitudes towards educational involvement influence learners' academic performance. Similarly, school environment and family jointly predict a positive attitude towards Mathematics, which further encourages learners in learning Mathematics in school.

2.3.11 Learner's Attribution

As discussed earlier under theoretical framework, attribution theory is a theory which supposes that people attempt to understand the behaviour of others by attributing feelings, beliefs, and intentions to them. According to Middleton and Jansen (2011), attribution theory is based on the fact that, the outcomes of an activity are evaluated in relation to the individual's view of their own contribution (i.e. effort or ability) and the contribution of the task demands. Hence, learners often associate some factors as contributing to their success or failure in Mathematics. Such factors which are mainly external factors which they believed they have no control of. Researchers have documented some reasons learners attribute their failure in Mathematics (Tachie & Chireshe, 2013).

In the study undertaken by Tachie and Chireshe (2013) on 'high failure rate in Mathematics examinations in rural senior secondary schools in Mthatha District, Eastern Cape, revealed that learners attribute their poor performance in Mathematics to lack of qualified teachers. They found that learners believed they could not pass the subject because many of their school Mathematics educators were unqualified Mathematics teachers. Consequently, incompetent Mathematics teachers which resulted in inadequate discussion of mathematical problems with the learners; creating stimulating classroom environments for learning Mathematics and that the teachers could not appropriately apply teaching methods. Some teachers were not versatile in

some of the topics in Mathematics, thus, sometimes it becomes difficult for them to solve problems for learners as far as past question papers are concerned (Tachie & Chireshe, 2013).

In addition to lack of qualified teachers, which invariably resulted in poor teaching methods, learners attribute the dismal performance in Mathematics to teacher' teaching methods. Learners' failure in Mathematics due to lack of skill was cited by Tachie and Chireshe (2013) who argued that, learners could not perform well in Mathematics because their educators were incompetent. One reason why learners fail in Mathematics was that some teaching methods educators employ do not help the learner to develop conceptual understanding of the subject (Tachie & Chireshe, 2013). In agreement to the above, Mbugua et al. (2012) argued that discussion method of all teaching methods is the most effective teaching method of dissemination of information to the learners, while (SMASSE, 2007) claimed that, the lecture method is ineffective way of disseminating information to the learners which turns the learners into passive participants, though it can be useful to cover a large content.

Another factor that learners also attributed their performance in Mathematics to is acute shortage of Mathematics educators. The few available Mathematics teachers available in schools could not teach all the classes in the school before the end of the day, which greatly affects the Mathematics periods, and thereby resulted to the Grade 12 learners having Mathematics classes only twice a week (Tachie & Chireshe, 2013).

Consequently, as a result of teacher shortage, teachers could not complete or cover the required syllabus for the year before examinations.

Research has also indicated that, educators' behaviour is another factor that learners attribute to their failure in Mathematics. This may involve how the educators conduct themselves in relation to the learners in the teaching and learning of Mathematics. For example, Tachie and Chireshe (2013) revealed that educators' absenteeism; educator's insulting learners for giving wrong answers; educators do not motivate learners; educators always beat learners and even some educators allegedly come to school

drunk as factors affecting the learners' performance. Regarding teachers' behaviour, Kolenski (2009) confirmed that a learner may develop a strong dislike for a certain subject whose educator habitually ridicules him or her before his/her colleagues.

In addition, learners also attribute their poor performance to the belief that Mathematics is naturally difficult (Tachie & Chireshe, 2013). This implies that the learners believed that Mathematics was by nature difficult and there was nothing they could do to pass and is supposedly beyond their control. According to Cao, Bishop and Forgasz (2006), Australian learners attribute their Mathematics poor performance to difficult tasks. As a result, learners are most likely not to put any effort to learn mathematics because of the belief that the subject is naturally difficult.

However, learners also attribute their failure in Mathematics to internal factors such as negative attitudes towards the subject, laziness and not attending Mathematics lessons. Many learners are lazy, majority of them are not able to answer past Mathematics questions just because they study neither at school nor at home and some of them knew Mathematics is difficult and they do not put any effort in it. Tachie and Chireshe (2013) concluded that one cannot do well in a subject he/she is not interested in. They further indicated that laziness and lack of interest result in learners failure to participate in Mathematics.

2.3.12 Motivation and performance

Success must be thought of in terms of overcoming obstacles, especially when beliefs of learners say to them they cannot do the task. One of the aims of Mathematics as set out in the National Curriculum Statement (Department of Basic Education, 2011) stipulates that, "if students are to achieve mathematics proficiency, they must 'believe' that Mathematics is understandable, not arbitrary; that with diligent effort, it can be learnt and used; and that they are capable of figuring it out". Experiences of success in the Mathematics class strengthen the learners' belief in their own ability to do Mathematics (Berends, Goldring, Stein, & Cravens, 2012; Bonne & Johnston, 2016; Charalambous, Panaoura, & Philippou, 2009). Repeated experiences of this type serve

to strengthen one's self-efficacy beliefs in Mathematics.

Motivation to achievement is a determination to be successful in activities one engages in. Gesinde (200) cited in Muola (2010) posits that learners that are high achievers as their models would develop the need to achieve, while those who are low achievers as their models would hardly see the need to achieve. In addition, learners that performed better academically were found to have higher motivation for achievement than the unsuccessful learners (Tella, 2007). Likewise, Broussard and Garrison (2004), and Skaalvik and Skaalvik (2006) show significant relationship between academic performance and motivation.

Further, in order to make Mathematics instruction interesting, there is need to employ the use of methods and materials that can make Mathematics learning active, investigative and adventurous in the best possible way. Such methods need to take learners' differences and attitudes toward Mathematics into consideration.

2.3.13 Educator and Learner's Academic Performance

Educators' role in education system is vitally important. The educator is the custodian of knowledge and instructor of instruction. The educators have been known to have important influence on learners' academic achievement and they play a crucial role in educational attainment. This is because, the educator is ultimately responsible for translating educational policies and principles into actions based on practice during interaction with the students (Akiri, 2013). According to Adu and Olatodun (2007), the educator, as an agent of change, should recognize that his/her major purpose is to helping learners gain the knowledge, skills, feelings and values that the learners need to function effectively in the society. In other words, both teaching and learning depend on the role of the teacher and thereby influence the learners' performance. The educator is therefore, the main manpower saddled with the responsibility of impacting the fundamental concepts to technology through the teaching of such basic Mathematics concepts in schools.

Studies have reported on the influence of the role of educators' teaching on learners' academic performance as measured by learners' learning outcomes (Adediwura & Tayo, 2007; Adu & Olatodun, 2007; Leone, Wilson, & Mulcahy, 2010; Owolabi & Adedayo, 2012). These researchers suggested that, effective teaching is an important predictor of learners' academic performance. Therefore, effective teachers should produce students of higher academic performance. Thus, the quality of the educator is paramount important. According to Leone et al. (2010) and Reddy (2007), desirable teacher qualities are reportedly linked to good subject knowledge, teaching skills and classroom management, relationships with learners, dedication, accessibility, and hard work.

Furthermore, educators who are effective are knowledgeable and are able to teach new numeracy skills and the actual instructions that influence learners' mathematics proficiency. These have a considerable effect on both remediating and advancing the learners' numeracy skills and overall mathematics proficiency (Leone et al., 2010). These authors further indicated that; effective Mathematics educators have knowledge of relevant Mathematics content and use profound understanding of Mathematics content to teach the concept of numeracy more effectively. Therefore, educators need to engage the use of explicit instruction of content which is effective for teaching numeracy concepts and processes, for learners with deficits in Mathematics in particular. Akiri (2013) agreed that the key to improve learners' performance is to improve the quality of the teaching force in schools.

According to Makgato & Mji (2006), the background of an educator determines his output. This fall in line with the common saying that, in the educational profession, an educator will only teach the way he was taught. In fact, the objective of most country's education sector cannot be achieved when the learners are taught by incompetent educators. It will be difficult for such educators to properly disseminate the required concepts to the learners. The view of Ajayi (2009) seems to be that, the professional qualities of a wide trained educator include: sense of organization, mastery of the subject matter, ability to motivate learners, ability to clarify ideas, good imagination, ability to involve the learners in meaningful activities throughout the period of teaching,

frequent monitoring of learners' progress through tests and examinations.

Furthermore, apart from qualities of teacher's teaching ability, research indicated an increase in learners' participation in tasks, where learners have the educators' support (Berends et al., 2012; Charalambous et al., 2009). This implies that educators that are well-prepared, passionate and confident about Mathematics may improve learners' confidence in their abilities and for example set higher goals for achievement (Pajares & Schunk, 2010). This argument is supported by Yara (2009) who indicated that effective educator facilitates learning by truly caring about the learners' participation and creating good learning environment for the learners.

As a result, teacher effectiveness therefore needs to be improved. The Department of Education pointed out that, the education system is not able to retain a good number of its employees, especially at school level, which is the core education delivery point (Department of Basic Education, 2014). In response to this observation, the government should make effort to retain experienced educators that are willing to serve so that they can contribute their wealth of knowledge and experience to improve the education system (Owolabi & Adedayo, 2012).

2.3.13.1 Role of the teacher in developing the classroom environment

Previous research has shown that educators' behaviours have not only affect learners' academic performance, but also their academic motivation (Maulana, Opdenakker, Stroet, & Bosker, 2013; Maulana, Opdenakker, Stroet, & Bosker, 2013). In the research undertook by Maulana et al. (2014) on the educator –learner relationship and academic achievement, which examined the extent of learners perception of educators' behaviours is associated with educator control and authority and behaviours associated with the educator-learner interpersonal relationship in respect of care and friendliness, found that educators' classroom attitude also influence learners' academic motivation. These authors concluded that students' perceptions of teacher–student good relationships have positive influence on students' motivation and achievements.

Agah et al. (2016) research carried out in Nigeria on teachers' instructional competence and attitude towards teaching as predictors of student learning behaviour in Mathematics, using interviews and a questionnaire on teacher interaction with 400 learners from the 2nd and 3rd year senior secondary school, revealed that, learners develop a more positive attitude towards Mathematics when the teachers are supportive, equitable, friendly and helpful to the learners. In the same vein, positive attitude towards Mathematics was encouraged when teachers showed good understanding of work, involved learners in investigations and displayed minimal admonishment of learners. This revealed that, learning environments may positively or negatively influence learners' behaviour based on the perceptions they have about their teachers. Therefore, learners' attitude to Mathematics is a product of their perceptions of the learning environment. Mata et al. (2012) found that, while learners whose teachers exhibited leadership qualities, helpful, friendly and understanding showed a healthy attitude to mathematics and those learners whose teachers displayed strict, admonishing behaviour showed negative attitude. Rollard (2012), in support of the above, opined that classrooms in which teachers actively support the learning of the students promote high achievement and effort.

In addition, Rollard (2012) in his meta analysis found that classrooms that promote mastery, meaning those that focus on the learning of the content rather than competitive performance, are more likely to foster positive learner attitudes to learning and that learners who seek mastery of content are more willing to take risks and are less dependent on the affirmation of others. Sullivan, et al. (2013) argued that "students, who focus on performance, meaning they seek social affirmation rather than understanding of the content, are more likely to avoid persisting" (p. 618). Rollard (2012) suggested that teachers can actively promote a mastery orientation in the students. A positive classroom culture, according to Sullivan et al. (2013), is not a matter of rules and procedures, but the ongoing and interactive support that teachers provide which encourages students to take up the challenge of tasks.

2.4 Chapter Summary

This chapter focused on the review of a range of related literature and theoretical framework underpinning this study. The literature reviewed highlighted the attitudes of learners towards Mathematics in relation to their academic performance. Some factors that could be responsible for the learners' negative attitudes towards Mathematics as well as some motivational measures that could help the learners to have positive attitudes towards Mathematics were discussed. The research methodology and design will be discussed in the next chapter.

Chapter Three

3 RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the methods and procedures that were used to address the research problem. The researcher discussed the research paradigm, the research approach, research design, population, sample and the sampling techniques. Data collecting method, data analysis and ethical considerations are also dealt with. Research methodology according to Creswell (2014) is defined as describing research approaches and paradigms. Further, research methodology can also be defined as the process of choosing, reflecting, evaluating and justifying how the researcher intends to carry out and accomplish a particular research study (Okeke, Adu, Drake, & Duku, 2014). Thody (2006) indicated that “methodology surveys always give the impression that the research design followed a calm, linear and orderly development from your initial idea, it’s determining philosophy, choice of methods, design of research instruments, data analysis, through to its final resting place in a document or presentation” (p. 99).

Thody (2006) added that a methodology survey should demonstrate validity, applicability, reliability, credibility, replicable, attraction and limitations.

3.2 Research Paradigm

Researchers have different beliefs about ways of conducting research. A paradigm is simply a belief system or a theory that guides how a research is carried out. These beliefs are informed by some standard principles which are referred to as paradigms. According to Taylor and Medina (2013) and Feilzer (2010) paradigms are worldview, system of beliefs, values and methods within which the research take place. Patton (2015) explained the pupose of a paradigm and how research is affected and guided by a certain paradigm. He asserts that paradigms are patterns of beliefs and practices that control inquiry within a discipline by providing lenses, frames and processes by which investigation is accomplished (Patton, 2015). A paradigm can be defined as “the

prevailing framework of theories, concepts and principles that accounts for universally accepted way of thinking and doing within the world view in which it exists” (Slabbert, De Kock, & Hattingh, 2009, p. 34). This is also referred to as a philosophy of living life. Moreover, Babbie (2006) defined a paradigm as the fundamental model or frame of references used by researchers to recognize their observations and reasoning. Feilzer (2010) also defined a paradigm as ways of perceiving and experiencing the world. Thus, a paradigm provides understanding of why and how a methodological approach is chosen in a research.

Lichtman (2013) explained that the ways of seeing the world and make certain assumptions about the world are referred to traditional research paradigms. He supposed that, there is an objective reality which researchers should try to uncover as they conduct their research. In relation to this, Maree (2013) defined a paradigm as a collection of assumptions or beliefs about fundamental aspects of reality that leads to a certain world-view. He added that paradigm is a lens or organizing principles by which reality is interpreted. Maree (2013) pointed out the following:

Paradigms represent our thinking about the world (but cannot prove). Our actions in the world, coupled with the actions we take as inquiries, cannot arise outside reference to those paradigms: “we act as we think”. Thus paradigms are to do with knowledge claims. There are a number of paradigms or knowledge claims that have taken root in today’s research, some of which are positivism, post-positivism, interpretivism, critical theory and pragmatism (Maree, 2007). A summary of these major paradigms and their respective ontological, epistemological, axiological, and methodological philosophical assumptions is presented in table 3-1 below.

Table 3-1 Major research paradigms and their philosophical assumptions

Source: (Aliyu, Muhammad, Rozilah, & David, 2014; Milman, 2012)

Descriptive	Positivism	Post-Positivism	Interpretivism	Critical Theory	Pragmatism
Synonym	Verify	Predict	Understand / Interpret	Emancipate	Dialectic
Ontology What is real?	Objectivist findings are the whole truth, which is realism	Modified objectivist, findings are probably true, and there is transcendental realism	Local, relative, co-constructed realities. There is subjective, objectivity and realism	Historical/virtual realism shaped by outside forces, material subjectivity	Constructed based on the world we live in and explanations that produce the best desired outcomes
Epistemology What is true?	The only knowledge is scientific knowledge- which is truth, reality is apprehensible	Findings approximate truth, reality is never fully apprehended	Co-created multiple realities and truths	Findings are based on values and local examples of truth	Objective and subjective points of view
Axiology What is the role of values?	Value- free, propositional knowing about the world is an end in itself, is intrinsically valuable.	Propositional knowing about the world is an end in itself, is intrinsically valuable.	Value-laden, and biased. Propositional , Transactional knowing is instrumentally valuable as a	Propositional , transactional knowing is instrumentally valuable as a means to social emancipation ,	Multiple stances, e.g. researchers include both biased and unbiased perspectives.
Methodology How do I examine what is real?	Quantitative- Primarily Experimental , Quasi- Experimental	Usually Quantitative- Experimental with threats to validity. Qual- a case study	Means to social emancipation . Often Qualitative and/or Quantitative	Which is an end in itself, is intrinsically valuable? Usually Qualitative, but also Quantitative	Quantitative & Qualitative Together (Mixed Methods Approach)

3.2.1 Positivism

The famous movement known as positivism started with Auguste Comte in the 19th century (Johnson & Christensen, 2008). These authors further stated that, positivism is the idea that only what we can empirically observe is important and that science is the only source of knowledge. Positivism, according to Lichtman (2013), dealt only with observable entities and objective reality; or traditional research paradigms (which are ways of seeing the world, make assumptions about it). Maree (2013) added that, only objective and observable facts can be the basis for science in positivism paradigm. He further explained the view of (Comte, the Vienna Circle, and logical positivism) that theological (the supernatural) or metaphysical (the abstract) claims must yield to positive – that which can be explained in scientific laws.

Further, Gray (2004) pointed that positivism it is the belief that what reality consists of, is what is available to the senses. Teddlie and Tashakkori (2013) were of the opinion that the knower and the known are independent within positivism paradigm. Research also has claimed that, within positivism the relationship between the self and the knowledge has been largely denied (Ryan, 2006). This means that for a statement to be true, it has to be tested and proved otherwise, Furthermore, blind faith in the positivist approach, according to Kim (2003), may potentially put at risk the unassailable of research in the social science because the influential contextual factors in organizations can be ignored by method aiming to draw casual inferences through examining only the phenomena that are readily observed.

3.2.2 Post - Positivism

Post- Positivism is a modification of positivism. Teddlie and Tashakkori, (2013) described post-positivism as an intellectual heir to positivism, which came about as a reaction to widely discredited axioms of positivity. A post positivist view would accept that reality can only be reached in an imperfect manner and nevertheless would anticipate a researcher striving to reach it (Lichtman, 2013).

According to Maree (2013), post-positivists approaches believed that reality is subjective and mentally individually constructed. He also asserted that, for the post-positivist researcher, the reality is not a fixed entity and it is to a certain extent agreed as a creation of the involvement of individuals in the research. Post-positivist thinkers focused on establishing and searching for valid and reliable evidence in terms of phenomena rather than generalization.

Critics of post-positivism criticized the participatory and interactive nature of quantitative and qualitative methods used in a study. They indicated that post-positivists employs methods that are merely an assembly of anecdotes and personal impressions that are highly suspicious in respect of research subjectivity and research bias (Maree, 2013).

In conclusion each school of thought enumerated above has its own advantages and disadvantages. Some of the criticisms made against one knowledge assumption could at the same time applied to the other. The choice depends in part on the aim of the research question.

