

**The influence of teachers'and learners' attitudes on Mathematics performance in  
selected rural secondary schools in Vhembe West District**

**By**

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**In**

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## DECLARATION

I, **Mafhenya Michael** (Student Number **2018263901**), declare that this dissertation is my own work and has not been previously submitted by me for a degree at any university and that all sources used have been indicated and acknowledged by means of complete references.

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Mafhenya Michael

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Date

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Supervisor: Dr SA Tachie

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Date

## **DEDICATION**

This study is dedicated to my loving wife Rudzani Patience Mafhenya and my children Ndivhuho, Takalani and Muano, for their patience, support and understanding when I was busy with my studies and they needed me most. It is also dedicated:

To my mother, Selina Tshimangadzo Mafhenya who gave me moral lessons from an early age and helped pay for my studies.

To my younger brother Khathutshelo Mafhenya who supported me in this dissertation throughout the process.

To my supervisor Dr Simon A. Tachie who was there to guide me on every step of the way as I researched for this dissertation.

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## **ABSTRACT**

The study investigated the influence of teachers' and learners' attitudes in Mathematics performance. The researcher used a mixed methods research approach in this study, which means that both qualitative and quantitative research approaches were used. The study's design was a sequential explanatory mixed method design. The following instruments were used to collect data for this study; a closed-ended questionnaire for teachers, a semi-structured interview schedule for teachers as well as a closed-ended questionnaire for learners. The questionnaires were tested for reliability using the Cronbach coefficient while a pilot study was conducted for validity. Convenience sampling was used to select the five schools that participated. The one hundred and thirty (130) learners and thirty (30) educators who participated in the quantitative stage were randomly sampled, while the fifteen (15) educators for the qualitative stage were conveniently sampled. The Statistical Package for Social Sciences (SPSS) Version 25 was used to analyse the responses from the quantitative data, and was presented in frequencies and percentages generated to explain all variables under study. Qualitative data analysis was through content analysis. For the qualitative analysis, the researcher studied the data to become familiar with it in order to identify the themes. Using this analysis method enabled the researcher to identify key words and ideas raised repeatedly by participants. The findings helped to unfold the influence of teachers and learners attitudes in Mathematics performance.

The study found that learners' attitudes are triggered by various factors that range from teacher-centred to learner-centred, and teacher's understanding of learners thinking in Mathematics has an effect on developing learner attitude. It also emerged that nearly three quarters of teachers were learning how to use inquiry-oriented teaching strategies and around 90% were learning how to assess learners in Mathematics. In addition, lack of material for learning Mathematics generates a negative attitude, while poor learner performance in Mathematics leads to dislike for the subjects. The study concluded that teaching style and learners' motivation to learn affected attitude towards Mathematics. Though educators taught the subject very well, some learners did not have interest. The study also concluded that while teachers indicated that they received support from other

Mathematics teachers and the management of the schools, and that the Department of Basic Education was putting effort through Mathematics workshop for teachers, the majority of teachers indicated that they were either not getting support from the parents of the learners or the support was minimal. Furthermore, most teachers responded that they did not have a good foundation in Mathematics, and that there were different ways through which learners' attitudes influenced their performance in Mathematics including interest or aversion due to lack of understanding. Most learners believed that Mathematics was difficult, and it took a long time to understand the concepts. The study recommends that the Department of Education (DoE) must support Mathematics by building enough classrooms and hiring more Mathematics teachers. This will make the classrooms conducive for learning. In addition, the DoE should ensure that a manageable number of learners are in one classroom to minimise overcrowding. Overcrowding makes it difficult for teachers to be effective as they may not be able to mark work for every learner or monitor each learner's performance. The study recommends that the DoE should also provide enough learning materials and consider utilisation of electronic materials to save paper, money and the environment. Ultimately, parents should support the teachers by being involved in their children's education, they should buy their children Mathematics materials, assist them with homework and arrange extra classes for them. If teachers and parents work together to assist these learners, the learners' performance can improve.

Key words: Mathematics, teachers, learners, attitudes and performance

## LIST OF ABBREVIATIONS AND ACRONYMS

AIMSSEC	Aims Schools Enrichment Centre
AMESA	Association for Mathematics Education of South Africa
ASCD	Association for Supervision and Curriculum Development
DBE	Department of Basic Education
DoE	Department of Education
EI	Emotional Intelligence
FIR	Fourth Industrial Revolution
HoD	Head of Department
LTSM	Learner Teacher Support Material
NCTM	National Council of Teachers of Mathematics
SGB	School Management Body
SMT	School Management Team
SPSS	Statistical Package for Social Sciences
TIMSS	Trends in International Mathematics and Science Study

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## CHAPTER 1

### ORIENTATION TO THE STUDY

#### 1.1. Introduction

The focus of the study was to investigate the influence of teachers' and learners' attitudes on learners' performance in Mathematics in selected senior secondary schools in the Vhembe West District of South Africa. Tsanwani's (2009) investigation shows that "factors such as learners and teacher' commitment and motivation, attitudes and self-concept, learners' career prospects, learners' perceptions of peers and teachers, and teachers' perceptions of learners appear to influence disadvantaged learners' decisions to persist and achieve in Mathematics in spite of their difficult circumstances". This study's selection of the schools aimed to ascertain the attitudes of teachers and learners towards Mathematics, as well as to identify related underlying factors responsible for the countrywide variation in mathematics achievement. The current chapter presents the problem and its context, covering the background of the study, the statement of the problem, the research questions as well as aims and objectives. It also addresses the rationale of the study, the significance of the study, delimitations, literature review in addition research methodology.

#### 1.2 Background to the study

The study of mathematics can be considered as critical beyond simply one's focus at obtaining a school or college qualification in academics in the sense that despite every learners' choice of their career paths, Mathematics does prepare learners towards their prospective lives(Davies & Hersh, 2012). Limin (2008) states that Mathematics education prepares students to cope successfully with real life. Mathematics prepares learners to be doctors, musicians, engineers, farmers, and many other careers. This means that everyone needs Mathematics in everyday life. However, globally, both teachers and learners have certain attitudes about teaching and learning of Mathematics (McEnrue & Groves, 2006; Mohamed & Waheed, 2011).

Mathematics likeness or dislike can be and has been classified in numerous ways. Sanchal and Sharma (2017:89) cite “Han and Carpenter (2014) state that attitudes consist of cognitive, affective and behavioural reactions that individuals display towards an object or the surrounding based on their feelings or interest”. However, it is clear that these studies and other related ones have failed to address issues that are aligned to teachers’ and learners’ mathematical likeness or dislike and the contribution of these attitudes to low or high performance in the subject. This implies that positive attitudes influence learners to achieve well in Mathematics, and teachers with positive attitudes will put enough effort to have adequate and suitable materials for teaching and learning in the Mathematics class. Negative attitudes influence learners to achieve poorly in Mathematics. Findings by Zan and Martino (2007) and other related studies fail to dwell on teachers’ and learners’ attitudes, and their contribution to poor performance in Mathematics. This realisation led to the current study.