3.2.3 Pragmatism

Pragmatists held that reality is external and multiple, constructed by humans in an ongoing process of action not in a posited structure of relations (Romm, 2014). According to pragmatist, any structure of relations between people is meaningless without action, but action must be guided by purpose and knowledge in order to perform changes in desired ways. The world is thus, changed through reason and action and there is an inseparable link between human knowing and human action (Goldkuhl, 2012). Pragmatists avoid arguing about metaphysical terms such as truth and reality. Instead, they argue that the value of evaluation is not based on whether they discover the truth, but on the demonstration that the results work with respect to the problem that is being studied (Mertens & Wilson, 2012). This invariably implied that pragmatism is typically characterized by a positive attitude toward integrating practice and rejecting traditional dualisms.

According to Hall (2013) the paradigm preferred empirical over idealistic or rationalistic approaches, as well as agreeing that knowledge and thinking should be seen as forms of activity, and as experimental inquiry. Considering their ontological stance, pragmatists believe in an external world independent of the mind as well as that lodged in the mind. They expected researchers not to ask questions about reality and the laws of nature and point them towards multiple methods, different assumptions, different worldviews, as well as different forms of data collection and analysis (Greene, 2012; Mertens & Wilson, 2012).

Research shows that pragmatism emerged through the work documented by Peirce, James, and Mead, to mention a few (Goldkuhl, 2012; Mertens & Wilson, 2012). In etymological terms, pragmatism is identified as a practical paradigm to providing solutions for existing problems and issues (Kalolo, 2015). The definition implies that pragmatism signifies practicality, prudence, compromise and a clear goal orientation in solving problems. From another perspective, pragmatism is believed to be a broad research paradigm covering many different areas which include knowledge, language and ethics (Goldkuhl, 2012). Other scholars have also noted that pragmatism is associated with action, intervention and constructive knowledge, drawing heavily on the inductive and deductive reasoning (Ihuah & Eaton, 2015). As a paradigm, it is characterized by its ability to accept all well-constructed paradigms of scientific inquiry as valid when they are appropriate (Kalolo, 2015).

The paradigm therefore, provides for both quantitative and qualitative research methodology to collect data and make inquiry into complex phenomenon in social and natural contexts (Creswell, 2009; Teddlie & Tashakkori, 2013). Pragmatists assert that, what works is what is useful and should be used, regardless of any philosophical or paradigmatic assumptions (Zandvanian & Daryapoor, 2013). Therefore, it can be described as a better process to answering “what”, “why” and “how” research questions (Saunders, Lewis, & Thornhill, 2009). It is acknowledged that pragmatism offers an alternative worldview to that of positivism and interpretivism and focuses on the problem to be researched and the consequences of the research (Creswell & Plano Clark, Designing and conducting mixed method research, 2011). These authors went

on to argue that pragmatism enables the researcher to be free of mental and practical constraints imposed by the “forced choice dichotomy” between positivism and constructivism, and researchers do not have to be prisoners of a particular approach or technique (Creswell & Plano Clark, Designing and conducting mixed method research, 2011).

The pragmatic research philosophy provides for the adoption of mixed methods as the data collection method which opens the opportunity to be objective and subjective in analyzing the points of view of the participants (Creswell, 2009; Saunders, Lewis, & Thornhill, 2009). It focuses on the problem and tries to provide practical solutions by the use of mixed methods (Ihuah & Eaton, 2015). By doing so, pragmatic approach allows permitted areas of interests to be studied embracing methods which are allow appropriate use of findings in a positive way in agreement with an identified value system (Creswell, 2009). It therefore, implies that pragmatic research is multipurpose in nature, making it a viable approach that address questions that do not fit comfortably within a whole qualitative or quantitative approach, research design and methodology (Ihuah & Eaton, 2013).

Pragmatic philosophy is concerned with the assumption that making choice between one position (i.e. ontology, epistemology or axiology) and the other is rather unrealistic in practice. Instead, it argues that the main significant determinant of which position to use is the research questions (Creswell & Plano Clark, 2011). However, this paradigm has its own ontological, epistemological, axiological and methodological positions in research. The essence of pragmatist ontology is actions and changes, and holding the argument that humans are acting in a world which is in a constant state of becoming (Goldkuhl, 2012).

3.2.4 Interpretivism

Interpretivism paradigm, according to Maree (2013), relates to hermeneutics, which is the study of theory and practice of interpretation. Schleiermacher and Dilthey as cited in Maree (2013) described understanding in terms of a process of psychology reconstruction in which the reader reconstructs the original intention of the author. Maree (2013) argues that the interpretivist view is found on the following assumptions:

- Human life can be understood from within. Interpretivism revolves around people's subjective experiences, on the way people construct the social world through sharing meanings, and how they interact with each other. Social life is a distinctively human outcome. There is a greater opportunity to understand the views they have of their own activities by placing people in their social contexts. The uniqueness of a particular situation (i.e. the context) is important to understand and interpret the meaning constructed.
- The human mind is the purposive source or origin of meaning. We can gain insights into the meanings impacted by discovering how meanings are constructed and hereby improve our comprehension of the whole. The knowledge of the social world affects human behaviour. The increase in human knowledge and understanding of the social world and the realities being constructed enriches his theoretical and conceptual framework.
- The social world is depends on human knowledge. The researchers' knowledge and understanding of phenomena always affect them in terms of the types of questions they ask and the manner they conduct their researcher. Interpretivism is a doctrine that emphasizes analyzing and meaning people confers on their own actions (Lichtman, 2013). Maree (2013) established that interpretivism has its most strength in the abundance and depth of exploration and descriptions it yields through the qualitative approach to research. However, it is criticized for its subjectivity and failure of the approach to generalize its findings above the situation being studied.

According to Creswell (2014), positing a reality which cannot be dissociated from our knowledge of it, the interpretivist paradigm suggested that researchers' values are inherent in all phases of the research process.

Following the nature of the research problem and research questions, the study was guided by the interpretive paradigm. An interpretive paradigm according to Creswell (2014) is based on the idea that people socially and symbolically construct their own organisational realities. Myers (2013) described Interpretivism as a paradigmatic theory which sees social constructions such as language, consciousness and shared meanings as central to the paradigm. In the light of this, Cohen et al. (2007) stated that interpretive paradigm aims to understand the subjective world of human experiences as well as to retain the integrity of the phenomenon under investigation.

This is because interpretivism is based on the view that humans can only understand the world as it appears to them and not as it really is (Van Rensburg, 2010). This means that reality from an interpretivist point of view is socially constructed. This implies that there will be need for interpretative analysis of data by the researcher which can only gain meaning if the researcher understands the language of the subject, together with all its attendant nuances (Taylor & Medina, 2013). This investigation adopted interpretive paradigm because it is consistent with the assumption that experience of the world is subjective and best understood in terms of individuals' subjective meanings rather than the researcher's objective definitions (Litchman, 2013).

Epistemologically, the interpretive approach has an anti-positivist orientation, as it emphasises that knowledge and understanding can be attained by the experiences of actors in their social context (Merriam, 2002; Neuman, 2009). The anti-positivists aim at understanding the subject's lived experiences and interpreting and giving meaning from a subjective perspective.

In the case of this study, a group of educators and learners in a social environment (school environment) who interact with each other, share common norms, values and rules provided the researcher with an opportunity to enter into their everyday life-worlds to explore and deeply understand their 'lived experiences' (views) in terms of their attitudes towards learning Mathematics and their performance in the subject (Lichtman, 2013). Moreover, the educators and learners involvement in this study were seen as unique individual people who interpret and practice events differently from others. Therefore, the researcher was interested in investigating the participants within their own contexts in an attempt to make sense and meaning of their attitude to teaching and learning in reality. In other words, the researcher would investigate what the participants think and see as meaningful and how they make sense of the world around them, since they are unique individuals in a specific context and would construct their own understanding of the events as they experience them (Van Rensburg, 2010). This makes the interpretive paradigm relevant to the study because 'attitude' has become uniquely a human activity.

According to Van Rensburg (2010), the design or approach that underpins interpretivist research is the qualitative design, which is used to reflect an interest in contextual meaning-making rather than generalised rules; hence this study is premised in this design. It was therefore imperative to adopt qualitative approach for this study to achieve the aim and objective of assessing the effect of learners' attitude on their academic performance in Mathematics without any form of generalisations to and from other settings or schools.

3.3 Research Approach

The structure in which a research study follows could be termed as the research approach. Research approach refers to the method of obtaining knowledge and activity of considering, reflecting upon and justifying the best method. Approach is the specific technique for obtaining the data that will give the evidence based for the construction of that knowledge. Thus, approach is about the theoretical and overall process to a research project rather than with the characteristics and practical application of popular

method (Wellington, Bathmaker, Hunt, McCulloch, & Sikes, 2005).

According to Maree (2007) there are different research approaches, namely quantitative, qualitative, and mixed method approaches. Creswell (2009) commented that the difference comes as a result of answers sought by the researcher to the following three questions:

1. What knowledge claims are being made by the researcher?
2. What strategies of enquiry will inform the procedures?
3. What methods of data collection and analysis will be used?

Positivism, interpretivism and post-positivism including realism and pragmatism as briefly enumerated above are the knowledge claims to mention a few. Creswell (2009) postulated that the strategies of inquiry or methodologies provide specific direction for procedures in a research design. These strategies can be experiments, quasi experiments, or surveys (in quantitative study), they can be ethnographies, case study or phenomenological research (in qualitative) (Creswell, 2009).

Quantitative and qualitative research methods differ primarily in the following ways:

- i. their analytical objectives;
- ii. the types of questions they pose;
- iii. the type of data collection instruments they use;
- iv. the forms of data they produce;
- v. how flexible is the study design.

The major difference between quantitative and qualitative as identified by Mack, Woodsong, Macqueen, Guest, and Namey (2005) are briefly outlined in table 3-2 below.

Table 3-2 Comparison of quantitative and qualitative research approaches

	Quantitative	Qualitative
General framework	Seek to confirm hypothesis about phenomena.	Seek to explore phenomena.
	Instruments use more rigid style of eliciting and categorizing responses to questions.	Instruments use more flexible, iterative style of eliciting and categorizing responses to questions.
	Use highly structure methods such as questionnaires, surveys and structured observation.	Use semi-structured methods such as in-depth interviews, focus groups and participant observation.
Analytical objectives	To quantify variation.	To describe variation.
	To predict casual relationships.	To describe and explain relationships.
	To describe characteristics of a population.	To describe individual experiences.
		To describe group norms.
Question format	Close-ended.	Open-ended.
Data format	Numerical (obtained by assigning values to responses).	Textual (obtained from audiotapes, videotapes, and field notes).
Flexibility in study design	Study design is stable from beginning to end. Study design is subject to statistical assumption s and conditions.	Some aspects of the study are flexible (for instance, the addition, exclusion, or wording of particular interview questions).
	Participant responses do not influence or determine how and which questions researchers ask next.	Participant responses affect how and which questions researchers ask next.
	Study design is subject to statistical assumptions and conditions.	Study design is iterative, that is, data collection and research questions are adjusted according to what is learned,

In order to answer the research questions (Section 1.3) posed in this study, qualitative research approaches which is associated with interpretive paradigm was considered. According to McMillan and Schumacher (2010), research approach is the process in which one collects and analyses data. It is systematic and purposeful in nature. McMillan and Schumacher (2010) further expounded that the researcher chooses qualitative methods because of the flexibility. Qualitative research is an inquiry whereby researchers interact with selected persons in their settings

Qualitative research is a common term that describes in-depth investigation about human behaviour. The rationale of qualitative research is to describe, understand and interpret human phenomena, human interaction or human discourse. Researchers within qualitative approach conduct interviews often in a way respondents tell their stories. Crossman (2017) among others posited that qualitative research is useful to examine the meanings that people attribute to their behaviour, actions, and interactions with others. Quantitative research is helpful for identifying relationships between variables (example, the connection between poverty and racial hate), but qualitative research clarifies reasons for the existence of this connection by going directly to people themselves.

Further, qualitative research is designed to divulge the meaning that informs the action or outcomes that are typically measured by quantitative research. Therefore, qualitative researchers investigate meanings, interpretations, symbols, and the processes and relations of social life (Crossman, 2017). In other words, qualitative research produces descriptive data that the researcher must then interpret using rigorous and systematic methods of transcribing, coding, and analysis of trends and themes (Crossman, 2017).

Crossman (2017) added that qualitative research lends itself well to creating new theories using the inductive method, which can then be tested with further research. Lichtman (2013) pointed to interviewees, informants, or conversational partners rather than subjects or sample to as sources of data for qualitative research. They suggested that one can easily understand experiences in ways which you do not expect.

Further, qualitative research is interesting in both intended and unintended consequences. Qualitative research shows determination to identify the phenomenon (Peter, 2003). It is also characterized by an understanding that contextual considerations should not be assumed to operate as destructive variables consistently or independently across a range of sites.

Qualitative research, according to Crossman (2017), is a type of social science research that collects and works with non-numerical data and that seeks to interpret meaning from these data to help us understand social life through the study of targeted populations or places. He went further to argue that people often term qualitative method to be the opposite of quantitative research that uses numerical data to examine large-scale trends and uses statistical operations to determine casual and correlative assumptions between variables. In addition, with respect to sociology, qualitative research is typically focused on the micro-level of social interaction that composes everyday life, whereas quantitative research typically focuses on micro-level trends and phenomena (Crossman, 2017).

3.3.1 Pros and Cons of Qualitative Research

Qualitative research uses 'wide and deep angle lens method' when examining behaviour as it occurs naturally in all its detail (Johnson & Christensen, 2008). Qualitative research has both benefits and drawbacks. These are stated below as informed by Crossman (2017) and Johnson and Christensen (2008).

3.3.1.1 Strengths of qualitative Research method

The advantages of qualitative approach are:

1. Data is based on the participants' own categories of meaning.
2. Qualitative method is useful for studying a limited number of cases in-depth.
3. It also creates an in-depth understanding of the attitudes. It also creates an in-depth understanding of the attitudes, events, interactions, behaviours and social processes that compose everyday life. In that regards, if enable social scientists

to understand how everyday life is affected by society-wide things such as social structure, social order and all kinds of social forces.

4. It provides individual case information.
5. It provides understanding and description of people's personal experiences of phenomena (that is, the emic or insider's viewpoint).
6. It can describe in rich detail phenomena as they are situated and embedded in local contexts.
7. Qualitative researchers are especially responsive to changes that occur during the conduct of a study and may shift the focus of their studies as a result.
8. Qualitative method also has the benefit of being supple and easily adaptable to changes in research environment and can be carried out with minimal cost in many cases.

The above descriptions show how the qualitative approach differs from the quantitative approach in a number of ways. It is idiographic and holistic in nature which aims mainly, to understand social life and the meaning people attach to everyday life rather than controlling measurement. It is concerned with the subjective exploration of reality from the insider perspective contrary to the outsider perspective where the world is regarded in terms of observable and measurable facts that are predominant in the quantitative approach. It generate descriptive data in the participant's own writing or spoken words through recognition of values and beliefs that bring about the phenomena of the participants and focuses on small samples instead of statistical methods (Babbie & Mouton, 2005; Johnson & Christensen, 2008; McMillan & Schumacher, 2006).

3.3.1.2 Weaknesses of qualitative method

Despite in-depth and comprehensive approach to data gathering of qualitative research approach, its weaknesses are discussed:

- i. Knowledge produced is not generalized to other people or settings (i.e. findings may be same as the relatively few people included in the study).
- ii. Quantitative predictions are difficult to make.

- iii. It may have less credibility with some administrators and commissioners of programs.
- iv. It mostly takes more time to gather data with respect to quantitative research.
- v. Researchers' biases and idiosyncrasies easily affect the outcomes. As a result, care must be taken with this method to make certain that researchers themselves do not influence the data collected at all and that they should not bring undue personal bias to their interpretation of the findings.

Thus, coming to understand these challenges associated with the qualitative approach enabled the researcher to take the subjective experience of the participants seriously as the essence of what is real for them (ontology) at the same time making sense of the experiences through their interaction and carefully listening to what they said (epistemology) in order to the participants' interpretations genuine without bias (Terre Blanche, Durrheim, & Painter, 2006).

Qualitative approach is appropriate for this study because it enables the researcher with the responses to the questions in the study. The researcher attempts to gain a clear understanding of the situations which learners experience when participating in learning of mathematics. Lichtman (2013) stressed that qualitative is about the conditions or relationships that exist, beliefs and attitudes that are held, affects that are being felt and developed trends. The research approach requires the researcher to be able to gain the trust of the subjects in order to avoid any personal biases, and in this way be able to garner data that will be fundamental to the process of the study.

3.4 Research Design

A research design illustrates the processes for carrying out the research study, coupled with when, from whom, and under what conditions the data will be collected, analyzed and reported (McMillan & Schumacher, 2010). Research design is also a plan which expresses the conditions and methods of collecting and analyzing data. It is a strategy which moves from understanding philosophical suppositions to indicating the participants' selection, choosing the method of data collection and lastly, to data analysis (Maree, 2013). He went further to explain that the choice of research design is based on the

researcher's assumptions, skills and research practices and influences the way in which she or he collects data.

A research design, according to Bless, Dessemontet, and Morin (2013), relates directly to the answering a research question and that the intention of a research design is to ensure high internal validity. In qualitative research, credibility is commonly used in place of internal validity and it is related with whether the method the researcher uses for collecting data and analysis correctly

Kuma (2005) pointed out that the major functions of a research design are to develop and to identify procedures and logistical arrangements to adopt during a study, as well as to emphasize to the value of quality in these procedures to ascertain their validity, objectivity and accuracy.

Suter (2012) defined qualitative research design as the logic that relates data to be collected (and the conclusion to be drawn) to the initial questions of the study. The documentation of the rigor leading to a meaningful conclusion and understanding becomes important because the purpose of most qualitative research is a deeper understanding of a phenomenon or process (Suter, 2012).

Further, a research design is an outlined plan of how the researcher will investigate the topic. Litchman (2013) indicated that research design is the blueprint, a plan of various elements of research, a detailed plan of how they related to each other. This research work sees the research design as the framework which details how the researcher plans to conduct the study (Lichtman, 2013). This study adopted case study research design.

3.4.1 Case Study

Cohen et al. (2007) identified a case study as “a process by which a researcher observes, describes, explains and views the operations and functionality of an individual person, an event, or social activity, or group of cases”. These authors added that case study is the approach which adopts in-depth study of one or more examples

of ongoing social phenomenon. This study adopted case study design because it helps the researcher to focus and deal with a specific unit in an in-depth way with a limited number of participants to obtain detailed information about learners' attitude and related challenges in teaching and learning of Mathematics exclusively with the three selected schools identified.

Further, in a case study, according to Mouton (2001), the researcher is able to establish rapport with the research subjects and this helped the participants to give more detailed information than they would have done in a more formal setting. Yin (2011) confirmed that the case study design allows the researcher to retain the holistic and meaningful characteristics of real-life events, such as individual life cycles, organizational processes, and neighbourhood change. In addition, it captures unique features which hold the key to the understanding of the situation that may otherwise be lost in larger scale data like surveys, as well as building in unanticipated events and uncontrolled variables (Nisbet & Watt as cited in Cohen et al, 2007).

A case study design may be single-case or multiple-case approach (Yin, 2011). In a single-case approach a unique phenomenon is studied whereas in the latter approach more than one case is studied. The multiple-case approach was preferred, based on the nature of this current phenomenon; hence three schools were involved in this study. The advantage of the multiple-case approach is that it allowed the researcher to establish whether the findings of one case or school occur in the other case for predictable reasons (a theoretical replication) since each case may have similar results (a literal replication) or predict contrasting results (Yin, 2011).

Yin (2011) identified two major concerns associated with the use of multiple-case approaches. First, is that they require extensive resources and time beyond the means of a single or independent researcher. Secondly, the evidence is often considered to be more compelling, and the overall study is regarded as more robust. In order to overcome these challenges, the researcher adopted a multiple-case as a multiple experiments whereby replication logic was followed by means of asking about the same phenomenon across cases to ensure that every case served a specific purpose within

the overall scope of the study.

However, case studies as a research design have some weaknesses. Among others are that, it is prone to problems of observer bias especially if it relies on an individual's memory since it is not easily open to cross-checking; and that the results obtained from a case-study cannot be generalized except where other researchers see their application (Cohen et al., 2007). To counteract these possibilities, I remained vigilant in terms of choosing knowledgeable participants and appropriate instruments so as to obtain data which captures the meaning of what the study is all about.

3.5 Population

A population of a study is the total group of persons or objects and events the researcher is willing in obtaining information and drawing conclusion about (Van Rensburg, 2010). Population can be described as a group of people, objects or items which from samples are taken for measurements (Babbie & Mouton, 2005; Okeke, 2015). A research population is seldom known as “target population”, or as a group of all elements (Bless & Higson - Smith, 2010; Johnson & Christensen, 2008). This can be referred to as the large group to which a researcher wants to generalize his or her findings.

The population of this study is comprised of all Grade 9 learners and the mathematics teachers of the three selected schools in Pinetown education District in Kwazulu-Natal.

3.6 Sample and Sampling Procedure

This section illustrates the sampling procedure for selecting the respondents and the total number of sample.

3.6.1 Sample

Sample can be defined as a group of subjects or situation representing a large group (Bless & Higson-Smith, 2010). According to Johnson and Christensen (2008), a sample is defined as a good sample as one that is representative of the intended population. In

other words, it means that a representative sample resembles the population that it came from on all characteristics (the proportions of males and females, teachers and non-teachers, young and old people, and so forth). They further highlighted that a sample is a set of elements taken from a larger population according to certain rules. Bless and Higson-Smith (2010) identified some advantages of sampling as follows:

- Collecting data on a sample is less time consuming.
- Collecting data on a sample is less costly since the costs of research are related to research.
- At times, the only practical way of collecting data.

The practical way of collecting data when the population is too large is sampling, thus making a study of all its elements impracticable.

3.6.1.1 Criteria for selecting the sample

The sample selection criteria required a decision as to which characteristics will reflect the sample population that will address the research question. Williams (2003, p. 73) suggested the following as the criteria for selecting a sample:

- The selected area should contain appropriate people (target population). The schools in which the data was collected were three different secondary schools.
- There must be a high probability that the study's focuses. The processes, people, programmes, interactions, and/or structures that are part of research question/s will be available to the investigator. In this research all these were available.
- An individual or individuals could conduct the research effectively during data collection phase of the study. The researcher was the only one who undertook the fieldwork. The duration of interviewing was two weeks.

Sample must enable generalizations to be made. It was possible for the researcher to generalize findings about the perceptions of the educators and learners about learners' attitudes and performance in Mathematics.

3.6.2 Sampling

Sampling is the selection of specific data sources from which data are collected to address the research objectives (Gentles, Charles, Ploeg, & McKibbin, 2015). They further emphasized that what is selected should include cases in addition to data sources. On the other hand, Maree (2013) asserts that sampling is known as the process of selection of unit of the population for study. Bush (2013) also pointed out that sampling refers to the process of selecting the sample from the population in order to obtain information regarding a phenomenon in a way that represents the population.

The quality of research, (whether quantitative or qualitative), is directly related to the sampling procedures, the sufficiency of the technique chosen, as well as the professionalism of implementation and the appropriateness of the sample size. The purpose of sampling is to provide various types of information of a qualitative or quantitative nature about a population by examining a few selected units. According to Punch (2011), the goal of sampling is to choose a sample that is broad enough to enable the researcher to speak about the population, big enough to enable the researcher to carry out the required analysis, and small enough to be managed (Punch, 2011).

Researchers in qualitative research must first decide whom or what to study. According to Johnson and Christensen (2008), this preliminary task is based on consideration that populations or phenomena are relevant to the research focus being proposed or developed. The researcher usually describes a number of criteria or attributes that the people to be investigated must have and use these criteria to differentiate the people of potential interest from those who should be excluded from consideration. The moment these inclusion boundaries are set, the researcher knows whom he/she wishes to study and can then try to locate and collect the sample (Johnson & Christensen, 2008).

Qualitative research is commonly found on non-probability and purposive sampling contrary to probability or random sampling approaches. Usually, qualitative approach involves smaller sample sizes than quantitative research studies (Maree, 2013). Johnson and Christensen (2008) agreed with Maree (2013) that sampling is the process of sample from a population. Sampling means selecting a group of people (subjects or participants) from a defined population (McMillan & Schumacher, 2006). White (2005) stated that sampling is to choose from the sampling frame to identify the people or issues to include in the study.

3.6.3 Sampling Technique

Qualitative research widely employs purposeful sampling technique for the identification and selection of cases that are information (rich cases) for proper utilization of limited resources (Patton, 2015), which does not plan to make a statistically representative sample or draw statistical conclusion. This technique entails identifying and selecting individuals groups of individuals that are especially knowledgeable about or experienced with a phenomenon of interest (Creswell & Plano Clark, Designing and conducting mixed method research, 2011). In this study, the researcher employed a purposive sampling technique, which was non-random sampling. With a purposive non-random sampling the number of people interviewed was less important than the criteria used to select them. This type of sampling does not require a list of a large population.

Participants for this study were purposively selected from three secondary schools. The samples of three teachers and twelve learners were purposively selected to provide information through interview on learners' perception and their interests in learning Mathematics.

In purposive sampling the researcher identified the characteristics of a population of interest and then attempts to locate individuals who have those characteristics (Johnson & Christensen, 2008). Purposive sampling, according to these authors, is a non-random sampling method where the researcher seeks individuals with particular behaviours to participate in a study. Merriam (2002) pointed out that purposive

sampling is a type of inquiry that seeks to understand the meaning of a phenomenon from the perspective of the participants. It is essential to choose a sample from which the most can be learned. Purposive sampling is used in special situations where sampling is done with a specific purpose in mind (Maree, 2013). Ezzy (2013) argued that purposive sampling provides a clear criterion or rationale for the selection of participants, or places to observe or events, that relate to the research question.

According to Christensen, Johnson, and Turner (2015), purposive sampling is preferred when samples selected are information-rich and could inform the issues under study. In the same vein, Cohen, Manion, and Morrison (2011) asserted that the outcomes in purposive sampling may be ungeneralisable. However, this may not be the main challenge in such sampling; but rather the challenge is to acquire an in-depth information those who are willing to provide it.

Through purposive sampling, the participants in this research were chosen because of some specific characteristic which made them holders of the data needed for the study. Thus information-rich cases were selected. Table 3-3 shows different types of purposeful sampling (Cohen et al., 2007).

Table 3-3 Different types of purposeful sampling

Types of purposeful Sampling	Description
i. Typical sample	Reflecting the average population of the phenomenon under study
ii. Unique sample	Having unique sample or rare attributes
iii. Maximum variation	Selecting a wide variety of instances of observed situation
iv. Snowball, network sampling	Each participant refers you to another participants
v. Theoretical sample	Samples are not selected in advance, because initial sample leads to the next people to be participants
vi. convenience	To gather information from respondents who the researcher can easily access

3.6.4 Challenges of using purposeful sampling

In spite of its wide use, many challenges are acknowledged in identifying and applying the proper purposeful sampling technique in any study (Palinkas, et al., 2015):

The range of difference, for example, in a sample where purposive sampling is to be taken is usually not really recognized at the outset of a study. In order to set as a goal the sampling of an information-rich informants that cover the range of variation assumes one acknowledge that range of difference.

Secondly, there are differences in opinion with respect to these approaches within qualitative researchers, with some rejecting systematic sampling of any type and refusing the limiting nature of the realist, systematic, or positivist approaches (Palinkas, et al., 2015, p. 536).

3.6.5 Selection of research participants: Purposive

The selection of the participants for this study is purposive. Purposeful sampling method was used in this study; whereby participants willingly volunteered to participate in the study. The sampling of learners was done by selecting four learners from Grade 9 class and a Grade 9 Mathematics educator per school for the three selected schools using purposeful sampling. The following table illustrates the sample of learners and teachers (Table 3-4). The four learners from each school were selected based on their previous performance in mathematics in the following criteria two learners that scored 50% and above, and another two learners that scored below 40%.

Table 3-4 The research sample

Participants	School A	School B	School C	Total
Teachers	1	1	1	3
Learners	4	4	4	12
Total	5	5	5	15

3.7 Data collection instruments, procedures and data analysis

This study used multiple data collection methods which is known as triangulation to collect data especially from the participants. The collection of materials by two or more different means and from many diverse sources as possible, according to Terre Blanche, Durrheim, and Painter (2006), is known as triangulation. Similarly, Cohen et al. (2007) argued that the more techniques contrast with each other, the higher the confidence of the researcher in the findings confirmed by the technique. Hence, this study employed a document analysis, observations and semi-structured interviews as data collection instruments. The use of data triangulation enabled the researcher to approach the phenomenon from different angles for better understanding.

3.7.1 Interviews

Interview is method of collecting data with the aim of gathering information through one-on-one verbal interaction between the interviewer and the interviewee (Willis, 2007). In the same vein, Schostak (2006) added that an interview is an extendable conversation between partners that aims at having 'in-depth information' about a certain topic or subject, and through which a phenomenon could be interpreted in terms of the meanings interviewees bring to it. Conversation involves two people; the interviewer and the interviewee (i.e. the participant). Under this interaction, the interviewee can say as much as he or she wants.

Further, Christensen, Johnson, and Turner (2015) described an interview as a method used to get more in-depth insight on the attitudes, thoughts and actions of the participants in form of verbal response. Moreover, Maree (2013) highlighted interview is a two way conversation in such a way that the interviewer asks the interviewees questions in order to gather data and to learn about the ideas, views, beliefs, behaviours and opinions of the interviewees. The intention of qualitative interviews is to see the world through the respondents' eye, and they can be valuable source of information, in as much as they are used properly.

Mathers, Fox, and Hunn (2002) said that the quality of the data collected in an interview is important and will depend on both the design of the interview and on the researcher's skill. An inadequately planned interview for instance, may include leading questions or questions that are not understood by the subject. As a result, an unskilled interviewer may "consciously or unconsciously influence the responses that the subject makes, and the research findings will be influenced detrimentally in either circumstance," (Mathers, Fox, & Hunn, 2002, p. 1).

Qualitative interviews, according to Johnson and Christensen (2008), consist of open-ended questions and provide qualitative data and that qualitative interviews are equally referred to depth interviews because they can be used to obtain in-depth information about participant's thoughts, beliefs, knowledge, reasoning, motivations and feelings about the topic.

Alshenqeeti (2014) identified five types of interviews that are frequently employed in social sciences which includes structured interviews, semi-structured interviews, informal conversational interviews, non-directive interviews and focused group interviews. Other types are face – to – face and telephony interviews. The researcher preferred semi-structured interviews because probing can be area of challenge for structured interview. This is because the participants may not understand the question or could be unable to answer it or may not have received sufficient information to answer the question.

3.7.1.1 Advantages of the interviews

According to Robson (2007):

- Interviews are a research version of something you do all the time.
- No special equipment is needed apart from a good tape-recorder and microphone.
- The interviewer is able to adjust questions to obtain valid information (i.e. flexibility).

- The atmosphere enables the respondent to be open and honest as against the questionnaires where the participants can just fill in answers to the questions.

The purpose of conducting an interview, according to (Lichtman, 2013), is to collect information from the participants about the study in question. The researcher used interview method to probe more valid information about the attitude of the learners and their opinion which he could have not managed to get with any other method.

3.7.1.2 Structured Interview (standardized interviews)

Structured interviews enable the interviewer to ask each other interviewee the same questions in the same manner (Mathers, Fox, & Hunn, 2002). Maree (2007) posited that in structured interviews, the questions are detailed and developed in advance. There is little probing in structured interview since the questions are excessively structured. The main feature in structured interview is that it is generally planned around a number of predetermined direct questions that need immediate, mostly 'yes' or 'no' type, responses (Alshenqeeti, 2014), wherein the researcher and the respondents would have very little freedom (Berg, 2007). In its form, it can be argued, that this kind of interviews is related to the 'self-administered' quantitative questionnaire in both its form and underlying assumptions.

3.7.1.3 Semi-structured interviews

Semi-structured interview is a more flexible type of the structured interview as it enables depth to be accomplished by offering the opportunity on the part of the interviewer to probe and expound the interviewee's responses (Rubin & Rubin, 2005). In the same vein, semi-structured interviews give the opportunity for flexible, open-ended questions allow additional probing of the responses of the respondents for clarification (Harris & Brown, 2010). This study adopts individual semi-structured interviews. (Cohen et al., (2010) point out that, individual interview is a two-way communication between two individuals (the interviewer and interviewee) on a topic of common interest. The researcher considered individual interview suitable contrary to the focus group interview, to prevent the phenomenon referred to as 'groupthink'.

According to Cohen et al. (2011), groupthink discourages individuals in an interview with another view from other members to voice their opinion. Focus groups can at the same time lead to nonparticipation/dominance by some members of the group and the introverts may be denied a voice (ibid). Another reason the researcher considered individual interviews suitable, was that, there are another shifts in behaviour of respondents, having the chance to probe respondents based on their behavioural change.

Moreover, semi-structured interviews employed an interview guide (checklist) with open-ended questions. According to Leedy and Ormrod (2014), an interview guide is a scheduled questions that the interviewer plans to ask, about the research questions and are prepared beforehand. Notwithstanding, the interviewer is permitted flexibility in the interview procedure where he/she can probe and investigate further issues raised by the interviewee Cohen et al. (2011). For the purpose of this study, the interview guide for this study was prepared to cover all relevant areas (i.e. research questions). The interview guide allowed the researcher the probing of views of the interviewees during the interview process in order to keep the interview within the parameters identified by the aim of this study (Berg, 2007). The interview guide is shown as Appendix A. The researcher was able to digress from the interview guide in order to explore further issues identified by the participants. If there is a need to guide the participants back to the focus of the interview, the researcher can use semi-structure interview (Maree, 2013). A good interviewer is a good listener who will avoid dominance in the interview process and at the same time understand he is there to listen.

One of the advantages of semi-structured interviews according to Gray (2004), is that it permits for probing of views and opinions. Further, it creates room to explain or rephrase the questions if interviewees are ambiguous. However, despite the strengths of semi-structured interview, it has its weaknesses. One of the weaknesses is that inexperienced interviewers may be unable to ask prompt questions. They are easily side-tracked by trivial aspects that are not related to the study (Maree, 2013). Further, care must be taken to avoid excessive use of probing questions which makes the participants feel intruded upon thereby diminishing the likelihood and the willingness to

entering into a deeper exploration of the issues (Terre Blanche, Durrheim, & Painter, 2006).

3.7.1.4 Focus group interviewing

Focus group is a carefully planned series of discussions designed to obtain perceptions on a defined area of interest in a permissive and non-threatening environment (Krueger & Casey, 2009). Kitzinger (2010) regarded focus groups as a forum of group interviews that focuses on communication between the interviewer and participants in order to generate data. Further, Barber (2008) pointed out that focus group can be viewed as group interviews only that it does not depend on question and answer format as is the case with group interviews; rather they depend on the interaction within the group. According to Mathers, Fox, and Hunn (2002) focus groups can be useful to obtain certain types of information or when circumstances would make it difficult to collect information using other methods of data collection. In the same vein, Barbour (2008) said focus groups in research are desirable when studying professional practices.

Focus group is based on the supposition that group interaction will be fruitful in broadening the range of responses, activating forgotten details of experience and realizing inhibitions which may otherwise discourage participants from disclosing information on the attitudes and performance of learners in mathematics (Maree, 2013).

The advantages and disadvantages of focus group interviews according to King and Horrocks (2010) are listed below:

Advantages

1. They are quick and relatively easy to set up.
2. Group dynamics can afford helpful information that individual data collection does not give.
3. Is useful in gaining insight into a topic that is more complex to collect information through other data collection methods.

Disadvantages

1. Prone to facilitator bias.
2. Discussion can be dominated by few individuals.
3. Data analysis takes time and requires early planning.
4. Does not offer valid information at the personal level.
5. The information does not represent other groups.

3.7.2 Observation

Observation is a data gathering technique on which qualitative interpretive research heavily depends on (Cohen et al., 2011; Neuman, 2009). For example, Cohen et al. (2011) posited that observations consist of detailed notation of behaviour, events and interactions and the contexts surrounding these. Further, observation can be defined as the systematic procedure of recording the behavioural patterns of respondents, objects and occurrences without necessarily questioning or communicating with them (Maree, 2013).

In addition, observation allows researchers to study people in their native environment in order to understand 'things' from their perspective. This is an everyday activity that engages our senses (i.e. seeing, touching, hearing, tasting and smelling) and intuition to collect the require data. Thus, observation is a qualitative data collecting technique in which the researcher engages senses to collect bits of data (Maree, 2013). The researcher adopted this technique in this study to enable him to get a deeper knowledge and understanding of the behaviours of the educator and the learners during teaching and learning.

However, Lichtman (2013) pointed out that the researcher must remember at all times his/her original role as a researcher and remain detached enough to gather and analyze data applicable to the problem under study. Maree (2013) posited that in qualitative research there are four types of observations:

- i. observer as participant
- ii. complete observer

- iii. complete participant
- iv. participant as observer

This study used the observer as non-participant approach. There are different roles observers take such that: If you are part of the group you observe, or if you become part of the group, you are called a participant observer. Observation usually occur in settings that already exist, like home, educational or work settings, rather than in a contrived setting (Lichtman, 2013).