According to Thorndike (1991), when a favourable attitude is displayed in view of the learning of a subject, pupils tend to work hard and perform relatively well in that subject. Thorndike asserts further that positive attitudes towards Mathematics are important because they affect learners’ motivation to learn, and may increase the tendency to select Mathematics as a subject in high school and/or college, leading to the pursuit of careers in Mathematics and Mathematics-related professions. Nicolaidou and Philippou (2003) show that during their early days at school, children normally display favourable attitudes towards Mathematics. Moreover, as they proceed with school, their attitudes tilt from being more positive towards less positivity and normally is negative at high school.

An Australian study by Raylands and Coady (2008) has indicated that increasing studies from the science and health disciplines in some of their institutions in recent years have shown that students do not possess the suitable ‘mathematical’ background in order to handle first-year science subjects. Consequential to that, there is escalation in the rates of failure in these subjects. The current study, therefore, aimed to find out whether what was happening in Australia along mathematics is applicable in the South African context. Furthermore, the mathematical background of students entering university in countries like Australia, as well as UK, Ireland and the US is found to be

problematic, as many of them cannot cope with university Mathematics due to poor background of Mathematics. The current study is not about students' performance in Mathematics at the tertiary level, but about the manner in which the attitudes of learners in secondary schools influence their achievement in mathematics in South Africa.

In Botswana, Mapolelo (2007) states that factors affecting the learning of Mathematics and Mathematics classroom experiences revealed learners' description of mathematics as a subject that emphasises correct answers and requiring memorisation of procedures as a critical factor in the learning of mathematics. These learners corroborated views expressed in other studies. These views about Mathematics and Mathematics learning can possibly have a considerable bearing on their interest in the subject, their gratification of the subject, and their inspiration during lessons. Whatever learners experience in the Mathematics class indicates a possible reason the majority of students dislike Mathematics.

Previous studies have established that female learners exhibit poor mathematics success in comparison to their male learners. According to Hanna (2006) in a Trends in International Mathematics and Science Study (TIMSS) which encompassed 41 nations and up to 500 000 male and female learners, there were no significant differences in terms of gender when it came to achievement in Mathematics up to grade eight (8). The results also showed five out of 16 countries which provided conditions that had almost eliminated gender-based achievement in mathematics at a level of Mathematics (in the last grade of secondary school).

Generating positive attitudes towards the study of Mathematics among learners is an important goal of Mathematics education. According to research that have been conducted over the last two decades, positive attitudes can impact on learners' preference to enrol for advanced studies and to consider careers in Mathematics and Mathematics-related fields (Trusty, 2002). Further TIMSS (2002) data from Canada found attitudes towards Mathematics as a strong determinant of students' likelihood to

participate in advanced courses in Mathematics(Ercikan, McCreith & Lapointe, 2005). In another study conducted in south-western Nigeria, Chacko and Crowe (2001) found that teachers' attitudes towards teaching Mathematics in schools predicted students' attitudes at a significant level, as well as the likelihood to study Mathematics in the near future.

Research which centres on learners' attitudes towards Mathematics study has received increasing attention as Chacko and Crowe (2001) further reveal that positive attitudes of teachers affect learners' attitudes positively, and lead to high achievement in Mathematics in most south-western Nigerian schools. Research has also demonstrated the impact of motivation and attitude on learner achievement (Sigh, Granvile & Dika, 2002). In addition to that, instructional strategies have an effect on learner needs towards learner achievement. For instance, Bottge (2001) discovered that when exciting and engaging Mathematics instructional approaches are utilised, even learners with learning disabilities are in a position to deal with problems that stress higher level thinking skills.

### **1.3 Theoretical framework**

Adom, Hussein and Agyem (2018:440) state that "theoretical framework is curled from the existing theory or theories in the literature that have already been tested and validated by others" and viewed as acceptable. Learners' performance in the study of Mathematics has been very poor and the problem is mostly attributed to learners' likeness or dislike of maths. The focus of this research was on the influence of teachers and learners' attitude on performance in Mathematics. In an attempt to explore how learners' likeness or dislike of maths influenced their achievement, theories dealing with the cognitive levels of the learner were blended with the theory of emotional intelligence to frame this study. The current study, therefore, was underpinned by the constructivist theory and the theory of emotional intelligence.

The Constructivist theory is rooted in Psychology, and is premised on the manner people acquire knowledge, suggesting that experience is the source of human construction of knowledge and meaning. Balacheff (1990 in Tsanwani, 2009:61) notes, “the constructivist hypothesis states that knowledge is constructed by the learner, not passively received, and that one comes to know by an adaptive process of organising one’s experiences rather than by perceiving some external reality”.

Emotional intelligence, on the other hand, is the one responsible for looking after our physical and mental health well-being, through to our capability to motivate and guide. In most cases, the concept of attitude is based on the emotions and the feelings of a person, be it good or bad. McEnrue (2006) is of the opinion that if a learner has a good feeling towards the study of the subject, his/her attitude may be affected positively towards that goal and vice versa. It is further established that if the attitude towards a task is positive, the individual will be willing and excited to do it and succeed. “Salovey-Mayer model defines emotional intelligence as the ability to perceive, understand, manage and use emotions to facilitate thinking, measured by an ability-based measure” (Bar-On, 2005:2 cited by Mishar & Bangun, 2014:395).

#### **1.4 Problem statement**

Most Senior Secondary school learners cannot reason logically to solve simple mathematics problems, and this influences their performance in the study of the subject (Department of Basic Education, 2011). According to Howie (2001), this problem has developed, over time, into attitude formation in the lives of both teachers and learners. This research was inspired by the reality that the schools involved have their Mathematics examination outcomes which remains substandard despite Mathematics being a strategic subject towards national development. Many learners are migrating from mathematics to do mathematical literacy because of low performance in Mathematics. Furthermore, others in the schools involved are repeating grade 9 many times, because for them to proceed to grade 10 they need to score 40% in mathematics and this leads them to dropout from the school. Trusty and Ng (2000) (in Tsanwani, 2009:25) “studied learners’ self-perceptions in Mathematics ability and found that positive

self-perception in Mathematics ability has relatively strong effects on later career choices". Therefore, the researcher decided to investigate teachers' and learners' attitudes and their contribution to low performance in Mathematics. To the best of my knowledge, not much research focusing on teachers' and learners' attitudes and their contribution to low or high performance in mathematics has been conducted in the Elim circuit of Vhembe West Education District of South Africa.

### **1.5. Main research question**

What is the influence of teachers' and learners' attitudes towards mathematics performance in selected rural secondary schools in Vhembe West District?

### **1.6. Sub-questions**

- ❖ What are the attitudes of senior secondary school learners towards the study of Mathematics?
- ❖ What are the attitudes of Mathematics teachers towards the teaching of Mathematics?
- ❖ How do learners' attitudes influence their performance in Mathematics?
- ❖ What is the association, if any, between learners' attitudes and their performance in Mathematics?

### **1.7. Aim of the study**

To establish the influence of teachers' and learners' attitudes towards Mathematics performance in selected rural secondary schools in Vhembe West District.

### **1.8. Research objectives**

- ❖ To investigate the attitudes of senior secondary school learners towards the study of Mathematics.

- ❖ To establish the attitudes of Mathematicsteachers towards the teaching of Mathematics.
- ❖ To ascertain how learners' attitudes influence their performance in mathematics.
- ❖ To determine if there is an association between learners' attitudes and their performance in Mathematics.