The good part of observation is that the researcher or the observer is able to record current behaviour. Leedy and Ormrod (2014) were of the opinion that the researcher or observer is an outsider enables him or her to see phenomena about the situation in which the people involved may take for granted. Therefore, the researcher was able to understand the framework of the phenomenon under study through observations. In addition, observations allow the researcher to determine phenomena that respondents might not freely talk about, for instance in interview situations (Cohen et al., 2007).

3.8 Data Collection Procedure

The researcher sought for permission in writing to access the schools where the research was carried out (i.e. the principals of the schools) and from the Department of Education and the Permission was granted to the researcher by the Department of Education and school principals to collect data from the selected schools. Interviews and observation were used to collect data from both the educators and learners on Grade 9 learners' attitude toward learning mathematics in the selected schools.

The researcher afterwards arranged times with school principals to visit the selected schools. The researcher then went to conduct interviews with the selected learners and Grade 9 Mathematics educators at the selected schools. Interviews were carried out according to the agreement with school principals. The purpose of the study was clearly explained that it was about the attitudes of learners toward Mathematics. Informed consent forms were given to the participants to sign before the interviews began. Participation was voluntary and the participants were informed that they had the right to

withdraw from the interviews anytime they wished to and that their identity would be protected.

3.9 Data Analysis

Qualitative analysis, according to Lichtman (2013), is a systematic procedure of selecting, categorizing, comparing, synthesizing and interpreting the phenomena of interest. In this study, the researcher analyzed the data collected from the educators and learners of the selected schools through transcribing, coding, categorizing and theming. Thus, this process gives meaning to the information collected for easy access by any interested readers of the study.

Bless et al. (2013) pointed out that coding procedure is the core component of qualitative analysis. Therefore, codes are a sort of categories, and the process of coding involves breaking up the original transcripts and classifying the fragments into these various categories. Further, qualitative data analysis attempts to ascertain how respondents make meaning of a particular phenomenon by analyzing their attitudes, perceptions, values, knowledge, understanding, feelings and experiences in order to approximate construction of the phenomenon (Christensen, Johnson, & Turner, 2015).

Qualitative data analysis according to Maree (2013), seems to be a continuous and iterative (non-linear) procedure, implying that data collection, processing, analysis and reporting are intertwined and not merely a set of successive steps. Lichtman (2013) posited that the researcher codes words, phrases, segments, or other portions of text to make meaning to the data. He further suggests that the researcher begins with a large amount of material, for example, the text of an interview. That material is dissected and categorized into codes. The codes are reviewed to look for ones that overlap or are redundant (organize and categories). Coding techniques were used to categorize the responses according to individual point of view. The researcher placed the raw data into meaningful categories in order to examine them holistically. Observation were recorded on field note and content analysis of code and data classification was used.

3.10 Validity

Validity, according to Suter (2012) is the most important quality of a measured dependent variable or a test score. This is because validity has to do with whether the instrument used actually measures what it is intended to measure. Validity is a primary concern of all researchers who gather educational data.

Christensen, Johnson and Turner (2015) suggested that the potential challenge to validity is that researchers must watch out for what is known as researchers' bias' which means obtaining results consistent with what the researcher intends to find (Johnson & Christensen, 2008). They further emphasize that researcher bias tends to result from selective observation and selective recording of information and also allowing one's personal views and perspectives to affect how data are interpreted and how the research is conducted. In the same vein, Christensen et al. (2015) argue that there are other terms associated with research validity in qualitative research such as descriptive validity, interpretive validity and theoretical validity.

First, descriptive validity refers to the factual accuracy of the account as reported by the researchers. In other words, descriptive validity refers to accuracy in reporting descriptive information (description of objects, people, events, behaviours, settings, times, places, etc.) (Christensen et al., 2015).

Secondly, interpretive validity refers to accurately portraying the meaning attached by participants to what is being studied by the researcher. More importantly, it refers to the degree to which the research participants' viewpoints, thoughts, feelings, intentions, and experiences are accurately understood by the qualitative researcher and portrayed in a research report (Christensen et al., 2015).

Thirdly, theoretical validity referred to the degree to which a theoretical explanation developed from a research study fits the data and is therefore credible and defensible. A strategy for promoting theoretical validity is extended fieldwork, which means spending a sufficient amount of time studying research participants and their setting so that you can have confidence that the patterns of relationships you believe are

operating are stable and so that you understand why these relationships occur (Johnson & Christensen, 2008).

The questions such as, 'what does this instrument actually measure?', 'what do the results actually mean?' are common to validity. According to Bless et al. (2013), except the researcher can be sure that the measurement techniques are actually measuring the things that they are supposed to be measuring, the results may be difficult to interpret. Further, validity is concerned with how accurately the observable measures actually represent the concept in question or whether, in fact, represents something else. In considering the issue of validity, the researcher took the necessary steps with the development of instrument to ensure validity. The researcher's supervisor first checked the validity of the interview questions to ensure the relevance to the study conducted. This was also to check in case the expected answers might offend someone or might cause any unforeseen problem or in case the answers might embarrass the researcher. All the interviewees were asked the same questions and given enough time to respond. Follow up questions asked. The researcher paraphrased the interviewee's responses after some questions. This served to increase validity by checking whether what the interviewer had heard was actually what the interviewee intended to say.

3.11 Reliability and Trustworthiness

Reliability connects with internal validity, because reliability is of little consequence if the measure is not a valid one (Suter, 2012). Further, the author added that it is a necessary condition for validity because reliability must be present for validity to exist. Reliability tells how well an instrument is measuring whatever it is measuring.

Reliability involves the consistency or repeatability of a measure or instrument and high reliability is obtained when the measure or instrument gives the same results if the research is repeated on the same sample (Maree, 2007). Reliability refers to the stability or consistency of measurement (Delpont, 2005), accuracy and precision (Cohen et al., 2007). The lower the degree of error in the instrument, the higher is reliability.

Trustworthiness of reliability of the study was confirmed for this study when the responses from the participants are more or less the same. In other words, when coding data, there were similar themes and conclusions. In qualitative research, reliability is referred to as the relationship between the recorded data and what has actually occurred in the setting being studied (De Vos, 2000). In order to enhance reliability, all collected data were analyzed and interpreted in a uniform manner in this research.

3.11.1 Trustworthiness

Apparently, trustworthiness does not absolve the qualitative researcher of the need to evaluate the value of research, but it is done in relation to how much trust of the reality under investigation (Bless et al., 2013). In the same vein, Suter (2012) indicated that qualitative researchers use different terms to communicate the worth of their measurements and conclusions based on them. Perhaps, the most common is trustworthy which is a concept used to refer to both reliability and validity in qualitative research.

Trustworthiness is the utmost important element in qualitative research Maree (2013). Assessing trustworthiness is the “litmus test” of data analysis. According to Maree (2013, p 113), the under mentioned points can enhance the trustworthiness of a study:

- i. **Multiple data sources:** Using data from different sources can help check findings;
- ii. **Verifying raw data:** The researcher may ask participants to verify the data collected in earlier interviews during subsequent data interviews or during informal conversations with participants. The researcher may sound out his/her earlier understandings with the participants to verify if the interpretation of what they have shared is correct.
- iii. **Maintaining confidentiality and anonymity:** Researchers think that as long as they do not mention names or positions of persons they have achieved confidentiality and anonymity

As a matter of fact, qualitative researchers use different terms to communicate the worth of their measurements and conclusions based on them (Suter, 2012). According to this author, trustworthiness is a common concept used to refer to both reliability and validity in qualitative research.

Bless et al. (2013) suggested some tools for increasing research trustworthiness as follows:

- i. **Adequate description of context:** which is, detailed descriptions of the researcher, the participants, their relationship, and the context in which they find themselves are essential because qualitative research emphasizes the context in which the study takes place.
- ii. **Concurrent data collection and analysis:** meaning, by analysing data as it is being collected might highlight a particular aspect of the investigation that the researcher was not previously aware of. This might mean, for example, adding a question to an interview.
- iii. **Triangulation:** method most frequently used to verify and increase the trustworthiness of qualitative research. The purpose of doing this is to show that the results obtained are independent of the methodology used.
- iv. **Methodological verification:** this is the method of involving other experienced researchers verifying the logic and implementation of the procedures of the methodology.
- v. **Ensuring data saturation:** The researcher should be able to prove that enough data has been gathered to reflect the full range and the depth of the topic.
- vi. **Respondent validation:** Sometimes called member checking or informant feedback is a process whereby the researcher presents the outcomes of a study to the people who provided the original data and asks for their feedback.
- vii. **Use of sufficient verbatim:** When many direct quotations from original data in research are included, the reader will be able to hear exactly what the respondents are saying and how the researcher interprets information. This is another important characteristic of rigorous qualitative research.

Qualitative researchers agreed that the data trustworthiness obtained through direct observations, interviews, or focus groups, is based on the following: (Suter, 2012, p. 362):

- i. **Transferability:-** which refers to the supporting evidence to the generalization of findings to other contexts – across several participants, groups, situations, etc.
- ii. **Dependability:-** in which qualitative researchers collect evidence to support the claim that similar results would be obtained if the investigation is repeated.
- iii. **Confirmability:-** referred to objectivity (neutrality) and the researchers' bias control. Likewise, consistency of qualitative research findings that resulted in similar conclusions enhanced confirmability.
- iv. **Credibility:-** referred to believability of the findings and is improved by evidence like confirming evaluation of conclusions by participants, convergence of multiple sources of evidence, control of unwanted influences, theoretical fit.

3.12 Ethical Considerations

Ethical concerns stem from discussions about codes of professional conduct for researchers (Creswell, 2009). Creswell adds that participants are to be protected, develop trust with them, promote integrity and guard against misconduct and inappropriate use of data that will divulge their private lives. In other words, each stage in the study process raises ethical issues. To put it in Cohen et al. (2011) perspective, qualitative research mostly requires obtaining consent and cooperation from people or institutions that are involved in the research or providing facilities for the study. McMillan and Schumacher (2006) pointed out that, from a moral perspective, ethical issues in research deal with beliefs based on what is considered to be correct or wrong, good or bad, proper or improper.

Ethical behaviour symbolizes a number of moral principles, rules, or standards governing an individual or a profession. To be ethical, according to Lichtman (2013) is to do well and avoid evil. Johnson and Christensen (2008) put ethics as the principles and guidelines that help us uphold human value. Bless et al. (2013) emphasized the

importance of respecting participants' rights and dignity. They added that, no research work should in any way violate participants' legal and human rights when participants are recruited. A crucial part of protecting individuals' dignity is to understand and respect their culture.

Johnson and Christensen (2008) pointed out three basic approaches that people tend to adopt when considering ethical issues, which are; deontology, ethical scepticism and utilitarianism.

First, the deontological approach assumes the position which ethical issues must be judged on basis of some general code, (The root of the word is the Greek word "deon", which means "duty" or "obligation"). Some behaviour is inherently unethical and should never be performed regardless of the situations.

Another approach is that, a person using ethical skepticism would argue that concrete and inviolate moral codes such as those used by the deontologists cannot be formulated. According to this approach, an ethical decision must be a matter of the individual conscience, and the researcher should do what he or she thinks is right and refrain from doing what he or she thinks is wrong.

Lastly, utilitarianism is an ethical approach that maintains that judgement relating the ethics of certain research study is based on the consequences that study for individual participants and the larger benefit that may arise from the study.

Research ethics emphasizes on the humane and sensitive treatment of research participants, who might be at varying levels of risk by research processes. It is therefore the responsibility of the researcher to make sure that his/her research is ethically conducted. It should be noted that the researcher must be sure that the research plan pass an ethical evaluation before contacting any participant.

The researcher informed the participants accordingly about the purpose of the research, type of interview questions they would be subjected to and the need for their voluntary participation. It is the responsibility of the researcher to protect the rights and welfare of the participants in the study.

The specific ethical issues considered in this study are discussed below.

3.12.1.1 Permission

Permission to visit schools was sought from and granted by the Department of Education. The researcher took the letter collected from the University of Fort Hare Ethic Committee (UREC) as **ethic clearance certificate** to the Department of Education, so as to ask for permission to conduct research in schools alongside with the letter written by the researcher **(See appendix C and E)**.

According to Bless et al. (2013), permission is to gain access to research participants by means of the gatekeepers. This means that sometimes it may be necessary for the researcher to approach the gatekeeper like school or educational authorities before approaching the participants directly to participate in the study. Wanat (2008) argued that gatekeepers are those who give access to a research field. Their role may be in allowing investigators into a given physical space, or it may go further in granting permission for research to be conducted in a particular way.

3.12.1.2 Informed consent

Johnson and Christensen (2008) pointed out that informed consent can be referred to as agreeing to participate in a research after being informed of its purpose, procedures, alternate procedures, benefits, risks, and limits of confidentiality. Before a person can participate in a research study, the researcher must give the prospective participant a description of all features of the study that might reasonably influence his or her willingness to participate **(see appendix F)**.

Participants in research need to be informed about what they are about to enter into before they make a decision to participate. Individuals participating in a research study should be informed of the nature of the study and may choose whether or not to participate (Lichtman, 2013), and they should not be forced into participation. However, in some cases, it may be difficult to obtain informed consent. It becomes a challenge to obtain consent from minors or individuals who do not have a clear understanding of written English or those who are mentally disabled or emotionally fragile (Lichtman, 2013).

Where minors are not able to make decisions on their own and cannot give consent, consent is to be obtained from the parents (or minor's legal guardian) after they have been informed of all features of the study that could influence their interest to permit their children to take part (**see Appendix G**). Assent must be obtained from the minor after consent has been obtained from the minor's parent or guardian (Johnson & Christensen, 2008). This means that the minor must also agree to partake in the study after being informed of all the conditions that could affect his/her willingness to partake. Informed consent is one of the critical issues to be sure the participants are duly informed, to the extent possible, about the nature of the research (Lichtman, 2013).

Getting informed consent implies that necessary information is given about the purpose of the study and procedures to be followed during the research work. The possible advantages, disadvantages and risks the participants may be exposed to, as well as credibility of the researcher, according to Babbie (2006), are to be communicated to the participants or their legal representatives. The researcher sought informed consent from participants in this study. A consent form was designed and participants were asked to complete it after the purpose of the study and conditions of participation were explained to them.

The researcher gave the details of the study that it was for academic purposes and that the findings are important in the improvement of curriculum planning and development. All participants signed the consent form and were made to realize that they could withdraw from the study at any time since participation was voluntary.

Johnson and Christensen (2008) identified some other forms of consents a part from informed consent, namely; passive and active consent, additional consent and something on deception.

1. Passive versus Active Consent

Passive consent is a process whereby consent is given by not returning the consent form. Parents or legal guardians return the consent form only if they do not want their child to participate in the research. On the other hand, active consent involves consenting to partake in a study by signing a consent form. The parent of the minor would go through the consent; either gives or refuses to consent, and return the consent form to the researcher.

2. Additional Consent

Additional research studies that are conducted within the confines of a school system require cooperation of a variety of individuals such as teacher and head of department who must give their approval to the study. This means that informed consent must also be received from them.

1. Deception and Debriefing

The principle of informed consent, involves the research participants receiving information about the purpose and the nature of the study. Occasionally providing full disclosure of the purpose and nature of the study will change the result and invalidate the study. Thus, it is necessary to withhold or mislead information from the research participants, in such case. In other words it is necessary to engage in deception to conduct a valid study (Johnson & Christensen, 2008).

Deception is discouraged according to the American Education Research Association (AERA) Guiding Standards, except it is necessary for the integrity of the study. Whenever a research involves deception, the reason for deception must be explained to the participants in the debriefing session that will be held after the completion of the

study (Johnson & Christensen, 2008). In the same vein, Bless et al. (2013) stated that deception may lead to several ethical challenges and if used, safeguards must be employed. The most safeguards are:

- The researcher should ensure that the deception cause no serious or long-term risk.
- The researcher should communicate the true nature of the deception to the respondents in a debriefing, which happens once all the data has been collected.
- The debriefing should oppose any lingering misconceptions, possible discomfort, or risk that may have been spawned by the deception.

Debriefing must be done carefully to make sure that participants are not left with bad feeling or doubts about themselves based on their performance in their study. Debriefing refers to a post study interview, in which all aspects of the study are revealed, any reasons for deception are explained, and any questions the participant has about the study are answered. Johnson and Christensen (2008) argued that debriefing should meet the two goals of dehoaxing and desensitizing.

Dehoaxing refers to informing the participants of any deception that was used in the study and communicating the reasons for its use. On the other hand, desensitizing refers to helping the participants during the debriefing interview, deal with and eliminate any stress or other undesirable feeling that the study created, as might exist if you are studying cheating behaviour or failure. One of the tactics used by experimenters is to point out that the participant's behaviour or feeling was normal and expected. In this study there was no deception made and the consent forms were signed by the participants.

3.12.2 Rights of participants

The AERA ethical standards clearly state that research participants have the right to withdraw from a study at any time, unless otherwise constrained by their official capacity (Johnson & Christensen, 2008) and that special consideration should be given to the minors and their freedom to dissent. The Ethical Standards for Research in Child

Development states that, the child's freedom to choose not to participate should be respected. No research work must violate participants' legal and human rights when participants are recruited. A crucial area of protecting the dignity of the people is in understanding and respecting their culture (Bless et al., 2013). Participants have a right to take part or to withdraw anytime they want to do so. In this study, the participants were provided with an explanation that they had the opportunity to terminate their participation at any time with no penalty.

3.12.3 Confidentiality and anonymity

Obtained information particularly from the participants has to be treated with confidentiality. There should be no access to personal data or the names of participants by any third party except the researcher. A system to link names to data, if used, can be destroyed. The researcher met with participants in order to communicate the purpose of the study to them, reasons and benefits for their participation and the right to participate or not.

Any individual, group or organization participating in the research study has a reasonable expectation that its identity will not be revealed (Lichtman, 2013). Identifying information should be removed from researcher's records. Permission from the participants to make public information that might reveal who they are or who the organization is should be asked from the participants. Importantly, caution must be taken in publishing long verbatim quotes.

According to the AERA ethical standards, the research participants have the right to remain anonymous and the confidentiality of both the participants and the data obtained must be protected (Johnson & Christensen, 2008). Privacy is defined according to Johnson and Christensen (2008), as controlling other people's access to information about a person. Respecting the privacy of research participants is at the heart of conducting ethical research. Further, anonymity, according to Johnson and Christensen (2008) is an excellent way of protecting privacy because anonymity means that the identity of the participants is not known to the researcher. Confidentiality is the other

means that researchers use to protect the privacy of the research participants. Confidentiality also refers to an agreement with the research investigators about what may be done with the information obtained about a research participant (Johnson & Christensen, 2008).

The participant is entitled to expect that any information given to the researcher will not be made available to anyone else and will be treated in a confidential manner (Lichtman, 2013). The researcher needs to be very sensitive to the information collected from minors and others who may be in a vulnerable condition.

3.12.4 Harm to participants

The main challenge the researcher is confronted with is the treatment of the research participants (Johnson & Christensen, 2008). Qualitative research is an on-going and evolving procedure, with the process of data gathering which is more like friendship connection between the researcher and the respondent.

There should be a reasonable expectation by those participating in a research study that they will not be involved in any situation in which they might be harmed (Lichtman, 2013). It is best to safeguard against doing anything that will harm the participants in a study.

Non-maleficence is a basic principle of research by which the participants suggest that participants must not be harmed by participating in the study (Bless et al., 2013). These researchers further indicated that it should be noted that harm may happen intentionally or unintentionally during the course of the study. If a certain research process results to unpleasant effects for participants, the researcher must have got the firmest scientific grounds for carrying it out.

3.12.5 Rapport and Friendship

Researcher must develop rapport with the participants once they have agreed to take part in the study so as to attract them to disclose information (Lichtman, 2013). Likewise, the researchers should make sure that they provide an environment that is trustworthy; and at the same time, they need to be sensitive to the power that they hold over participants (Lichtman, 2013). Researchers need to avoid setting up a situation in which participants think that they are friends with a researcher.

3.12.6 Intrusiveness

Intrusiveness, according to Lichtman (2013) means intruding on participant's time, space, and personal lives. As the researcher designs a research study, he or she has to be able to make a reasonable estimate of the length of time for participation. In the case of this study, the researcher had to specify how much time to spend with each participant in the letter requesting permission to carry out a research from the Department of Education and likewise time for visit per school. So the researcher had to arrange for relevant time with the principals of the schools to consult with the teachers and learners.

3.12.7 Inappropriate Behaviour

The researcher did not engage in conduct of a personal or sexual nature. Researchers might find themselves getting too close to the participants and blurring boundaries between themselves and others (Lichtman, 2013). If a researcher thinks he or she is getting too close to the participants, he or she has to bow out and remember that he or she is a researcher and is bound by the code of conduct to treat participants with respect.

3.12.8 Data Interpretation

Misleading statements should be avoided. Researchers should bear in mind of admonitions to interpret data conservatively and go beyond what numbers or facts show (Lichtman, 2013). Lichtman further asserts that a researcher required to analyze data in a way to avoid misinterpretations, misstatements or fraudulent analysis and that a researcher has a responsibility to interpret his or her data and present evidence so as to enable others to decide the extent to believe the interpretation. Bless et al. (2013) indicated that researchers are not allowed to change their data or observations as a matter of ethics in analysis and reporting; and that the fabrication or falsification of data is a very serious ethical transgression.

3.12.9 Data Ownership and Rewards

The work generated is owned by the researcher (Lichtman, 2013). Many researchers decided to acquire data and make them available through data banks. Bless et al. (2013) suggested that when research outcomes are published, it is crucial for participants not to be identified by name or in any other manner that will make it possible to identify them Parry and Mauthner 2004 as cited in Lichtman (2013) suggested that there are unique issues about confidentiality, anonymity and consent because qualitative data might be a joint construction between researcher and participant.

3.12.10 Appropriate referral

The researcher must always anticipate the case that the well-being of research participants (psychological, physical, emotional and/or social) may be compromised, after a traumatic experience like social turbulence or displacement. Procedures are required to be employed in order to control any negative results should they happen. This is mainly done by arranging appropriate referral to a counselling center, medical facility or social work agency.

3.12.11 Reporting back to participants

The researcher needs to show the outcomes of every study to the participants in the form that will be easily understandable. Consideration must be given to factors like participant's home language, culture and education level (Bless et al., 2013). These authors also suggest the following principles of ethical research:

- **Non- maleficence:** The most basic principle of research is that participation must not harm the participants. It is crucially important to remember that harm may happen intentionally or unintentionally during the study. If a certain research process results to unpleasant effects for participants, the researcher must have got the firmest scientific grounds for carrying it out.
- **Beneficence:** The principle of beneficence entails social and behavioural research that is effective and considerable in promoting the welfare of people.
- **Autonomy:** The principle of autonomy entails the freedom of peoples' actions and choices to decide whether to participate or not in research. The principle of informed consent is crucially important. Notwithstanding, the principle of autonomy can affect the generalizability of the outcomes such a way that people who consent to participate in a study may differ from the many others who do not volunteer. This can be referred to as volunteer effect.
- **Justice:** The principle of justice is based on the belief that every individual must be treated equally. Discrimination on the basis of gender, race, disability, income level or any other characteristic should be discouraged.
- **Fidelity:** The principle of fidelity implies truthfulness and promise or agreement keeping, particularly between researcher and participants. Thence, it is ethical violation to engage in deception or breaching confidentiality, which infringes on the right of the participants. Respect for the right and dignity of the participants is important to assure that the participants' dignity and self-respect is always preserved. A crucial aspect of people's dignity is privacy and respect of their rights.

3.13 Chapter Summery

In this chapter, the researcher discussed and justified the research methodology which was used in the current study. The researcher discussed the interpretivism research paradigm, the qualitative approach, case study as the design used in the study. The data gathering instruments such as open ended interview, and observation were also discussed.

The reliability of the instruments and data analysis method was also highlighted. The researcher thoroughly provided detailed ethical measures in research with specific focus on this stud. T he n e x t chapter will focus on data analysis, presentation and interpretation of findings.

Chapter Four

4 DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

The preceding chapter enumerated and justified the research methodology which was adopted in this study. The researcher discussed the interpretive research paradigm, the qualitative approach, the research design (case study). The data gathering instruments and methods such as observation, interview and document analysis were reflected on. The researcher likewise highlighted the reliability of the instruments and data analysis method as well as different ethical measures in research. In this chapter, the researcher analyses, interprets and presents the data collected on the attitudes of Grade 9 learners towards their academic performance in Mathematics in line with the research question.

The aim of this study was to assess Grade 9 learners' attitude towards their academic performance in Mathematics in Pinetown Education District in KwaZulu-Natal Province. The following sub-research questions were raised and they formed the themes and sub-themes that emerged from the data analysis.

1. Why Mathematics as a subject seems difficult for Grade 9 learners in relation to other subjects?
2. What are the expected roles of educators in the development of learners' attitude to the study of Mathematics?
3. What are the possible policy directions needed to motivate learners' interest in the study of Mathematics?

4.2 The Sample

Table 4-1 The participants across the three selected schools

Participants	School A	School B	School C	Total
Teachers	1	1	1	3
Learners	4	4	4	12
Total	5	5	5	15

The sample consisted of 3 Grade 9 Mathematics educators and 12 Grade 9 learners across the three selected secondary schools in Pinetown Education District in Kwazulu-Natal (see table 4.1 above). For the purpose of this study, the researcher refers to the participants by codes with respect to their school as shown table 4.2 below.

Table 4-2 The participant's codes

Data collecting Instruments	Participants	Code Alluded
Interviews	Grade 9 Mathematics educators	EdrA, EdrB and EdrC Where EdrA represents interview with Mathematics educator in school A; EdrB represent interview with Mathematics educator in school B while EdrC represent interview with Mathematics educator in school C.
	Grade 9 learners	Lr(1- 4)A, Lr(1- 4)B and Lr(1- 4)C. Where Lr1A, Lr2A, Lr3A and Lr4A indicate Grade 9 learners in school A; Lr1B, Lr2B, Lr3B and Lr4B indicate Grade 9 learners in school B, while Lr1C, Lr2C, Lr3C and Lr4C indicate Grade 9 learners in school C.
Observations	Grade 9 Mathematics class	ObsA, ObsB and ObsC. Where ObsA represents the class

		observation in Grade 9 Mathematics class in school A, while ObsB and ObsC represents the class observation in Grade 9 Mathematics classes in school B and C respectively.
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The data collected is analysed using some themes and sub-themes from the responses given by the participants to bring out the main issues on the attitudes of Grade 9 learners towards their academic performance in Mathematics.

4.3 Demographic Information of Participants

The participants' personal information was presented according to the codes assigned to participating educators and learners with respect to their school locations as illustrated in Table 4-2 above. Table 4-3 and table 4-4 illustrate the demographic characteristics of the participants across the three selected schools in Pinetown Education District.

4.3.1 Demographic Characteristics of Participants (Educators)

Table 4.3 show the distribution of participating educators according to age, gender, marital status, qualification, years of teaching Mathematics in the case study schools and overall teaching experience.

Table 4-3 Demographic characteristics of participants (Educators)

Participants	Age Range	Gender	Marital Status	Qualification	Employment Status	Years of teaching maths in case study	Teaching Experience	Grade 9 maths class enrolments
EdrA	30-35	Female	Married	National Professional Diploma in Education (NPDE)	Permanent	3 years	13 years	113

EdrB	30-35	Male	Single	Bachelor of Education (B. Ed)	Temporary	2 years	2 years	212
EdrC	50-55	Male	Married	Junior Sec Education Diploma, Further Diploma in Education	Permanent	17 years	32 years	255

The age range of two of the educators who participated in the study falls between 30 and 35 years while the other falls within the range of 50 and 55 years. Among the three educators, two were males and one female. Similarly, two of the participants were married. All the educators were professional teachers and they qualified to teach Mathematics as revealed by their qualification. Thus, this information helps the researcher to determine the nature of the educators' experiences in teaching Mathematics, and to ascertain whether their varying experiences is related to their understanding of the Mathematics curriculum design, and how this affects the learners' performance in Mathematics.

4.3.2 Demographic Characteristics of Participating Learners

Table 4.4 show the distribution of participating learners according to age, gender and performance in last examination.

Table 4-4 Demographic characteristics of participants (Learners)

	School A				School B				School C			
Learners	Lr1A	Lr2A	Lr3A	Lr4A	Lr1B	Lr2B	Lr3B	Lr4B	Lr1C	Lr2C	Lr3C	Lr4C
Age	14	15	15	14	14	15	14	14	14	14	15	14
Gender	F	M	M	F	F	F	F	F	M	F	F	M
Grade	9	9	9	9	9	9	9	9	9	9	9	9
Maths Score	88%	76%	30%	29	60%	36%	48%	70%	72%	39%	66%	40%

The table above shows that all the learners who participated in the study are in Grade 9 and aged between 14 and 15 years across the three selected schools. The number of male participants was equal to the number of female participants. Likewise six of the learners scored above 50% (29 – 88%) in their previous examination, while the other six scored less than 50% (29 – 45%).

4.4 Findings from interviews with the Grade 9 Mathematics educators

4.4.1 Theme 1: Grade 9 learners' attitude towards Mathematics

Table 4-5 Grade 9 learners' attitude towards mathematics

Theme 1	Sub-themes	Issue raised
Why Mathematics as a subject seems difficult for Grade 9 learners in relation to other subjects?	Learners' perception and belief of Mathematics	The respondents indicated that learners assumed that Mathematics is a complex subject and should not be for all learners but for the intelligent ones.
	Prior knowledge of Mathematics	The respondents acknowledged that most learners are affected by stigma on Mathematics (that is Mathematics is difficult) either from their parents, people around them or their seniors.
	Previous performance in early grades	The respondents remarked that many of the learners that failed or performed poorly in their previous grades were scared of the subject and consequently were not interested in participating in it.
	Learning ability and competence in Mathematics	The respondents said that majority of the learners believe they are not capable to grasp some of the facts and formulae involved in Mathematics. Particularly in geometry.

4.4.1.1 Learners' perception and belief of Mathematics

The findings of the study revealed that, the learners' perception on Mathematics is major factor that determine their interest, whether to participate or not in learning the subject. According to the participants, most learners perceive and believe that Mathematics procedures are complicated; and are not suppose to be attempted by everyone, but should be reserved only for the learners who are endowed with the ability of Mathematics. The participants across the three selected school responded that:

EdrA: *Many learners see Mathematics as abstract, difficult subject to understand and of no importance.*

The participant from school B had this to say:

EdrB: *The learners don't want to learn Mathematics because they already have it right [sc] in their mind that they cannot do well in the subject. Some of them come to the class just because Mathematics is compulsory.*

Another participant had this to say in corroboration to the views above:

EdrC: *Many of the learners dislike Mathematics and see it as complicated subject that can only be understood by the brilliant learners.*

4.4.1.2 Prior knowledge of Mathematics

The findings from the participants revealed that the information the learners received affected their interests and participation in Mathematics. It was gathered that these information might have been from parents or seniors who did not do well in Mathematics and thereby dislike the subject. Previous knowledge about Mathematics that the subject is difficult, according to the participants, discouraged a lot of learners from trying their ability in doing Mathematics. One of the participants said:

EdrA: *Most learners are fed with wrong information about Mathematics*

that the subject is scary and difficult. That created fear of unknown and emotional consequences in them which in turn made them not to put much effort in the study of Mathematics.

Another educator had this to say:

EdrB: *Learners were not made known [sc] of the importance of Mathematics to their future and career, instead their belief is that Mathematics is not important and as a result there no [sc] need [sc] wasting precious time.*

The response of EdrC was similar to that of EdrB.

4.4.1.3 Previous performance in Mathematics

On the issue of previous performance, it was gathered from the participants that most of the learners had negative attitudes towards Mathematics because of their previous performances at lower grades. It was also revealed that some learners exercise fear and think they cannot do well in the subject as a result of their repeated failures in past tests and examinations. One of the participants had this to say:

EdrC: *Learners were not well prepared from primary schools for the basic skills required to engage in mathematics tasks in the secondary school. They lack basic fundamental knowledge at entry level (Grade 8) which invariably compounded challenges learners are experiencing.*

4.4.1.4 Learning ability and competence in Mathematics

The findings from the participants revealed that, some of the learners are often scared of formulae in Mathematics and as a result they lose confidence in Mathematics. Due to this disengagement from Mathematics, they develop interest in engaging in other subjects where they can understand statements of facts instead of memorisation of formulae as it is in Mathematics. Further, the study revealed that, the few learners that

have the ability to do Mathematics believed that, if they could work hard, they will perform in Mathematics. One of the participants opined the following:

Edr2: *Some of the reasons why many learners lack ability to do Mathematics is that they failed to take time to practice Mathematics at home, and when you give them homework, they will not do it. Mathematics, most of the time, required [sc] a lot of practices [sc] so as to build confidence and interest in it. And at times, parents are not helping to encourage the learners to do their homework and practice some exercises [sc] in the subject.*

And another respondent commented that:

Edr3: *Mathematics is a skilled [sc] based subject which requires the learners a lot of practice in order to build confident and ability.*

In contrary to the opinions of Edr2 and Edr3 above, a participant reiterated that:

Edr1: *Every learner has an ability, it is only that most of our learners are not encouraged. They are not given opportunity to do Mathematics. For example, the learners were judged by their performance in examinations in such that those who score below 60% are not allowed to choose Mathematics in Grade 10. Those who score 50% and below should be given chance if they are willing to select Mathematics as against mathematical literacy.*

4.4.1.5 Summary of findings and discussion on why Mathematics as a subject seems difficult for Grade 9 learners in relation to other subjects

The findings from the participants revealed that a number of factors were responsible for the learner's attitude towards Mathematics. It was discovered that majority of Grade 9 learners dislike Mathematics because they perceived and admitted that it is a difficult subject. This is in line with Moses et al. (2011) findings in that the belief the learners

have towards Mathematics such as being an exceptionally difficult and tedious subject, was the major reason for underperformance or high drop rate in the subject. They further acknowledged that most learners could not try to do Mathematics because they were discouraged and therefore lost interests in it. The loss of interest was attributed to the information their parents or seniors fed them with, which in turn affected their participation and performance in Mathematics. Similarly, Prendergast and Hongning (2016) observed that the perception that Mathematics learning is difficult could be passed on to learners by their parents. For an individual to attempt a modelled behaviour, he must value the observed outcome and perceive it as successful (Pajares & Schunk, 2010).

The study also revealed that learners' negative attitude toward Mathematics was as a result of their previous performances at lower grades, which resulted to mathematics anxiety. This is supported by Zakaria and Nordin (2008) in that, learners who were high in mathematics anxiety perform lower in Mathematics tests compared with learners who have moderate or low mathematics anxiety. In addition, they argue that learners are often scared of Mathematics because it involves a lot of formulae that need to be memorized and as a result, they cannot engage confidently in Mathematics. This finding is in line with Pajares and Schunk (2010) study which pointed that, the continuous underperformance of scores of learners in Mathematics is due to inadequacy of positive self-beliefs. Learner positive attitudes will grow a sense of effectiveness and confidence in their ability to perform well in Mathematics. This will in turn help the learner to willingly participate and learn more of Mathematics.

4.4.2 Theme 2: The roles of educators in the development of learners' attitude to the study of Mathematics

Table 4-6 Educators' role in the development of learners' attitude to the study of mathematics

Theme 2	Sub-themes	Issue raised
The roles of educators in the development of learners' attitude to the study of Mathematics	Background and quality of Educators	The respondents agreed that they are qualified to teach Mathematics and that they are competent and passionate in teaching the subject since Mathematics is their area of specializations in their studies.
	Educators attitude towards Mathematics	The participants said that they love teaching Mathematics and that they are passionate in it. However, they said they were not usually happy and fulfilled about the performances of the learners.
	Teaching methods	The respondents remarked that there was no single teaching method that may be appropriate for teaching Mathematics but that educators must apply different methods of teaching and note which particular method will be adequate and cater for the learners' individual and collective needs
	Homework and assignments	The participants admitted that they give the learner homework and assessments (formal and informal) regularly to ensure the progress and understanding of the learners toward current work
	Workload	The respondents across the three schools said they are comfortable with their present workload.
	Relationship with	Respondents remarked that they have

	learners	good relationship with their learners particularly when the need assistance.
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4.4.2.1 Background and quality of Mathematics educators

The participants stated that Mathematics is interesting and challenging and that they are passionate in teaching the subject. They indicated that, the learners are the major the challenge as they lacked the basics in Mathematics and motivation from previous grades. They responded as follow:

EdrA: *Mathematics is not difficult to teach but most of our learners lack basics and they are not motivated from their previous grades.*

Another educator stated that:

EdrB: *Yes, I love my subject and am passionate about it. The only problem is the background quality of the learners.*

And the third educator said:

EdrC: *I liked teaching Mathematics and it's easy to teach but the problem was the quality of learners.*

4.4.2.2 Educators' attitudes toward Mathematics

Educators have regular contact with the learners; thus, their behaviour in classroom affects the behaviour of the learners as learners draw knowledge from the educators. If the educator positions and conditions the learners in the right direction to build interest in the subject, many of the learners will love to engage in the subject. The participants also emphasised that, educators' attitude will also affect the learner attitude and performance. They revealed that many educators also have negative attitude towards Mathematics. Such educators, they said, believed that it is only few learners that can do Mathematics successfully and therefore, accept dismal outcomes with no interest in any

remedial action. However, they all showed love for teaching Mathematics and they were passionate in it and expressed displeasure when the learners performed poorly.