### **1.9. Rationale of the study**

The current research was prompted by the fact that at one school with 80 out of 426 learners who were doing mathematics at the time of the study, the researcher was surprised to learn that only 20 out of 80 mathematics learners in that school passed their first term examination. Thus, all 60 out of 80 learners who were doing mathematics failed their first term examination at that particular school. The researcher also has a concern about the learners that are dropping out from school due to mathematics underperformance. Many learners are preferring to take mathematical literacy as one of their subjects in grade 10 and they end up taking making wrong choice of career. Most of such learners end up not obtaining work at the end of their studies. The researcher also observed that the school had scarce materials for use in the Mathematics classes.

According to Tsanwani (2009:25), "Ma (1997) observes that in the case of trigonometry learners, the attitude that Mathematics was important and enjoyable was significantly associated with achievement in Mathematics". Stuart (2000 in Tsanwani, 2009:25) "argues that teacher, peer and family attitudes toward mathematics may either positively or negatively influence learners' confidence in mathematics. Their findings are that learners who have positive attitudes towards their teachers have high achievement levels". For such reasons, the researcher was inspired to do a research in this area.

### **1.10. Significance of the Study**

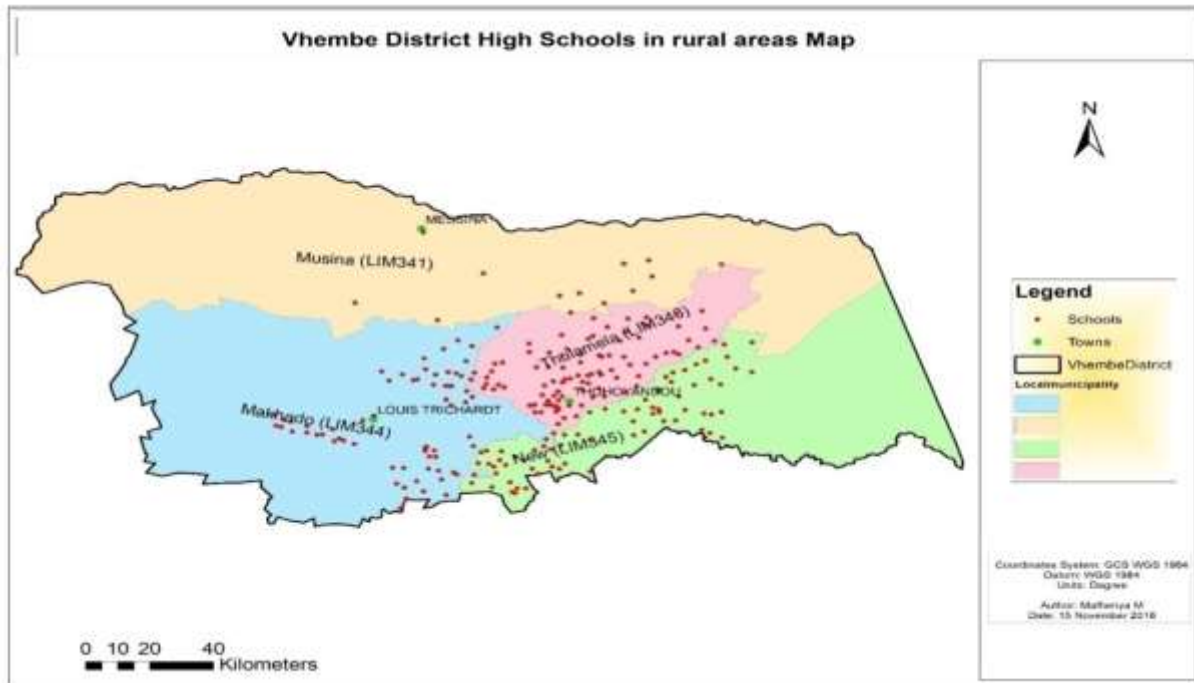
One advantage could be that learners' interests to select mathematics as one of their subjects might be stimulated, which will lead them to perform well in this subject. This might also lead learners to have correct choices of careers in the field of Mathematics, such as Mathematics teachers, engineers, doctors, pharmacists and many careers that

involve mathematics. Teachers could also benefit, as they would know what to do to make mathematics teaching easier. This might also include choice of methods and materials to be used to facilitate effective teaching and learning in mathematics classes. Teachers may also would have to teach learners that have interest in learning mathematics, and they would be encouraged when there is improvement in learners' achievement during assessments.

The parents as well as the community might also benefit as their individual homes and communities could be developed with learners that are more educated, working and earning a lot of money. The learners might also help other siblings and children in rural communities that are in great poverty to pay their school fees. They could also benefit, as more learners might not drop out of Mathematics. The Department of Education may also benefit as learners perform well in Mathematics, equipping them with important skills that may help national development. These include teachers who will teach learners in Mathematics, doctors that will contribute in terms of health in the country and engineers and many other professionals that would be valuable to the country.

### **1.11. Delimitations of the study**

The study was conducted within the Elim Circuit in Vhembe West District under Makhado Municipality. Figure 1.1 below indicates the study area, which is Vhembe District, with its local municipality, major towns and high schools in rural areas. The population of the study were all secondary schools under the Elim Circuit out of which five public schools were considered as the research sites. In these sampled schools, 130 learners in grades 10 up to 12 and 30 teachers participated in the study.



**Figure 1.1: Map for Makhado Municipality where Vhembe District and Elim Circuit are located**

### **1.12. Limitations of study**

This study was affected by a below 100% participation rate as some learners collected consent forms for parents and they never returned them. In addition, as this research was conducted after school, other learners did not wait for it to take place. Considering that there was no remuneration for taking part in this study, other teachers might have felt that they were being used by someone who wanted to enrich himself through the study, and others thought that they were going to be published for not performing well in their school field. As such, these teachers ended up not taking part in this study while some collected and never returned the questionnaires. However, as the researcher explained the purpose of the study to everyone concerned, the participating sample was deemed enough for this study.

There was also the issue about finance as the researcher made a print out of questionnaires as well as made a lot of questionnaire copies with many pages for both

learners and teachers, and copies for consent forms for both learners and parents for underage learners to complete. The researcher also found it costly to travel using a car from one school to another as using a car demanded money for petrol. This was done to travel to and from school distributing and collecting the questionnaire as well consent forms. To overcome photocopying challenges, the researcher had to request for the schools' assistance as well as used the free copying facilities at the university.

Another limitation was time to conduct the study as it involved moving from one province to the other province to attend some conference sessions at the university. The researcher further found it time consuming to design, type and make copies for teachers' interview questions, teachers' questionnaire as well as learners' questionnaire that covered the 160 sampled people with some of the questionnaire having more than two pages. The time was also a limitation as all the travelling was done during school hours. The researcher had to take leave to successfully conduct and complete this study.

### **1.13. Definition of terms**

**Mathematics:** According to the Department of Education (2011: 8), "mathematics 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 and investigating patterns and qualitative relationships in physical and social phenomena and between mathematical objects themselves. It helps to develop mental processes that enhance logical and critical thinking, accuracy and problem solving that will contribute in decision-making". In this study, mathematics takes the same definition.

**Teachers:** According to Senge (2000:26), "a teacher is defined as an expert who is capable of imparting knowledge that will help learners to build, identify and to acquire skills that will be used to face challenges in life. The teacher also provides to the learners, knowledge, skills and values that enhance development. An educated person is capable of utilizing the available opportunities in both private and public sectors. The educated person can easily secure employment as well as have life skills that will enable him/her to interact with others well in the society". In this study, a teacher is an

individual working in a public formal school who imparts knowledge to Grades 10 to 12 Mathematics learners.

**Learner:** “Learner” is defined by Tsanwani (2009:13) as having the following meanings: “person who learns, persons preparing for a particular subject, persons who through lengthy and systematic study attain a high degree of expertise, skill and efficiency, and persons who have the following attitudes or characteristics; curiosity perseverance, initiative, originality, creativity and integrity”. A learner in this study is a student grades 10 to 12 who is taking mathematics in a formal public school.

**Attitude:** “Attitude as a concept is concerned with an individual’s way of thinking, acting and behaving. It has very serious implications for the learner, the teacher, the immediate social group with which the individual learner relates, and the entire school system. Attitudes are formed as a result of some kind of learning experiences students go through. This is mimicry, which also has a part to play in the teaching and learning situation. In this respect, the learner draws from his teachers’ disposition to form his own attitude, which may likely affect his learning outcomes” (Yara, 2009 in Ngeche, 2017:2). Attitude is here defined as a positive or negative feeling.

#### **1.14. The structure of the study**

##### Chapter 1

This chapter presents the introduction and the background of the study. It also presents the theoretical framework, research problem, main research question, sub-research questions, aim and objectives of the study. The chapter further presents rationale of the study, significance of the study, delimitations of the study, limitations of the study, definition of terms and structure of the study.

##### Chapter 2

This chapter presents collected works pertaining to the study. The literature focuses on factors influencing learners’ performance, attitudes of senior secondary school learners towards studying mathematics, mathematics teachers’ attitude towards teaching the subject as well as learners’ achievement in mathematics. The review also focuses on

the influence of attitudes of learners on their performance in mathematics learning environments and finally the learners' performance in mathematics, with the possibility of association between attitude and performance.

### Chapter 3

This chapter presents the methodology adopted for the study. It also presents the current research's approach and design, target population, sample, description of instrument, means of collecting data and its analysis, as well as ethics considerations. The established validity and reliability / trustworthiness of the research instrument in addition to chapter summary were presented.

### Chapter 4

Chapter 4 is data presentation and analysis.

### Chapter 5

This chapter discussed findings and presented the study's conclusions and recommendations.

## **1.15 Conclusion**

This chapter presented the background to the study, which covers previous studies that investigated effect of mathematics teachers and learners' attitudes on performance. The theoretical framework for the study was also briefly presented and justified. The chapter further justified the need to conduct this study as well as presented the research questions the aim and objectives of the study. The chapter also presented the rationale of the study and highlighted the significance of the study, the delimitations as well as the limitations of study. The chapter ends by defining terms and outlining the structure of the study.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1. Introduction

An orientation to the study was given in the previous chapter. The focus of Chapter 2 is on literature concerning teachers' and learners' contribution of their attitudes to low achievement in mathematics. First, the literature presented is in line with the research questions. Secondly, the study's theoretical framework is presented to outline the theories that framed the study. The last section presents the conceptual framework of the study.

#### 2.2. Sources of learners' attitudes towards studying mathematics

Krech, Crutchfield and Ballachey (1962:177 in Getachew, 2011:24) state that "an attitude is an enduring system of positive or negative evaluations, emotional things, and poor action tendencies with respect to a social object". In other words, you cannot observe attitude directly, but it can be deduced from overt behaviour both verbally and non-verbally. According to Howie (2001 in Tsanwani, 2009:26), "the high rate of absenteeism reported among learners indicates that the problem lies more with learners not being motivated enough to attend school". In researching issues that influence achievement in mathematics, it is crucial to broadly review variables associated to school, teachers and learners (Malcolm et al., 2000:1).

##### 2.2.1. High failure rates and poor teacher supply

The positive relationship between school environment and overall learner achievement has been supported by numerous studies. Mensah, Okyere and Kuranchie (2013:132) state that "it has been realised that many students have developed negative attitudes towards the study of Mathematics because of mass failure of students in the subject. It is irrefutable that the successfulness of learning the subject is contingent on myriad of factors. School, classroom, student and teacher factors all impinge on the learning of Mathematics. In particular, the seriousness or otherwise attached to the teaching of

Mathematics invariably affects students' performance in their final examinations". Martin, Mullis, Gregory, Hoyle & Shen (2000) (in Mogari, Kriek, Stols & Iheanachor, 2009:6) revealed that "the number of years in teaching is not associated with students' achievement". Mamali (2015:20) notes, "Arnott et al. (1997:1) discovered in a study on the supply of mathematics teachers in South Africa that economically disadvantaged black learners were undersupplied with qualified teachers and hence achieved not as good as their white peer classes in Mathematics". According to Mamali (2015:20), "Murray (1997:376), for example, notes that Northern Cape and Western provinces, with their large white population and well-endowed communities and schools, have high learner pass rates in Grade 12 national examinations compared to, for example, Limpopo Province, with its African majority inhabitants, which is ranked last in national mathematics achievement". Even though such findings display the general notion that disadvantaged learners have a tendency to perform worse than other learners, there are some studies which counter such claims.

### **2.2.2 Curriculum**

Beggs (1995 in Tsanwani, 2009:20-21) indicates that "curriculum by tradition means a list of content topics in a national or examination prescription and school syllabus, usually stated as course framework". Tsanwani (2009:20) citing Pinar, Reynolds, Slattery and Taubman (1995) indicates that "the concept of curriculum is extremely symbolic; it is what the older generation decides to inform the newer generation". Tsanwani (2009:21) notes, "A mathematics curriculum, according to Beggs (1995:97), consists of:

- Mathematical processes (what mathematicians do)
- Mathematical content (what mathematicians know)
- Mathematical thinking and logical reasoning, problem-solving, making connections and using computational tools
- Contexts in which the topics are set
- Assessment strategies that are used, and appropriate teaching methods (DoE, 2002)" (Tsanwani, 2009:21).

Literature has highlighted several matters regarding the present mathematics curriculum. While worries raised do not just point to the need for learners to learn how to calculate, but specifically emphasise the need for learners to be taught how to analyse mathematics questions analytically so as to produce solutions that are effective. This way learners are necessitated to study how to make sense of complicated mathematics concepts and how to think mathematically (Cobb, Yakkell & Wood, 2009:99). In addition, South Africa had three curriculum changes since independence in 1994, from C2005, National Curriculum Statement (NCS) to the Curriculum and Assessment Policy Statement (CAPS). These frequent curricula changes might be a source of discomfort for teachers, as they will have to learn and understand each new curriculum before teaching. Most Mathematics teachers do not find this easy, hence the possibility of developing unfavourable attitude towards some topics or the whole subject.