4.4.2.3 Teaching methods

The participants revealed that the method of teaching the teacher adopts is very important and determines the effectiveness of teaching and learning in the class. They noted that teaching Mathematics should be highly interactive by involving learning by examples and paying attention to application questions. They indicated that there is no specific method of teaching in the class that may be appropriate for teaching Mathematics, but rather the educator needs to do a psycho-educational assessment of the learners in order to know what method would be most appropriate to adopt for better learners' understanding. Some of the participants had this to say:

EdrA: *My view on teaching method is that, there is no preferred method or approach, either direct Instruction, discussion or mental modelling method or any other method. The best method is to be empathetic and feel what the learners would like more in the sequel for them to make good progress.*

EdrB: *The issue is to get the message (knowledge) across. Since people are different from another and got different learning ability, one cannot just say a method is the best approach. One has to find which method would effectively get the message across. For example, in my class, I have discovered that engaging the learners actively in class tasks catches the interest of the learner though its time consuming, but it is effective.*

And another had this to say:

EdrC: *Teaching Mathematics should be highly interactive which involves learning by examples and paying attention to application questions. And every example has to be worked out with the learners on the*

chalk board.

4.4.2.4 Homework

In response to the question on how often the educators give the learners homework, it was revealed that homework is an extension of school work that need to be consolidated at home. In accordance with assessment policy of the department, the educators reported that they give homework at least three times in a week. They also indicated that they give homework and assessments so that the learners can practice and to monitor their learning progress. They highlighted that, the challenge was with the responses of the learners which were not encouraging; where majority of the learners would not do or complete their homework. The sentiments are illustrated in the verbatim below:

EdrA: *I give the learners assessments both formal and informal and homework regularly, but the majority of the learners would [sc] not attempt to do it [sc] complete their work. When I started laying emphasis on it, I discovered that, most of the homework submitted would be the same although [sc]. This means that it is only one learner that will do it and others would copy.*

The contribution of EdrB was in agreement with EdrA and emphasised as follow:

EdrB: *I give the learners homework almost every day and I make sure I mark those that did and submit. For example, I wanted to use one of their homework for assessment and I found out that the majority of them did not do it. I had to use their free period for them to do it.*

4.4.2.5 Workload

On the issue of workload undertaken by the educators per day, the participants replied that, overloaded with work and teacher-learner ratio could affect the teacher effectiveness and quality of teaching. However, the participants reported that they were not overloaded with task and that they are comfortable with their current load of work. One of the participants had this to say:

EdrA: *I am not overloaded with task. It's only that apart from Grade 9 Mathematics, I also teach Grade 10 and 11.*

EdrB and EdrC's views were in agreement with the comment of EdrA. EdrB had this to say:

EdrB: *I am just fine with the number of period am given, like today I have two free periods.*

4.4.2.6 Educator – Learner relationship

In the aspect of educator – learner relationship, the participants indicated that having a relationship that is not tense, but friendly is necessary for learning. They therefore reported that, they have good relationship with their learners in any way possible in order to develop their confidence, interest and participation in the classroom. An educator had this to say:

EdrA: *... I tried to build a good relationship with them. We laugh, we joke, and I do go to them during class to find out if they understand what we are doing or if they need help. That is when some would say they need help or they don't understand.*

Another participant said:

EdrB: *I tried to relate with the learners, sometimes I asked them to come to me any time if they have any challenge relating to their work. But*

sometimes they take advantage of you.

4.4.2.7 Summary of findings and discussion on the roles of educators in the development of learners' attitude to the study of Mathematics

The participant's demographic information in table 4.2 was used to determine the nature of educators' experiences in teaching Mathematics, and to ascertain whether their varying experiences were related to their understanding of the Mathematics curriculum design, and how this affects the learners' performance in Mathematics.

The study showed that all the participants were qualified Mathematics educators, and they all attended an institution of higher learning and obtained teaching qualifications in Mathematics. Two of the educators had obtained a Higher National Diploma in education while one had obtained bachelor degree in education in Mathematics. Two of the participants obtained their educational qualifications for at least 13 years and had been teaching Mathematics for more than 12 years, except for one who had only 2 years teaching experience. These findings show that the educators were qualified to teach Mathematics in secondary schools. This is in line with Leone et al. (2010) and Reddy (2007) findings in that, the desirable teacher qualities were linked to good subject knowledge, classroom management, teaching skills, dedication, relationship with the learners, diligence and accessibility.

The study revealed that educators' positive attitude would build a positive attitude in their learners. This was evidenced by their love and passion to teach Mathematics. However, the highlighted the challenge with learners who were not well prepared from primary schools to take the subject at secondary school level. These findings corroborate with the views of Edomwonyi-otu and Avaa (2011) and Ogembo et al. (2015) who argued that educator's attitude reflects on the way they teach and this ultimately has adverse effects on learners' academic performance. In other words educator's attitude towards Mathematics is directly proportional to learner academic learning outcomes (Yara, 2009).

The participants in this study emphasized that teaching Mathematics should be highly interactive such as learning by examples and paying attention to application questions and that homework and assignments should be given regularly so as to consolidate the school work at home. This finding echoes that of Olatunde (2009) in that the teacher method of teaching Mathematics and his personality to a great extent is responsible for the students' positive or negative attitude towards Mathematics and performance. They also indicated that educators should develop a good and friendly relationship with the learners to develop their confidence, interest and participation in the classroom. This is supported also by Agah et al. (2016) who revealed that learners would develop a more positive attitude towards Mathematics when the educators are supportive, equitable, friendly and helpful to them.

4.4.3 Theme 3: Motivation of learners to study Mathematics

Table 4-7 Motivation of learners to study mathematics

Theme	Sub-themes	Issue raised
Strategies that can be used to motivate learners to learn and perform well in Mathematics	Learner motivation	The department in collaboration with the school managements should invite Mathematics specialists to motivate learners, and the educators should always speak positively to learners about Mathematics.
	Staffing	The department as a central organ should source for adequate educators who are specialized in Mathematics both locally and internationally
	Department's contribution to teaching and learning Mathematics	The participants acknowledged the importance of the roles of the Department in teaching and learning.
	Availability of Instruction	The participants indicated that they are been equipped with learning materials such

	materials	as textbooks, workbooks, writing materials and geometry materials. They added that the materials supplied were not adequate.
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4.4.3.1 Learner motivation

On the aspect of motivation, the participants identified that learners need to be motivated enough to begin to like Mathematics. Further, they said stakeholders such as education department officials, parent, school principals, etc and educational experts should be invited to talk to the students on the importance and benefits of Mathematics; and the possibility to conveniently engage Mathematics and see it as good subject. They added that the school should organise Mathematics extracurricular activities such as mathematics games, mathematics fun fare and excursions outside the school particularly in a higher institution of learning. Last, they mentioned that the school heads and or the education department should organise teacher discussions on how to improve learners' performance in the schools. In addition to these, let us see what the educators had to say on the question of how to motivate their learners:

EdrA: *I always encourage them to come to me whenever they have challenges, and if they come I do welcome them and attend to them spontaneously. During class, I give them opportunity to solve some of the exercises on the board to give them courage. I also speak to the learners positively about Mathematics. We organised extra class on Saturdays but it's only [sc] they don't attend it. Also, I put stickers on their work not only when they performed well but also when they complete any task given.*

EdrB: *you will discover that a lot of the learners need help in Mathematics. I do ask them to come to me either personally or as a group for help. I ask them to come for extra classes on Saturdays (though not all honour it). Since last year we introduce [sc] maths game and it bring fun. Sometimes I give incentives to those that do*

well.

EdrC: *the motivating factor we use is that we pass to the learners that Mathematics is all their life. Studying Mathematics will afford them a good opportunity [sc] good job. We likewise encourage parents to allow learners to go to programs where they can improve their Mathematics ability.*

4.4.3.2 Staffing

From the interviewees, it was discovered that only the qualified Mathematics teachers should be allowed to teach Mathematics in secondary schools. The participants added that the department of education which is responsible for employment of teachers should source for the qualified Mathematics educators even from foreign countries, if possible to change the present state of affairs of Mathematics education in South Africa. One of the participants has the following to say:

EdrC: *We need more educators to teach Mathematics so that we can have more Mathematics lessons for the learner. For example the other educator had gone for maternity leave and no one has been sent to cover up for her.*

The contributions of EdrA and EdrB were similar to sentiment that there was need for adequate and qualified teachers to teach Mathematics in schools.

4.4.3.3 Department's contribution to teaching and learning Mathematics

Apart from sourcing and employment of educators and supplying the schools with teaching and learning materials, the participants in this study indicated that the Department should do more in encouraging and fostering a meaningful Mathematics education through monitoring, supports and adequate funding as well as organising workshops, seminars and trainings. One of the participants had this to say:

EdrC: *when the learners are not well prepared and as the learners move from one phase to another, the challenges in different phases are compounded which make them to lose interest in learning Mathematics. Therefore, the Department need to synergise the different phases (foundation, intermediate, senior and FET) so that the learners can acquire the necessary skills required in Mathematics to avoid the usual unresolved challenges from each phase.*

4.4.3.4 Availability of Instruction materials

The participants indicated that schools were being supplied with prescribed teaching materials by the Department of Education. However, some of the materials were not adequate and not meeting the needs of the lessons in schools. The learners, most of the time, have access to the textbooks only during classes. In other words, for improved performance they should give the learner the textbooks to take them home, at least for the term, so that they can do some exercises on their own from the textbooks. One of the participants had this to say:

EdrA: *We do not have enough materials in the school. For example we don't have some materials to do geometry. We usually have problem doing geometry. At the same time, I don't like some textbooks we are supplied, I don't like them [sc] they are full of stories and we need to do Mathematics. What I do is that I source for good textbooks and make copies available for learners.*

On the contrary, another educator from another school had this to say:

EdrB: *we do have enough textbooks and workbooks for the learners. We also have the materials for geometry. We are equipped. The only challenge is that the school would not allow the learners to go home with the textbooks like the workbooks.*

EdrC: *We have textbooks, Department resource books, worksheet, though the books need to be reviewed in accordance with what we are doing. In addition we use a lot of practical geometry tools, we encourage learners to have mathematical sets instrument as additional tools.*

4.4.3.5 Summary of findings and discussion on the strategies that can be used to motivate learners to learn and perform well in Mathematics

According to the evidence presented by the participants in this study, learners need to be motivated enough to begin to like Mathematics as a subject. This is why the participants wished that the stakeholders such as education department officials, parent, school principals, etc. and educational experts should be involved in encouraging the learners on the importance of Mathematics. In addition, the school should organise Mathematics extracurricular activities within and outside the school. The participants also mentioned that the principals and or the Department should organise teachers' seminars and workshops on how to improve learner performance in the schools. These findings are supported by the National Curriculum Statement which underline that, for learners to achieve Mathematics proficiency, they must believe that Mathematics is understandable and not arbitrary; that it can be learnt and used with diligent effort; and that they are capable of figuring it out (Department of basic Education, 2011).

Further, the educators through the interviews suggested that the government should source for qualified Mathematics educators both locally and from outside countries, supply schools with adequate teaching and learning resources and put in place a working monitoring and training program with adequate funding. This is supported by Yemi and Adeshina (2013) who found that, shortage of qualified teachers, poor facilities; equipment and instructional materials for effective teaching were associated with poor performance in Mathematics.

4.5 Findings from interviews with the Grade 9 learners

4.5.1 Theme 1: Grade 9 learners' participation in Mathematics in relation to other subjects

Table 4-8 Grade 9 learners' participation in mathematics in relation to other subjects?

Theme	Sub-themes	Issue raised
Why Mathematics as a subject seem difficult for Grade 9 learners in relation to other subjects?	The nature and importance of Mathematics	Almost all the participants acknowledged the importance of Mathematics for their studies and in the future. However, some learners see it as a complicated subject.
	Attitude towards Mathematics	More than half of the participants said they love and enjoy Mathematics, while some said that they used to enjoy it but now they have started disliking Mathematics because the task is becoming bigger. The respondents also said that many learners have bad attitude towards mathematics.
	Learners' Perception and belief towards Mathematics	Some of the participants see Mathematics as easy and enjoyable subjects while some said it was a difficult subject that should not be a compulsory subject.
	Learning ability and competence	Majority of the respondents expressed various challenges relating to ability and competence in Mathematics. Some said they were experiencing decline in their performance in Mathematics
	Learner's Attribution	Some of the participants attributed their success to hard work and good teacher, while some attribute their low performance to the nature of Mathematics itself and some said lack of interest to do it.

4.5.1.1 The nature and importance of Mathematics

The participants revealed that the use of Mathematics in both the society and their future is indispensable, particularly when technology has taken over almost everything. This is timely important because Mathematics is the basis of science and technology. Though some participants appreciated the complexity of the subject, they lamented that they were been forced to engage in the subject since it was required for their future carrier. The following interview extracts attest to these findings:

Lr1A: *yes I believe that Mathematics is important because one can see it in everything he/she does. The funniest thing was that unknowingly for many, people practice Mathematics every day. So it is in everyday use, you cannot avoid it.*

The responses of Lr2A, Lr4A, Lr2B and Lr3B were in line with the response of Lr1A when asked about the importance of Mathematics. Likewise, the responses of Lr3A and Lr4B were the same. Lr3A had this to say:

Lr3A: *I know that Mathematics is important because we were told so.*

Another participant said:

Lr1B: *you can't go anywhere without working [sc] with Mathematics particularly when you are looking for a good job.*

On the aspect of the complexity of Mathematics, the respondents perceived the subject in different ways. Some respondents said it is not difficult and that, it is one of the subjects that is easy to get high marks unlike other subjects. To the contrary, some said it is becoming difficult than before while another set of participants said it was difficult to understand. The following interview verbatim supports these findings.

Lr4A: *It is not like other subjects such as isiZulu; I have never enjoyed Mathematics. It's difficult for me. Most of the time, Mathematics is just like something that is not real. It is the subject where I usually get the lowest mark.*

Lr3A: *Mathematics is a difficult subject. In fact doing Mathematics requires much patience. Once you miss one line, you get all wrong. I don't actually enjoy Mathematics.*

The response from Lr3B and Lr4B corroborates with the view of Lr3A. On the contrary, a participant remarked as follow:

Lr1B: *I used to enjoy Mathematics. It is becoming challenging particularly when all these a, b, x, y, z (variables) were introduced. Though, I have never fail Mathematics but I must confess, it is becoming difficult more than I can imagine.*

On the other hand, other participants had a different version of the story as illustrated below:

Lr1A: *yes, I enjoy Mathematics a lot. Is one of the subjects I love to do because it makes me think.*

Lr2B: *... though Mathematics is a difficult subject, I will have to do it because I want to be a doctor and because it is one of the required subjects to be admitted to study medicine in the university. I will work hard to get a good grade in Mathematics.*

4.5.1.2 Attitude towards Mathematics

Majority of the participants reported that they love and enjoy Mathematics, while some indicated that they used to enjoy Mathematics in their previous grades compared to the present grade, where they started to dislike it because the task is becoming bigger. The participants further revealed that many of their colleagues have or have developed negative

attitude towards Mathematics and have also affected many learners in learning Mathematics. They lamented that, these learners have the attitude of disrupting Mathematics classes, absenting themselves from Mathematics lessons and walking out of classrooms during Mathematics lesson. The participants had these to say:

Lr1A: *Mathematics is a very interesting subject and I am passionate about it. I think people are not patient enough, that is why they are not performing well in Mathematics and consequently hate the subject.*

Lr3A: *The truth is that I have difficulty with Mathematics because it involves memorizing formulas and a lot of things which are not easy to grasp.*

Lr2C: *Many of the learners behave abnormally when it comes to Mathematics class. I have not been able to enjoy Mathematics class because of disruptions such as noise making, walking around while the teacher is teaching, throwing things here and there and such things like that.*

4.5.1.3 Learners' Perception and belief towards Mathematics

The data gathered from the interviewees showed that the learners perceived Mathematics as a good and indispensable subject which forms the basis for technological development in the society. They indicated that Mathematics is not difficult and it is an enjoyable subject. However, some participants indicated that it was a difficult, abstract and unstable subject that should not be for everyone, but for the brilliant learners who would be willing to do it. One of the participants responded as follows:

Lr1C: *Mathematics is a complicated subject in its nature and it is not stable. Most of the topics lead one to another which most times makes it difficult. For instance, if you are not good at a particular aspect, let's say a topic, you may not be able to understand*

another because solving a problem in one topic may lead to another topic which you might have forgotten or not understand very well.

4.5.1.4 Learning ability and competence

Majority of the participants expressed various challenges relating to ability and competence in Mathematics. Some said they were experiencing decline in their performance in Mathematics; while some said that, they were always nervous when it comes to problem solving. Others indicated that difficult tasks and letters replacing numbers were their major challenges.

4.5.1.5 Learner's Attribution

Some of the participants acknowledged that, their good performance was as a result of their hard work, the amount of time dedicated and their good teachers; while others attributed their poor performance in the subject to the nature of Mathematics itself in that, it was naturally difficult. On the other hand, other participants attributed their ability to lack of interest to do Mathematics as reasons for poor performance. Some of the students responded as follows:

Lr1C: *Thanks to my teachers, they encouraged me to do well in Mathematics and I also believe in myself.*

Lr3B: *majorly I have challenges in understanding and working with alphabets and shapes.*

4.5.1.6 Summary of findings and discussion on why Mathematics as a subject seems difficult for Grade 9 learners in relation to other subjects

Some factors associated with low participation in Mathematics were highlighted according to the data from the interviews. The participants all agreed that Mathematics is important both in the society, for their studies and future career. This is supported by the South African government's new National Curriculum Statement, that adequate skills

and knowledge of Mathematics are believed to be a crucial component of successful contemporary life and socio economic development (Department of Basic Education, 2011). Despite their acknowledgement of the importance of Mathematics, the participants in this study reported that, many of the learners are struggling to achieve in the subject and consequently see it as naturally complicated as compare to other subjects and thus do not like it. This is in agreement with the view of Tachie and Chireshe (2013) in that many learners belief Mathematics was by nature difficult and there was nothing they could do to pass and is supposedly beyond their control.