### **2.2.3 Learning Environment**

“Classroom climate not only has been shown to affect student outcomes and attainment but is a prominent policy issue in a number of countries and regions. The actions of students within classrooms and the creation of a safe and productive learning environment are important for many schools and can be a challenging dimension of teachers’ work. For example, TALIS finds that one teacher in four in most countries loses at least 30% of lesson time to disruptive student behaviour or administrative tasks, and some teachers lose more than half” (Organisation for Economic Cooperation and Development (OECD), 2009:5). The environment of the school, including its infrastructure, physical structures as well as amenities, also have an effect on mathematics performance. An example is that classrooms in socio-economically disadvantaged rural schools are often in poor conditions. As such, it becomes a nightmare for good learning and teaching to take place in such environments. The implication is that “school condition can influence educators’ efficiency in the classroom” (Dhigra & Manhas, 2009:59). Kufakunesu (2015:100) cites “Patrick, Ryan and Kaplan (2007:83) who found a strong positive correlation between learners’ levels of motivation and their perceptions of the classroom environment as being socially supportive. The

way teachers interact with learners can determine the quality of teaching and learning. In an attempt to shed more light on classroom management, leadership and management are described before the attention of the review is directed at some leadership styles that may be employed in the classroom. The implications of each leadership style with regard to learners' academic achievement in Mathematics are also highlighted". As such, teachers and learners' attitude to teach or learn is more likely to be negative towards the school in general, and subjects in particular if they conduct their education in dilapidated school infrastructure. On the other hand, good school infrastructure is more likely to develop positive attitude towards learning.

Zaaiman (1998) notes that due to several interconnected explanations, a number of the underprivileged households in South Africa have greater concentration in countryside and in the peripheries of urban areas known as squatter camps and townships. Zaaiman (1998) further argues that it can therefore be concluded that learners who go to under resourced schools in South Africa have been academically underprivileged due to nonexistence of prospects to gain admission to excellent educational services. The schools that are most under-resourced are those that are located in the formerly black-only educational system. Mabila, Malatje, Addo-Bediako, Kazeni and Mathabatha (2006:1) also cite Zaaiman's (1998) stance that "In South Africa, a student can be regarded as 'disadvantaged' if s/he had inadequate access to quality education service, resulting in a lack of opportunity to fully develop their academic potential".

#### **2.2.4 School and class size**

"It can be argued that the school is virtually learners' academic home where they come into direct contact with intellectual stimuli from their teachers. The events that occur within the school premises as learners interact with their teachers can determine the extent to which their intellectual potential can be fully utilised. Studies investigating differences in Mathematics achievement highlight the importance of classroom, teacher and school factors" (Lamb & Fullarton, 2001:2). "School factors such as the quality of teaching, teacher expectations, personality of teachers and classroom management" (Lamb & Fullarton, 2001:2), "school size and class size have been shown to have an

impact on achievement” (Tsanwani, 2009:22). Lee, Smith and Croninger (1997) (in Tsanwani, 2009:22) indicate that “larger schools have a negative influence on academic achievement in high school mathematics and science”.

## **2.6 Attitudes of senior secondary school learners towards mathematics**

Attitude towards the learning of mathematics in schools can be traced back to a number of causes. They included teacher-learner relationship, beliefs and attitudes, peer pressure and learner motivation among others. These are presented in the section below.

### **2.3.1 Teacher-learner relationship**

Newman and Schwager (1993) (cited in Tsanwani, 2009:24-25) “found that at all grades a sense of personal relatedness with the teacher is important in determining a learner’s frequency in seeking help from the teacher. They further state that this aspect of the classroom climate has been shown to be related to good academic outcome”. Tsanwani (2009:25) also acknowledges, “In the same vein, Dungan and Thurlow (1989) state that the extent to which learners like their teacher influences their liking of the subject”.

### **2.3.2 Beliefs and attitudes**

Tsanwani (2009:26) notes that “In mathematics education, most of what is known about beliefs and attitudes of the learners towards mathematics is based upon large-scale survey data (Martin, 2000). For example, the National Assessment of Education Progress in the United States of America has shown that African American learners constantly express the most positive attitudes towards Mathematics among all learner groups. Other studies show that many African American learners identify Mathematics as their favourite subject. Similar studies in South Africa show that most of the learners have positive attitudes towards Mathematics (Howie, 2001). According to Howie (2001), the high rate of absenteeism reported among learners indicates that the problem lies more with learners not being motivated enough to attend school. Molepo (1997) found

that the rural communities regard Mathematics as an important subject that can play a role in developing them socio-economically”.

### **2.3.3 Peer pressure**

Learners personally accommodate outcomes related to their personal experiences and knowledge (Uslu, 2013). In many events, students imagine what they dreamt to become through their colleagues and their environment. In addition, learners can be affected negatively or positively due to the response they find from other learners, and this depends on the type of group they are associating with. If the group is interested in a subject like Mathematics and there are learners who are fellowshiping well with other learners, the other learner will be affected positively. However, if the group is not interested in Mathematics as a subject or they are not placing education as their first priority, or they are involving themselves in bad lifestyles, that learner can be affected negatively. They cannot encourage the learner to follow the dreams that need mathematics as a subject because of the influence obtained from other learners. “Eventually, they follow their choices through with the influence of peer pressure” (Owoyele & Toyobo, 2008 in Moldes, Biton, Gonzaga & Moneva, 2019:301). Dumas, Ellis and Wolfe (2012 in Moldes et al., 2019:301) also note that “The pressure among peer groups may influence its member to engage in undesired things or negative behavior, with the presence of a particular peer group leader who engages group members in deviant acts or promotes undesirable things in the group”. “Studies show that the influence of peer groups among students can boost their anxiety, especially pertaining to their education” (Kadir, Atmowasdoyo & Salija, 2018 in Moldes et al., 2019:301).

“Peers in a peer group are co-related with each other, hence the direction of this particular relationship should be monitored in terms of where these relationships should go” (Wilson, 2016 in Moldes et al., 2019:301). “Due to peer pressure faced by many teenagers in the society, professionals understood the concept of peer influence that could affect teenagers in a negative way, and as can be prevented by educating

and preparing teenagers to face the negative aspects caused by peer pressure” (Temitope & Ogonsakin, 2015 in Moldes et al., 2019:301). “Similarly, peer influence among teenagers does not directly affect them in a negative way, but it varies in how much the influence is and how the students receive the climate of the peers coming from the group” (Mosha, 2017 in Moldes et al., 2019:301). Boechinke (2018 in Moldes et al., 2019:301) also note that “When a student is influenced and motivated by peers, he will perform excellently at school and get good grades in mathematics”. “Getting the support needed from the peer group, a student tends to excel and exceed his/her capability and concentrate more pertaining to his/her studies and do good in the academic tasks in school” (Olalekan, 2016 in Moldes et al., 2019:301).

Tsanwani (2009:26) correctly puts it when saying, “Peer pressure in mathematics affects all learners, successful ones as well as those who are less successful. The effect of negative peer pressure has been recorded in numerous articles (Dungan & Thurlow, 1989; Reynolds & Walberg, 1992; Stuart, 2000). In this regard, Stuart (2000) argues that peer and family attitudes towards mathematics may influence learners’ confidence in the subject either positively or negatively. In their review of literature, Dungan and Thurlow (1989) found that learners’ attitudes towards mathematics have been associated with peer group attitudes. Accordingly, Reynolds and Walberg (1992) identified peer attitudes as one of the most influential factors in learners’ mathematical achievements. According to Harris (1995), learners are ridiculed by their peers for taking mathematics while others are encouraged by their peers to pursue academic excellence in mathematics”. If in a class of mathematics learners perform low and a few perform very high all the time, those that are performing very low may be affected, where at the end they lose confidence and conclude that mathematics is not meant for them but for a few gifted ones. In some cases, learners discourage each other through frightening others in such a way that at the end learners see that even at home no one took the careers that need mathematics, making them question how they can manage to perform well in mathematics.

#### **2.3.4 Learner motivation**

Many teachers have a problem with “how to motivate learners in the classroom and this has become a leading concern for teachers in all disciplines; they decide to leave them alone in mathematics. These learners are motivated by the desire for knowledge. Stimulation of this desire is one of the basic tasks of a teacher” (Tsanwani, 2009:31). Wlodkowskin (1986:6) (cited by Tsanwani, 2009:31) defines motivation as “the word used to describe those processes that can (a) arouse and instigate behaviour; (b) give direction or purpose to behaviour; (c) continue to allow behaviour to persist; and (d) lead to choosing or preferring a particular behaviour”. According to Tsanwani (2009:31), “Motivation shows the reasons for which learners become interested and react to those events that attract their attention. There are two distinct types of motivation that are linked to most academic settings, namely intrinsic and extrinsic motivation”.

According to Piek (1984:22 in Tsanwani, 2009:31), “extrinsic motivation stems from outside the subject matter area, but is in some way analogous to it. One thinks here of favourable circumstances, an exemplary teacher, the subject matter and the method of instruction, competition, prizes, allocation of marks, promotion and various other rewards”. “In this type of motivation, learners tend to centre on such performance goals as obtaining favourable judgment of their competence from teachers, parents, and peers or avoiding negative judgments’ of their competence” (Duda & Nicholls, 1992 in Tsanwani, 2009:32). “Academic intrinsic motivation is the drive or desire of the learners to engage in learning for its own sake” (Tsanwani, 2009:32). “Hunter (as cited in Molepo, 1997:63) describes the meaning of intrinsic motivation as follows: ‘When the activity itself is rewarding (enjoying reading or swimming) we have a situation where motivation is intrinsic, that is, the activity will achieve its goal’” (Tsanwani, 2009:32). Learners’ motivation cannot be observed directly, and they cannot be measured directly, but through interpretation, the observable can be recognized. “In addition to the factors mentioned earlier, other factors that contribute to these students’ disadvantage are: family background; characterised by lower socio-economic status, isolation of rural communities from adequate exposure to career opportunities; and lack of other motivational factors.” (Mabila et al., 2006:297).

### **2.3.5 Perception towards the subject**

In Tsanwani (2009:25), “Ma (1997) observes that in the case of trigonometry, learners’ attitude that mathematics was important and enjoyable was significantly associated with achievement in mathematics. Ma (1997) holds learners who have more enjoyable experiences while learning mathematics achieve higher scores. In a study of grades 10 to 12 geometry classes, Schoenfeld (1989) explores aspects of the relationship between learners’ beliefs about mathematics, their sense of mathematics as a discipline and their relationship with it, and their mathematics performance”. Mensah, Okyere and Kuranchie’s (2013:137) study in Ghana “has disclosed that the attitudes of mathematics teachers were related to the attitude of the students towards the subject. A significant relationship was found between teacher attitude and student attitude towards Mathematics. This connotes that irrespective of the mathematical capability of students, if teachers display negative attitudes towards Mathematics they may not develop positive attitudes towards the subject and vice versa. The more positive the attitude of Mathematics teachers towards the subject, the more positive the students’ attitude towards the study of the subject. The attitude of the teacher resonates in the attitude of her students toward the subject. Teachers’ attitude towards Mathematics, therefore, matters as it has a powerful influence on student attitude formation”.

### **2.4The attitudes of mathematics teachers towards the teaching of mathematics**

Tsanwani (2009:36) cites Meyer and Koehler (1990) who state that “one of the most important factors in developing learners’ ability in mathematics is by the attitude of their teacher of mathematics”. Meyer and Koehler (1990 in Tsanwani, 2009:36) also indicate that “knowledge of the learners’ thinking is important while teachers’ knowledge of mathematics content and pedagogy is also critical to the culture of the learning environment”. Lubinski (1994 in Tsanwani, 2009:36) argues that “knowledge of the

content and pedagogy in conjunction with learners' thinking, allows a teacher to design blueprints for worthwhile mathematics tasks".

In defining and seeking the importance of mathematics attitudes (Regional Education Laboratory Northwest, 2017), Regional Education Laboratory Northwest (2017:1:1) cites Ma's (1997) definition of mathematics attitudes as that which "can refer to many aspects of learners' self-perceptions, beliefs, and mindsets related to math. Research suggests that math attitudes and math skills have a reciprocal relationship; positive attitudes about math promote good performance in math, which also encourages even more positive attitudes down the road" (Ma, 1997 cited by Regional Education Laboratory Northwest, 2017:1). "Why might this be the case? One reason may be that learners who have negative math attitudes tend to avoid math" (Hembree, 1990 in Regional Education Laboratory Northwest, 2017:1). "The result of practicing less in math is likely to be worse math performance, which in turn also means even more negative math attitudes" (Regional Education Laboratory Northwest, 2017:1).

Citing Relich, Way and Martin (1994:56), "According to Leder (1992), attitudes are learnt, and predispose one towards action that may be either favourable or unfavourable with respect to a given object. Such a definition implies that attitudes are comprised of an emotional reaction to an object, behaviour towards an object, and beliefs about the object (Rajecki, 1982). Formations of attitudes towards academic subject matter are thought to develop through (a) the automisation of a repeated emotional reaction to the subject, and (b) the transference of an existing attitude to a new but related task (McLeod, 1992). Additionally, formation of academic attitudes has been identified as a complex process involving socialisation, relationships with teachers, teacher attitudes and aspects of the subject matter itself (Taylor, 1992)". Relich et al. (1994:56) also cites Sullivan (1987) and other researchers who note that "When exploring the attitudes of pre-service teachers toward mathematics, it is necessary not only to consider their attitudes towards the subject itself, but also their attitudes towards the teaching of mathematics. The attitudes of pre-service teachers are of particular

importance because of their potential influence on learners. Although research evidence is certainly not conclusive, it has been sufficient to suggest that positive teacher attitudes contribute to the formation of positive learners”.