According to the interviewees, learners' attitude towards Mathematics was one of the major factors with regards to participation and engagement in Mathematics. Engagement in a subject will depend on how one perceives it. While some of the participants declare their love for the subject, some perceived difficulty in it. They however, indicated that many learners have bad attitude towards the subject and their behaviours also discourage many who would have loved to enjoy Mathematics. This is in agreement with Tachie and Chireshe (2013) who argued that, one cannot perform well in a subject he or she is not interested in. in this study, some participants indicated that they experienced decline in their performance in relation to their primary schools days. This is in concossance with the view of Idil et al. (2016), K'õgce et al. (2009) and Taşdemir (2009) in that, learners usually have positive attitudes towards Mathematics at earlier grades to compare to higher grades where they experienced negative attitudes.

Some of the learners attributed their performances to their diligence and their good educators. This is in contrary to the findings of Tachie and Chireshe (2013) who argued that learners attribute their poor performances in Mathematics to lack of qualified educators. While some blame the complexity of Mathematics, others associated their performances to lack of interest. This is in agreement with the view of Tachie and Chireshe (2013) that learners also attribute their poor performance to the belief that Mathematics is naturally difficult.

4.5.2 Theme 2: The role of educators in the development of learners' attitude to the study of Mathematics

Table 4-9 Learner's view on the roles of educators in the development of learners' attitude to the study of mathematics

Theme	Sub-themes	Issue raised
The role of educators in the development of learners' attitude to the study of Mathematics	Quality of educators	The participants indicated that their educators are good educators and that are qualified to teach Mathematics.
	Learner perception of educators	The participants (learners) indicated that the teachers are good and caring.
	Educator – learner relationship	The participants said that they had good relationship with their educators and that they are free to relate their challenges with their teachers.

4.5.2.1 Quality of educators

The participants agreed that their educators were good educators and were qualified and capable to teach Mathematics. They also acknowledge the method they use in the class to make the learners understand during the lessons.

4.5.2.2 Learner perception of educators

The attitudes of educators in the classroom and how learners comprehend the educators is a function of their behaviours and achievements. The participants perceived their educators as good educators, who relate well and friendly to them in the class. The good relationship of the educators with them and the method of teaching arouse their interest to learn Mathematics. The following interview extracts supports this argument.

Lr1A: *The educator always makes us happy during the class. He teaches us from the basics. When you go to her for help, she likes to take you through what you have done first to see where the problem is.*

Lr1C: *My maths educator is a good teacher. He always encourage us that we can do better in Mathematics. He always takes his time to explain things to us: he would explain step by step to make you understand whatever he is teaching.*

4.5.2.3 Educator – learner relationship

All the participants agreed that they had good relationship with their educators and that they care for them, they are supportive and friendly. They also reported that they were free to relate their problem to them. They also confirmed that their educators always give them attention whenever they ask for assistance. One of the participants indicated as follows:

Lr2A: *One thing about our maths educator is that he makes the classroom lively. She moves from table to another to assist us during class. She encourages us to work hard to achieve in life.*

4.5.2.4 Summary of findings and discussion on the role of educators in the development of learners' attitude to the study of Mathematics

According to the data from the interviews, the Mathematics educators are qualified to teach Mathematics judging from their class behaviours and ways of teaching. This complements the view of Maulana et al. (2013) that educators' behaviours affect learners' academic achievement and their academic motivation. The participants in this study reported that their educators are good and relate well with them both in and outside the class and demonstrate good quality worthy to emulate. This is in line with Rollard (2012), who argued that classrooms in which teachers actively support the learning of the students promote high achievement and effort.

4.5.3 Theme 3: strategies that can be used to motivate learners to learn and perform well in Mathematics

Table 4-10 Learner's view on strategies that can be used to motivate learners to learn and perform well in Mathematics

Theme	Sub-themes	Issue raised
strategies that can be used to motivate learners to learn and perform well in Mathematics	Lesson time duration	The participants emphasized that the time used for learning Mathematics is not enough and that the school management should do something to increase time for Mathematics lessons. They also said they wanted all the Mathematics lessons in the morning periods.
	Learning resources	They said they were given only bluebooks (workbooks). They revealed that the textbooks were only made available for them during class and that they are not allowed to go home with the books. They added that mathematical instruments for doing geometry were also not made available.
	Motivation	The interviewee said that the school and the department can help organise mathematics talks, internal and external maths competitions, organise excursions. They also emphasised that the school should provide a platform to see to each learner's challenge and provide them extra tuition. They added that the Department need to supply schools with good books and allow us to take them home.

4.5.3.1 Lesson time duration

The participants indicated that the amount of time allocated for mathematics period was not enough and that they would appreciate it if the school management could allocate more time for Mathematics lessons. They also said, since Mathematics require much of memorizing of formulas, that all the Mathematics lessons should be moved to morning periods. Some of the participants had this to say:

Lr2B: *I mostly enjoy Mathematics lessons during morning times when my brain is still fresh. I always struggle to catch up in the afternoon Mathematics classes.*

Lr1C: *the time allocated for Mathematics lessons should be increased so as to accommodate more worked examples and do some exercises with the teacher's supervision.*

4.5.3.2 Learning resources

The participants reported that the school only provides them with bluebooks (i.e. workbooks). They revealed that the textbooks were only made available for them during classes and that they were not allowed to carry the books home. They added that since many of the learners are not able to acquire mathematical instruments for doing geometry and calculators, the school or the Department should provide them with these learning resources.

4.5.3.3 Motivation

The participants highlighted that, the school and the Department can help organise mathematics talks, internal and external maths competitions and organise excursions so they can have fun. They also emphasised that the school should provide a platform to understand each learner's challenge and provide them with extra tuition. Furthermore, it was revealed that the Departments need to supply schools with good books and allow the students to take them home.

4.5.3.4 Summary of findings and discussion on strategies that can be used to motivate learners to learn and perform well in Mathematics

The participants emphasized that the time used for learning Mathematics was not enough and that they wanted school managements to increase Mathematics lessons. They also suggested that Mathematics lessons should be allocated in the morning times, when the brain is still fresh, since the subject requires memorisations of formulas and rules. This is supported by Pope (2016) who said that, learners performed better when Mathematics classes are scheduled at the beginning of the day, in the first or second period as compared to the end of the day (i.e. the fifth or sixth period).

The participants in this study pointed to inadequate learning resources. They reported that, apart from the bluebook (workbook), textbooks were not made available outside classroom. Therefore, they suggested that the Department of Education should supply schools and learners with good books, mathematical instruments and calculators and allow them to take them home. This is supported by the KZN Department of Education Curriculum Management Strategy (2013), which stipulates that all schools must be adequately resourced with materials that support teaching and learning and each learner must be provided with one textbook per subject.

Moreover, this study indicated that the school and the Department of Education could organise mathematics talks, internal and external mathematics competitions, and organise excursions. This is supported by Bicknell and Riley (2012) who opined that, competitions provide learners the opportunity to make every effort for their achievement and to compare themselves with other learners particularly in Mathematics. This provides a motivating platform in which gifted students compete, excel, and are honoured for their abilities. They also emphasised that the schools should provide a platform to identify each learner's challenge and afford them extra tuition.

4.6 Summary of the observation at the schools

4.6.1 4.6.1 How does the teacher introduce the lesson to the learners?

ObsA-C: *The teachers started the lesson by asking the learners about the previous topic so as to refresh their memories prior to the new topic. They also review the homework given.*

4.6.2 How do the learners participate in Mathematics lessons?

ObsA-C: *Very few learners really participated when the educators asked question and when they were asked to use their calculators to confirm some worked examples.*

4.6.3 What teaching method the educator employed?

ObsA-C: *there were no specific defined method or style the educators employed during class lessons. The educators interacted with the learners by asking them questions. And during class exercises, they moved from one learner to the other to see if the learners were doing the right thing.*

4.6.4 Learner responsiveness to teaching

ObsA & ObsC: *Majority of the learners were quiet when the teacher was talking. There were no learners who interrupted the educators to ask question(s) on the current topic until the teacher asked if they understand or following what they were teaching.*

ObsB: *most of the learners were not concentrating on what the educator was teaching. Some were busy talking to one and other, banging tables and moving from one place to the other. It was observed that very few learners cooperated with the educator.*

4.6.5 How did the educators motivate learners?

ObsA-C: *the educators checked the learners writing books and paste stickers on any completed work. As the lesson progressed, they kept on asking if they understood every step of the lesson. They went to some learners to see their work.*

4.6.6 Was there any homework given at the end of the lesson?

ObsA-C: *at the end of the lessons, the educators gave homework/exercises to the learners to be submitted on a due date.*

4.7 Chapter Summery

This chapter focused on the presentation and analysis of data on the views of educators and learners on how Grade 9 learners' attitudes affect their academic performance in Pinetown education District, KwaZulu-Natal. The researcher draws conclusions from the outcomes of the study and makes recommendations for further considerations by all education stakeholders. This study assessed the view of the participants on how Mathematics as a subject seems difficult for Grade 9 learners in relation to other subjects, the expected roles of educators in the development of learners' attitude to the study of Mathematics, and possible policy directions needed to motivate learners' interest in the study of Mathematics. Employing the qualitative interviews and observations as primary research instruments, themes and sub-themes were developed and discussed appropriately. The next chapter will discuss the summary of findings, conclusions and recommendations of the study. Furthermore, areas for further research will be highlighted.

Chapter Five

5 SUMMARY OF THE FINDINGS, RECOMMENDATIONS AND CONCLUSIONS

5.1 Introduction

The previous chapter focused on the data presentation, analysis and interpretation of findings. The aim of this chapter is to summarise the findings of the study in relation to the research questions, draw the conclusions from the findings, and make recommendations as well as offer suggestions for further studies.

5.2 Restating the research questions

The main research question that guided this study was “how does Grade 9 learners’ attitude affect their academic performance in Mathematics in Pinetown Education District in KwaZulu-Natal Province?” This question was answered through the following sub-research questions:

1. Why Mathematics as a subject seem difficult for Grade 9 learners in relation to other subjects?
2. What are the expected roles of educators in the development of learners’ attitude to the study of Mathematics?
3. What is the possible policy directions needed to motivate learners’ interest in the study of Mathematics?

5.3 Summary of findings

This section summarises the major findings with respect to the views of educators and learners in line with the research questions and objectives of the study. The outcomes of the study are summarised as follows.

5.3.1 Why Mathematics as a subject seems difficult for Grade 9 learners in relation to other subjects?

5.3.1.1 Educators' Views

The findings from the participants revealed that a number of factors were responsible for the learner's attitude towards Mathematics. The educators revealed that the majority of Grade 9 learners dislike Mathematics because they perceived and admitted that it is a difficult subject. They acknowledged that most learners could not try to do Mathematics because they were discouraged and therefore lost interests in it. This was attributable to the information their parents or seniors friends fed them with, which in turn affected their participation and performance in Mathematics.

They also reported that learners' negative attitude towards Mathematics was as a result of their previous performances at lower grades, which resulted to mathematics anxiety. Thus, the learners are often scared of Mathematics because it involves a lot of formulae that need to be memorized and as a result, they cannot engage confidently in Mathematics. It should be noted that, learner positive attitudes will grow a sense of effectiveness and confidence in their ability to perform well in Mathematics. This will in turn help the learner to willingly participate and learn more in Mathematics.

5.3.1.2 Learners' views

Some factors associated with low participation in Mathematics were highlighted according to the participants. The learners as participants all agreed that Mathematics is important both in the society and for their studies and future career. Despite their acknowledgement of this importance, they lamented that many learners are struggling to achieve in the subject and consequently see it as naturally complicated subject as compare to others, thus, disliking it. According to the participants in this study, learners' attitude towards Mathematics was one of the major factors that influence the participation and engagement in the subject. Thus, engagement in a subject will depend on how one perceives it. While some of the learners declare their love for Mathematics, some perceived it as difficult subject. They however indicated that many learners have bad

attitude towards the subject, and their behaviours are also discouraging many who would have loved to enjoy Mathematics. Some indicated that they experienced decline in their performance in relation to their primary schools days. Some of the learners attributed their performances to their diligence and their good educators; while some blame the complexity of Mathematics. On the other hand, others associated their poor performances to lack of interest. Learner positive attitudes will grow a sense of effectiveness and confidence in their ability to perform well in Mathematics. This will in turn help the learner to willingly participate and learn more in Mathematics.

5.3.2 The roles of educators in the development of learners' attitude to the study of Mathematics

5.3.2.1 Educators' views

According to the background information in table 4.2, the study showed that all the participants were qualified Mathematics educators and they were qualified to teach Mathematics in secondary schools. They indicated that educators' positive attitude would build a positive attitude in their learners. They reported that they love to teach Mathematics, but the challenge was with the learners who were not well prepared from primary schools to take the subject at secondary level. They emphasized that teaching Mathematics should be highly interactive such as learning by examples and paying attention to application questions. Further, homework and assignments should be given regularly so as to consolidate the school work at home. They also indicated that educators should develop a good and friendly relationship with the learners so as to develop their confidence, interest and participation in the classroom.

5.3.2.2 Learners' views

According to the learners, the Mathematics educators were qualified to teach Mathematics, based on the evidence from their class behaviours and ways of teaching. They said that their educators were good and related well with them both in and outside the class and demonstrated good quality worthy to be emulated.

5.3.3 The strategies that can be used to motivate learners to learn and performs well in Mathematics

5.3.3.1 Educators' views

According to the views of the educators, learners need to be motivated enough to begin to like Mathematics as a subject. They suggested that stakeholders such as education department officials, parent, school principals, etc. and educational experts should be involved in encouraging the learners on the importance of Mathematics; and that the school should organise mathematics extracurricular activities within and outside the school. They also mentioned that the principals and or the Department of Education should organise teachers' seminars and workshops on how to improve learner performance in the schools. Further, they suggested that the government should source for qualified Mathematics educators both locally and outside the country, supply schools with adequate teaching and learning resources and put in place a working monitoring and training program with adequate funding.

5.3.3.2 Learners' views

The learners emphasized that the time used for learning Mathematics was not enough and that they wanted school managements to increase Mathematics lessons. They also proposed that Mathematics lessons should be allocated in the morning hours when the brain is still fresh, since the subject requires memorisations of formulas and rules. The learners also raised the issue of inadequate learning resources in their schools. They complained that, apart from the bluebook (workbook), textbooks were not made available outside classroom. They then suggested that the Department of Education should supply schools and learners with good books, mathematical instruments and calculators and allow them to take them home. They also indicated that the school and the Department could organise mathematics talks, internal and external mathematics competitions, and academic excursions. The learners emphasised that the school should provide a platform for identifying and addressing each learner's challenge and provide them with extra tuition when necessary.

5.4 Conclusions

The study sought to assess the views of educators and learners on: why Mathematics as a subject seems difficult for Grade 9 learners in relation to other subjects, the expected roles of educators in the development of learners' attitude to the study of Mathematics, and the possible policy directions needed to motivate learners' interest in the study of Mathematics. The conclusions will be presented in line with the main themes which emerged during the data analysis.

5.4.1 Why Mathematics as a subject seem difficult for Grade 9 learners in relation to other subjects?

The study shows that a number of factors were responsible for the reason why learners felt Mathematics is difficult in relation to other subjects.

5.4.1.1 Educators' Views

The findings from the study indicated that the learners perceived and admitted that Mathematics is a difficult subject because:

- Learners were discouraged and consequently lost interests due to the information their parents or seniors students provided to them. This affected their participation and performance in Mathematics.
- Their previous performances at lower grades, which resulted to mathematics anxiety.
- They were scared of Mathematics because it involves a lot of formulae that need to be memorized.

5.4.1.2 Learners' views

The study showed that the learners agreed that Mathematics is important both in the society, for their studies and future careers. Despite their acknowledgement of the importance, they said:

- many learners were struggling to achieve in Mathematics and consequently see it as naturally complicated subject as compare to other subjects and thus they hate it;
- learners have negative attitude towards Mathematics;
- some love Mathematics, while some perceived difficulty in the subject;
- some learners' behaviours discouraged others who would have loved to enjoy Mathematics;
- they experienced decline in their performance in relation to their primary schools days; and
- Learners attributed their performances to their diligence, good educators, the complexity of Mathematics and lack of interest.

5.4.2 The roles of educators in the development of learners' attitude to the study of Mathematics

5.4.2.1 Educators' views

According to the analysis in this study the study showed that:

- all the participants were qualified educators and were qualified to teach Mathematics in secondary schools;
- educators had positive attitudes toward Mathematics;
- there existed challenges with the learners who were not well prepared from primary schools;
- teaching method in Mathematics should be highly interactive, such as learning by examples and paying attention to application questions;
- homework and assignments should be given regularly so as to consolidate the

school work at home; and

- educators should develop a good and friendly relationship with the learners so as to develop their confidence, interest and participation in the classroom.

5.4.2.2 Learners' views

The participants agreed that:

- their educators were qualified to teach Mathematics based on their class behaviours and ways of teaching; and
- their educators were good and related well with them both in and outside the class and demonstrated good qualities worthy of emulating.

5.4.3 The strategies that can be used to motivate learners to learn and performs well in Mathematics

5.4.3.1 Educators' views

According to the educators, learners need to be motivated enough to begin to like mathematics. They suggested the following:

- stakeholders such as education department officials, parents, school principals, etc. and educational experts should be involved in motivating learners on the importance of Mathematics.
- the school should organise mathematics extracurricular activities within and outside the school.
- the principals and or the Department of Education should organise teachers' seminars and workshops on how to improve learner performance in the schools.
- government should source for qualified Mathematics educators both locally and outside country.
- government should supply schools with adequate teaching and learning resources and put in place a working monitoring and training program with adequate funding.

5.4.3.2 Learners' views

The study found that the learners had the following suggestions to improve their performance:

- the time used for learning Mathematics need to be increased;
- the school managements should increase Mathematics lessons;
- Mathematics lessons should be fixed in the morning hours when the brain is still fresh, since the subject requires memorisations of formulas and rules;
- Provision of textbooks outside classroom;
- the Department should supply schools and learners with good books, mathematical instruments and calculators and allow them to take them home;
- the schools and the Department of Education should organise mathematics talks, internal and external mathematics competitions, and organise academic excursions; and
- the schools should provide a platform for addressing each learner's challenges and provide them extra tuition.

5.5 The study's Contribution to New Knowledge

Attitude is one of the major factors contributing to the achievement particularly in Mathematics and has received a high attention in research. Thus, learners in the three selected schools need to be motivated enough to begin to like Mathematics. The results of this study suggest that, educators have regular contact with the learners; and their behaviour in classroom affects the behaviour of the learners, where the learners draw knowledge from the educators. The learners who come to school with their pre-determined notion that mathematics is difficult, could be modelled by their educator's classroom behaviour for a change of attitude towards the subject. This will then result in performing Mathematics better.

In general, many parents will not be able to afford textbooks. Thus, this study provides that, the textbooks supplied to schools should be made available for the use of the learner at school and at home to consolidate the school works, study and practice some exercises. These textbooks have to be good quality, such that they will meet the need of the educators for lessons delivery.

Finally, the study revealed that time of teaching and learning Mathematics should not be undermined. The participants revealed that they mostly enjoy learning Mathematics in the morning hours and this should be paid attention to. Importantly, the learner positive attitudes will grow a sense of effectiveness and confidence in their ability to perform well in Mathematics, when adequately motivated. This will in turn help the learner to willingly participate and learn more in Mathematics.

5.6 Recommendations

Stakeholders in education sector are responsible for improving the learners' attitudes towards Mathematics. Based on the findings of this study, the following strategies for building positive attitudes of learners towards Mathematics are recommended.

5.6.1 Parents

Parents should spend more time encouraging learners to believe in themselves and see Mathematics just like any other subjects. They can motivate them by rewarding every positive move (like completing tasks or achievements) by words like “well done”, “you can do better”, you are on the right track”, etc. and at the same time discourage the use of words like “poor”, lazy, “dump”, etc.

In addition, parents should supervise their children to complete their school works and homework. They should have a good relationship with the educators so as to monitor how the learner is making progress.

5.6.2 Learners

Learner has to believe in themselves that they can perform Mathematics. They should realize that Mathematics is part of our daily living and it has become an indispensable tool of life and therefore face the challenges that come with the study of Mathematics rather than joining the multitude singing that it is boring, difficult and challenging. For better performance in the subject and other related subjects, learners should diligently endeavour to listen and follow their educator's instructions, worked examples and take more time to practice Mathematics often.

5.6.3 Educators

They should encourage the learners to practice Mathematics more and work on their own. Educators should equip the learners with problem solving skills to build confidence in them. They should give the learners enough homework, assignments or projects based on the work to be covered in the next few week(s) so as to prepare them to work ahead of the current tasks. The educators are to create stimulating classroom environments for learning Mathematics.

5.6.4 School Managements

The school should discourage late-coming and absenteeism at all cost. They should organise mathematics activities in the school and excursions. As the evidence from the learner interviews indicate, time of the day affects learner's participation in Mathematics, and thus the school authority could move all mathematics lessons to the morning periods.

5.6.5 Policy makers/Department of Education

They should source for qualified Mathematics educators to teach Mathematics in secondary schools from both local and international personnel. They should adequately fund schools so as to equip the educators with good teaching resources. Seminars and workshops on a regular basis should be arranged for Mathematics teachers. They

should ensure that each learner can own learning materials (textbooks, mathematical sets, calculators, etc).

5.7 Suggestions for Further Study

The study assessed Grade 9 learners' attitude towards their academic performance in Mathematics in Pinetown Education District. Since the study was mainly focused on Grade 9 learners' attitudes towards Mathematics in the Pinetown Education District only, it could be ideal for similar studies be extended to other districts of the Kwazulu-Natal or even the whole country at large. The study selected three secondary schools which are purely public schools. Another study can be carried out in purely private schools or the combination of both to bring out issues concerned with learners attitude in Mathematics.

The study focused on Grade 9 learners because issues prevalent in making choice between pure Mathematics and mathematical literacy are clearly identified in this grade and it is an exit point for General Education and Training (GET). However, attitudes of learners towards their academic performance can be studied holistically at all levels of secondary school education to shed more light on the learners' attitude towards Mathematics. Primarily, this study used qualitative approach; another study can look at the effects of attitude on learners' academic performance using quantitative or mixed method.

5.8 Chapter Summery

This chapter presented a summary of findings and conclusions drawn from the findings and the recommendations which are offered on the basis of these findings as well. The study sought to assess the views of Grade 9 Mathematics educators and learners on how learners' attitudes affect their academic performance. First, the study sought to establish the why does Mathematics seem difficult for learners as compared to other subject. Secondly, the study established the expected roles of educators in the development of learners' attitude to the study of Mathematics. Lastly, the study established the possible policy directions to motivate learners' interest in the study of

Mathematics. The study also analysed the observations recorded by the researcher during the field work. The chapter has offered some practical recommendations and suggestions for further research.

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APPENDICES

APPENDIX A: INTERVIEW SCHEDULE

Learners' Interview Questions

1. How important is mathematics to you in life?
2. Have you ever enjoyed mathematics class before now?
3. How can you rate your ability to solve mathematics problems?
4. Who assist you on your homework or assignments?
5. Have you ever had a really bad experience with mathematics? If so, what happened?
6. How do you react when you see mathematics problems/tests?
7. What do you think is responsible for your performances in mathematics tests?
8. What do you think makes you lose interest in mathematics now/gain interest in mathematics now?
9. Do you have confidence in your ability to do/solve mathematics exercises/problems?
10. How would you compare your interest in mathematics to other subjects?
11. Do you think you can do better in mathematics in the future? Why do you think so?
12. Judging from your experience in Maths, will you like to choose Maths in Grade 10?
13. Is your mathematics teacher a good teacher? Explain your answer?
14. What do you think teachers can do to help learner with learning mathematics?
15. How is your relationship with your mathematics teacher?
16. Do you feel free to relate your challenges in Mathematics with your teacher?
17. What do you think the school/teacher can do to make learning a fun/ interesting?
18. What can you say about mathematics teaching materials available in your school?
19. What do you think the school can do to make learning a fun/ interesting?
20. Is there anything you think the government can do to help mathematics learning?
21. What do you think makes mathematics easy or difficult for you?

Teachers' Interview Questions

1. What could be the factors that contribute to the low participation of learners in Mathematics?
2. How often do you give home work/assessments?
3. Do learners do their homework/ assessments?
4. What do you think is responsible for low/poor performance in mathematics?
5. In your opinion, what do you think are the major factors which may contribute to the negative attitude of learners towards mathematics?
6. Are you suitable in teaching mathematics?
7. Is mathematics your major?
8. How will you feel when learners perform poorly in your class?
9. How can you do when you discover a learner is not paying attention in the class?
10. What teaching methods will you suggest best for Maths class?
11. How best can you describe your relationship with your learners?
12. What can you do as a Mathematics teacher to motivate learners to learn and improve their performance in Mathematics?
13. Are you working with other Mathematics educators in your school?
14. Do you have enough mathematics resources at your school? Do you get enough assistance from learners' parents?

APPENDIX B: EDITING CERTIFICATE

CERTIFICATE OF EDITING



TO WHOM IT MAY CONCERN

This document certifies that the dissertation whose title appears below was edited for proper English language usage, grammar, punctuation, spelling and overall style by Dr Anthony Masha who is a member of the Professional Editors' Group and whose academic qualifications appear in the footer of this document.

DISSERTATION TITLE

**ASSESSING GRADE 9 LEARNERS' ATTITUDE TOWARDS THEIR ACADEMIC
PERFORMANCE IN MATHEMATICS IN PINETOWN EDUCATION DISTRICT**

RESEARCHER

SUNDAY OLAYINKA OLORUNFEMI

DATE EDITED

May 2018

Editor's comment

All mistakes relating to grammar, punctuation, spelling and overall style have been corrected. The editor was not responsible for conducting a cross-referencing check.

(Ed), Honours B.A. (Social Sciences), Honours B.A (Group Dynamics), Postgraduate Diploma in Education,
M.ADMIN (Public Administration), Doctor of Administration in Public Administration

APPENDIX C: ETHICAL CLEARANCE CERTIFICATE



University of Fort Hare
Together in Excellence

ETHICAL CLEARANCE CERTIFICATE REC-270710-028-RA Level 01

Certificate Reference Number: ADU211SOLO01

Project title: **Assessing Grade nine learner's attitude towards their academic performance in Mathematics in Pinetown Education District.**

Nature of Project Masters in Education

Principal Researcher: Sunday Olanyinka Olorunfemi

Supervisor: Prof E.O Adu

Co-supervisor: Mr L Khala

On behalf of the University of Fort Hare's Research Ethics Committee (UREC) I hereby give ethical approval in respect of the undertakings contained in the above-mentioned project and research instrument(s). Should any other instruments be used, these require separate authorization. The Researcher may therefore commence with the research as from the date of this certificate, using the reference number indicated above.

Please note that the UREC must be informed immediately of

- Any material change in the conditions or undertakings mentioned in the document
- Any material breaches of ethical undertakings or events that impact upon the ethical conduct of the research

The Principal Researcher must report to the UREC in the prescribed format, where applicable, annually, and at the end of the project, in respect of ethical compliance.

Special conditions: Research that includes children as per the official regulations of the act must take the following into account:

Note: The UREC is aware of the provisions of s71 of the National Health Act 61 of 2003 and that matters pertaining to obtaining the Minister's consent are under discussion and remain unresolved. Nonetheless, as was decided at a meeting between the National Health Research Ethics Committee and stakeholders on 6 June 2013, university ethics committees may continue to grant ethical clearance for research involving children without the Minister's consent, provided that the prescripts of the previous rules have been met. This certificate is granted in terms of this agreement.

The UREC retains the right to

- Withdraw or amend this Ethical Clearance Certificate if
 - Any unethical principal or practices are revealed or suspected
 - Relevant information has been withheld or misrepresented
 - Regulatory changes of whatsoever nature so require
 - The conditions contained in the Certificate have not been adhered to
- Request access to any information or data at any time during the course or after completion of the project.
- In addition to the need to comply with the highest level of ethical conduct principle investigators must report back annually as an evaluation and monitoring mechanism on the progress being made by the research. Such a report must be sent to the Dean of Research's office

The Ethics Committee wished you well in your research.

Yours sincerely



Professor Lindelwa Majova-Songca
Acting Dean of Research

13 November 2017

APPENDIX D: ACCESS LETTER REQUESTING PERMISSION TO CONDUCT RESEARCH



The Research Unit; Resource Planning
KwaZulu Natal Department of Education
Office G25; 188 Pietermaritz Street
Pietermaritzburg
3201

Dear Sir/Madam,

REQUEST FOR PERMISSION TO UNDERTAKE RESEARCH

I am currently registered for the degree of Masters in Education at the University of Fort Hare. My research topic is '**ASSESSING GRADE 9 LEARNERS' ATTITUDE TOWARDS THEIR ACADEMIC PERFORMANCE IN MATHEMATICS IN PINETOWN EDUCATION DISTRICT**'.

I undertake to ensure that the ethical consideration in carrying out research shall be strictly adhered to. I hereby request for permission to carryout research in the selected schools at the Mafukuzela circuit, Pinetown Education District in KwaZulu-Natal. To assist you in reaching a decision, I have attached to this letter:

1. Ethical clearance certificate from University of Fort Hare's Research Ethics Committee (UREC)
2. Ethics Confidentiality Consent Form
3. Consent form for use by parents
4. List of schools where the research will be carried out
5. Interview Questions

Researcher: S.O. Olorunfemi, **Cellular phone:** 0786918984, **Email:** olorunfemiso@gmail.com

Supervisor: Prof. E.O. Adu, **Cellular phone:** 084925 1948 , **Email :** EAdu@ufh.ac.za

Yours sincerely

S. Olayinka Olorunfemi

APPENDIX E: DEPARTMENT OF EDUCATION'S APPROVAL LETTER TO CONDUCT RESEARCH



education

Department:
Education
PROVINCE OF KWAZULU-NATAL

Enquiries: Phindile Duma

Tel: 033 392 1063

Ref.:2/4/8/1436

Mr SO Olorunfemi
104 Wattlebrook Crescent
Brookdale
Phoenix
4068
Brookdale

PERMISSION TO CONDUCT RESEARCH IN THE KZN DoE INSTITUTIONS

Your application to conduct research entitled: **"ASSESSING GRADE 9 LEARNERS' ATTITUDE TOWARDS THEIR ACADEMIC PERFORMANCE IN MATHEMATICS IN PINETOWN"**, 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 26 January 2018 to 09 July 2020.
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 Miss Phindile Duma 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 Office of the HOD, Private Bag X9137, Pietermaritzburg, 3200.
10. Please note that your research and interviews will be limited to schools and institutions in KwaZulu-Natal Department of Education.

Pinetown District

Dr. E.V. Nzama
Head of Department: Education
Date: 21 January 2018

... Championing quality Education Creating and Securing a Brighter Future

KWAZULU-NATAL DEPARTMENT OF EDUCATION

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Facebook: KZNDOE....Twitter: @DBE_KZN....Instagram: [kzn_education](https://www.instagram.com/kzn_education)....Youtube: [kzndoe](https://www.youtube.com/kzndoe)

APPENDIX F: ETHICS RESEARCH CONFIDENTIALITY AND INFORMED CONSENT FORM



University of Fort Hare
Together in Excellence
Form

Ethics Research

Confidentiality and Informed Consent

I, Sunday Olayinka Olorunfemi, Faculty of Education, University of Fort Hare, is asking learners and mathematics teachers to answer some interview questions, which I hope will benefit our community and our nation at large now and time to come.

Sunday Olayinka Olorunfemi of Faculty of Education, University of Fort Hare, is conducting research regarding **"Assessing Grade 9 learners' attitude towards their academic performance in Mathematics in Pinetown Education District"**. I am interested in finding out more about grade 9 learners' attitude towards mathematics which thereby affects their performance.

Please understand that you are not being forced to take part in this study and the choice whether to participate or not is yours alone. However, we would really appreciate it if you do share your thoughts with us. If you choose not take part in answering these questions, you will not be affected in any way. If you agree to participate, you may stop me at any time and tell me that you don't want to go on with the interview. If you do this there will also be no penalties and you will NOT be prejudiced in ANY way. Confidentiality will be observed professionally.

I will not be recording your name anywhere on the interview schedule and no one will be able to link you to the answers you give. Only the researchers will have access to the unlinked information. The information will remain confidential and there will be no "come-backs" from the answers you give.

The administration of the interview questions will last for one day I beseech you to be open and honest as possible in answering these questions. Some questions may be of a personal and/or sensitive nature. I plead with you to think deeply before answering the questions.

INFORMED CONSENT

I hereby agree to participate in research regarding **Assessing Grade 9 learners' attitude towards their academic performance in Mathematics in Pinetown Education District** I understand that I am participating freely and without being forced in any way to do so. I also understand that I can stop this interview at any point should I not want to continue and that this decision will not in any way affect me negatively.

I understand that this is a research project whose purpose is not necessarily to benefit me personally.

I have received the telephone number of a person to contact should I need to speak about any issues which may arise in this interview.

I understand that this consent form will not be linked to the questionnaire, and that my answers will remain confidential.

I understand that if at all possible, feedback will be given to my community on the results of the completed research.

.....

Signature of participant

Date:.....

I hereby agree to the tape recording of my participation in the study

.....

Signature of participant

Date:.....

APPENDIX G: CONSENT FORM FOR USE BY PARENTS/LEGAL GUARDIANS



University of Fort Hare
Together in Excellence

TITLE OF THE RESEARCH PROJECT: Assessing Grade 9 learners' attitude towards their academic performance in Mathematics in Pinetown Education District

REFERENCE NUMBER: 201707513

PRINCIPAL INVESTIGATOR: Mr. S.O. Olorunfemi

ADDRESS: SCHOOL OF GENERAL AND CONTINUING EDUCATION, EAST LONDON

CONTACT NUMBER: 0786918984

Your child (*or ward*) is being invited to take part in a research project. Please take some time to read the information presented here, which will explain the details of this project. Please ask the study staff or doctor any questions about any part of this project that you do not fully understand. It is very important that you are fully satisfied that you clearly understand what this research entails and how your child could be involved. Also, your child's participation is **entirely voluntary** and you are free to decline to participate. If you say no, this will not affect you or your child negatively in any way whatsoever. You are also free to withdraw him/her from the study at any point, even if you do initially agree to let him/her take part.

This study has been approved by the University Research Ethics Committee at the University of Fort Hare and will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki, South African Guidelines for Good Clinical Practice and the Medical Research Council (MRC) Ethical Guidelines for Research.

This study intends:

To examine some of the factors associated with why some of the grade 9 learners in South Africa do not like mathematics as a subject

To examine the role of educators in learners' attitude and performance in mathematics

To identify policy directions to develop the interest of learners in mathematics education.

Your child has been invited to participate in this study because he/she is currently a mathematics learner in Grade 9.

You are not going to participating in the study. Your responsibility will only be to give consent for your child's participation.

This study is for academic purposes and that the findings are important in the improvement of learners' mathematics performance and curriculum development

There will be no any risk involved in your child taking part in this research because of the nature of the study.

If you do not agree to allow your child to take part, your child will not be affected in anyway.

The information that will be collected about your child will not be available to anyone else and will be treated as confidential and protected.. if it is used in a publication or thesis, your child's identity will remain anonymous.

Your child's participation in this research will be only in the interview, therefore there will be no injury in any way, as a result of taking part in this research study.

You or your child will not be paid to take part in the study, but out-of-pocket expenses will be covered for each study visit. There will be no costs involved for you if your child does take part.

You may also:

inform your family practitioner or usual doctor that your child is taking part in a research study.

contact Pro E.O. Adu at 0437047176 if you have any further queries or encounter any problems.

contact the Chair person of the University Research Ethics Committee if you have any concerns or complaints that have not been adequately addressed by your child's study doctor.

You will receive a copy of this information and consent form for your own records.

Declaration by parent/legal guardian

By signing below, I (*name of parent/legal guardian*) agree to allow my child (*name of child*) who is years old, to take part in a research study entitled (*insert title of study*)

I declare that:

- I have read or had read to me this information and consent form and that it is written in a language with which I am fluent and comfortable.
- If my child is older than 7 years, he/she must agree to take part in the study and his/her ASSENT must be recorded on this form.
- I have had a chance to ask questions and all my questions have been adequately answered
- I understand that taking part in this study is **voluntary** and I have not been pressurised to let my child take part.
- I may choose to withdraw my child from the study at any time and my child will not be penalised or prejudiced in any way.
- My child may be asked to leave the study before it has finished if the study doctor or researcher feels it is in my child's best interests, or if my child do not follow the study plan as agreed to.

Signed at (*place*) on (*date*)

.....
Signature of parent/legal guardian

.....
Signature of witness

Declaration by investigator

I *Mr. S.O. Olorunfemi* declare that:

- I explained the information in this document to **Participants**.
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understand all aspects of the research, as discussed above
- I did/did not use a interpreter (*if a interpreter is used, then the interpreter must sign the declaration below*).

Signed at (*place*) on (*date*)

.....
Signature of investigator

Declaration by interpreter (Only complete if applicable)

I (*name*) declare that

- I assisted the investigator (*name*) to explain the information in this document to (*name of parent/legal guardian*) using the language medium of Afrikaans/Xhosa.
- We encouraged him/her to ask questions and took adequate time to answer them.
- I conveyed a factually correct version of what was related to me.
- I am satisfied that the parent/legal guardian fully understands the content of this informed consent document and has had all his/her questions satisfactorily answered.

Signed at (*place*) on (*date*)

.....
Signature of interpreter

.....
Signature of witness