“Different researchers connect belief with motivation and conception” (Breiteig, Grevholm & Kislenko, 2005). Kloosterman (2002 in Breiteig et al., 2005) “sees a direct connection between belief and effort. ‘Student’s belief is things that student knows or feels that affects effort – in this case effort to learn mathematics’ (p. 248). Moreover, Kloosterman (2002) argues that students’ choices are on one hand based on beliefs and on the other hand on personal goals. Thus, there is a close connection between beliefs and choices. However, sometimes the personal goals and beliefs are at variance. One major example is the learning of mathematics”. According to Breiteig et al. (2005), “This is a paradox. The reason for seeing mathematics as important can be practical – need for a better profession and to some degree for a better life. ‘Most youngsters know, as an empirical and sociological fact, that mathematical competence – even if for unclear reasons – is a key to attractive education and job opportunities’” (Niss, 1994:377 in Breiteig et al., 2005). Leder and Forgasz (2002:96 in Breiteig et al., 2005) note, “In everyday language, the term “belief” is always used loosely and synonymously with terms such as attitude, disposition, opinion, perception, philosophy, and value. As these various concepts are not directly observable and have to be inferred, and because of their overlapping nature, it is not simple to produce a precise definition of beliefs”. “Beliefs play an important part in mathematics learning and teaching. The learning outcomes of learners are strongly related to their beliefs and attitudes about mathematics” (Furinghetti & Pehkonen, 2000 in Breiteig et al., 2005). “Thus, assessment or evaluation of learners’ mathematical knowledge must be made in awareness of their beliefs” (Breiteig et al., 2005).

Tsanwani (2009:37) argues that in “mathematics research, one area of focus has been teachers’ beliefs and attitudes towards mathematics. Ernest (1989 in Tsanwani, 2009:37) “observes that the practice of teaching mathematics depends on a number of

key elements, such as the teachers' mental contents and schemes, particularly the system of beliefs concerning mathematics and its teaching and learning; the social context of the teaching situation, particularly the constraints and opportunities it provides and the teachers' level of thought processes and reflection". Jacobs and Durandt (2016:69) acknowledge that "Yara (2009) confirms that teachers with positive attitudes towards the subject stimulate favourable attitudes in their learners". Ma and Wilkins (2002 in Jacobs & Durandt, 2016:69)"put the vital role of teacher attitudes and beliefs into perspective, by positing that learners who believe that teachers have high expectations of them, tend to have a more positive attitude towards mathematics". "Even when teachers become aware of the existence of a research study on a topic, they very often find it difficult to appreciate its relevance to their own classroom" (Cockroft, 1982 in Hoyles, Armstrong, Scott-Hodgetts & Taylor, 1984:26). A mathematics teacher may influence good attitude of several young people towards mathematics or disturb many in their career choices. This and other information indicates that teachers' attitude towards mathematics have a great impact on mathematics than any other area.

"Sarason (1993) maintains that if one wants to change the education of learners, they need to first change the education of the teachers" (in Mamali, 2015:26). "Principals should influence the quality and attitudes of Mathematics education through arranging for meaningful professional development, mentoring teachers in order to strengthen the focus on Mathematics instruction, working to align curricular materials, technology, and assessments with goals for Mathematics education, establishing effective processes for analysis and selection of mathematics instructional materials" (NCTM, 2000:15 in Rikhotso, 2015:38). Tsanwani (2009:40) notes Sarason's (1983) argument that "it is necessary to prepare educators for what life is like in classrooms, schools, school systems and society". "The pre-service and continuing education of teachers of mathematics should provide them with the opportunity to examine and revise their assumptions about how mathematics should be taught, and how learners learn mathematics" (National Council Teachers of Mathematics, 1989:160 in Tsanwani, 2009:40). Tsanwani (2009:40) also notes "Chen, Clark and Schaffer (1988) who establish in their literature review that teachers positively influence learning and

achievement through high expectations in relation to learners' learning". "Cheung (1998) found that if a learner believes a teacher has a low opinion of him/her, it is possible that the learner will perform accordingly" (in Tsanwani, 2009:40).

"Educators have to make decisions appropriate to the requirement level, manage learning in the classroom and administrative duties efficiently and participate in school decision-making structures. This has to be done in ways that are democratic, which support learners and colleagues, and which demonstrate responsiveness to changing circumstances and needs" (Tsanwani, 2009:41). Daso (2013:273) notes that "Ojoko (2001) defines teaching as the art and science of directing the learning process. These, according to Ojoko (2001), indicate that teaching is often regarded as a process of imparting knowledge and skills in developing attitudes. It also necessitates managing instructional facilities and equipment, providing and organizing learning materials and resources and meeting students' needs".

Gbamanja (2001) (in Daso, 2013) states that "planned teaching results in more teaching; students tend to achieve in ways they are tested; students learn more effectively if they know the objectives and are shown how to gain the ends; the teacher's function in the learning process is that of guidance to reach an objective and that pupils learn from one another." It is the teacher's duty to see to it that learning and teaching in the class are efficient and effective in order for the learners to discover their potential. This means that if a teacher comes to class inadequately prepared to present a mathematics lesson, he or she cannot expect learners to discover their potential well.

Ogunniyi in Yara (2009 in Ngeche, 2017:6) specifies that "learners' positive attitude towards mathematics is enhanced by the following teacher-related factors: teachers' enthusiasm, teachers' resourcefulness and helpful behaviour, and teachers' thorough knowledge of the subject matter and making mathematics quite interesting". Etukudo (2002) (in Daso, 2013) points out that "the inadequacy or otherwise of a facilitator,

instructor or a teacher as the case may be, definitely produces a conspicuous effect on both the learner and what is learned. These also indicate that two teachers can teach the same group but the average learning outcome may vary. It also shows that what is learned is a function of what is taught.” These also vary because teachers are also coming from different schools that approached teaching and learning in different ways. Therefore, when teachers are imparting that knowledge to learners, they do so according to how they learnt it.

“In the same vein, Manouchetri (2002) points out that good subject matter knowledge alone is not enough for a teacher to teach well; they (teachers) need adequate knowledge of how to teach to enable them perform well and give out a rich harvest” (Daso, 2013:273). Daso (2013:273) further cite Iwuoha (2001) who “concluded that it was teachers’ lack of effective methods of teaching mathematics that scared the students away from mathematics”. According to Ball (1990:66) (in Mamali, 2015:33), “mathematics education has not been exposing enough alternative teaching methods for teaching Geometry, with an emphasis on meaning. Ball (1990) further mention that pre-service secondary mathematics teachers often lack sufficient geometrical understanding to teach the subject effectively.”

Tsanwani (2009:43) states, “In 1991, the National Council of Teachers of Mathematics, together with the Association for Supervision and Curriculum Development, published *A Guide for Reviewing School Mathematics Programs*. In that document, they state that in order to have high-quality mathematics programs, teachers of mathematics must be well-prepared, process and demonstrate positive attitudes, continue to grow professionally, and be actively involved in educational issues that affect the quality of their learners’ learning (NCTM & ASCD,1991)”. “Mullis (1991) in his assessment of the state of mathematics achievement in the USA, found some modest evidence of a positive relationship between the extent of in-service education and learners’ achievement in Grade 8. However, in Grade 4, in-service education did not seem to be significantly related to mathematics achievement” (Tsanwani, 2009:43).

Tsanwani (2009:43) indicates, the “lack of adequate in-service training opportunities for some teachers is a barrier to learners’ academic achievement in mathematics”. Furthermore, Tsanwani (2009:43) reports, “experienced teachers did not have adequate opportunities to improve their knowledge and skills, and that in-service training opportunities for teachers were “second rate (US Department of Education, 2000:32)”. According to Tsanwani (2009:43-44), “The report cites the following problems regarding the in-service training of teachers: In-service training remains largely short-term and non- collaborative and in-service training is often unrelated to the teachers’ needs and the challenges faced by their learners”. These come to a point that when learners see mathematics as a boring subject, all this is caused by the teachers that are not qualified enough to teach. “Teachers are offered in-service training opportunities that last for a few hours (less than eight)” (Tsanwani, 2009:43).

Tsanwani (2009:44) also notes, “Lockheed and Komenan (1989) show a significant positive relationship between teacher experience and learner achievement in some developing countries, for instance in Nigeria and Swaziland. In contrast, Chen et al. (1988) established no significant relationship between teacher experience and learners’ mathematical achievement”. Teachers also need more time for training in the field they are teaching so that they can master and acquire more knowledge. This can help them to face and solve problems that are also more complicated when teaching learners in the class of mathematics.

## **2.5 Association between learners’ attitudes and their performance in mathematics**

In a study in Portugal, “Fraser and Kahle (2008) have highlighted the aspect in research which shows that learning environments at home, at school, and within the peer group accounted for a significant amount of variance in student attitudes and, furthermore, that class ethos had a significant impact on the scores achieved by students for these attitudes” (in Mulala, 2015:4). Kufakunesu (2015) cites Rammala (2009:19) who notes that “negative attitudes towards learning could result in learners performing poorly, thereby preventing them from obtaining the results required for university entrance. This

means that the relationship between attitude and achievement is based on the concept that the better the attitude a learner has towards a subject or task, the higher the achievement or performance level in that subject or task". This implies that negative attitudes can lead to low performance, and positive attitudes to high performance.

Mohamed and Waheed (2011) (cited in Mata, Monteiro & Peixoto, 2012:2), "in reviewing literature aimed at understanding attitudes and the influences on their development in relation to differences between students, identified three groups of factors that play a vital role in influencing student attitudes. These are factors associated with the students 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 maths, guidance, beliefs); finally factors from the home environment and society (e.g., educational background, parental expectations)". "Attitudes can be seen as more or less positive" (Mata, Monteiro & Peixoto, 2012:2). According to McLeod (1992 cited in Knowles, 2004:78), "factors such as attitudes and beliefs play an important role in mathematics achievement. The general relationship between attitude and achievement is based on the concept that the better the attitude a learner has towards a subject or task, the higher the achievement or performance level in mathematics".

"A positive attitude towards mathematics reflects a positive emotional disposition in relation to the subject and, in a similar way, a negative attitude towards mathematics relates to a negative emotional disposition (Zan and Martino, 2008). These emotional dispositions have an impact on an individual's behavior, as one is likely to achieve better in a subject that one enjoys, has confidence in or finds useful. For this reason, positive attitudes towards mathematics are desirable since they may influence one's willingness to learn as well as the benefits one can derive from mathematics instruction" (Eshun, 2004 cited in Imasuen & Omorogbe, 2016). Thuo (1985) notes that in Kenya,

'learners' attitude towards mathematics' (Imasuen & Omorogbe, 2016) expectations and aspirations contributed to achievement. The learners who showed negative attitude in mathematics spent less time in the subject and performed badly. A learner feels bored with the subject. A learner who is negative feels it as time consuming spending much time on a subject in which they do not perform well. On the other hand, learners who showed a positive attitude in mathematics spent more time on the subject and they performed well.

Different socio-economic factors, lack of basic mathematics skills and lack of resources influenced performance of learners in the teaching and learning of mathematics (NCTM, 2000). Efklides (2009) (cited in Arends, Winnaar & Mosimege, 2017:2) argues that "students' problem-solving difficulties are not always an outcome of lack of mathematical knowledge, but commence from ineffective activation of student knowledge, since students lack the metacognitive skill needed to control, monitor and reflect on the solution process". "As a result, cognitive/meta-cognitive difficulties cause many students to develop negative feelings towards mathematics, thus hindering learning and achievement" (Efklides, 2011; Efklides & Petkaki, 2005 in Arends, Winnaar & Mosimege, 2017:3). Grane's (1990:125) survey showed "that the problem of low performance of learners is not restricted to languages only in the Mthatha schools with which researchers are familiar, but is also prevalent in other subjects as well". "The detailed compliment of this assertion is essentially demonstrated by the number of learners who are low in mathematicians, and not only low in Mathematics, but also poor in other related school subject skills" (Grane, 1990, p. 125).

## **2.6 Theoretical Framework**

Brondizio, Leemans and Solecki (2014) (in Adom, Hussein & Agyem, 2018:438) concur that a "theoretical framework is the specific theory or theories about aspects of human endeavor that can be useful to the study of events". Ravitch and Carl (2016) (in Adom, Hussein & Agyem, 2018:438) state that "the theoretical framework helps researchers in situating and contextualizing formal theories into their studies as a guide. This positions

their studies in scholarly and academic fashion. They further state that theoretical framework serves as the focus for the research and it is linked to the research problem under study". This study utilised the Constructivism Theory and the Emotional Intelligence (EI) theory. These were regarded relevant for this study.

### **2.6.1 Constructivism Theory**

Constructivism is defined as an idea that emphasises the active role of learners in creating their own knowledge by creating understanding and construction of sense of information (Woolfolk, 2010 in Gweshe, 2014:20). According to Cobb, Yackel and Wood (1992) (cited in Gweshe, 2014:20), constructivist learning is described "as an active construction and the representational view of the mind, whereby learners modify their internal mental representations to construct" (Kufakunesu, 2015). According to Bada (2015:66), "Constructivism is an approach to teaching and learning based on the premise that cognition (learning) is the result of "mental construction." In other words, students learn by fitting new information together with what they already know. Constructivists believe that learning is affected by the context in which an idea is taught as well as by students' beliefs and attitudes. Constructivism is a learning theory found in psychology which explains how people might acquire knowledge and learn. It therefore has direct application to education. The theory suggests that humans construct knowledge and meaning from their experiences. Constructivism is not a specific pedagogy. Piaget's theory of Constructivist learning has had wide ranging impact on learning theories and teaching methods in education and is an underlying theme of many education reform movements. Research support for constructivist teaching techniques has been mixed, with some research supporting these techniques and other research contradicting those results".

Vygotsky (1964) (in Shortt, 2017:46) "suggested that social processes were important from a very early age". "Cheek (1992) cited in Paulsen (2009) maintains that in constructivism learners actively take in knowledge, connect it with prior knowledge and make it their own knowledge by constructing their own interpretations. In a constructivist

classroom, the teacher provides learners with resources and activities that ensure they are actively involved and participate while they are constructing their own knowledge” (Kufakunesu, 2015). Suhendi and Purwarno (2018) note, “Constructivism views the formation of knowledge as an active subject that creates cognitive structures in their interactions with the environment. Cognitive interaction will occur as far as reality is structured through the cognitive structure created by the subject itself. The cognitive structure must always be altered and adapted according to the demands of the environment and the changing organism. The process of adjustment occurs continuously through the process of reconstruction (Amineh & Davatgari, 2015:9-16)”.

“The most important thing in constructivism theory is that in the learning process, the learner should get the emphasis. Learners must actively develop their knowledge, not others. Learners must be responsible for their learning outcomes. Their creativity and liveliness will help them to stand alone in their cognitive life” (Suhendi & Purwarno, 2018). However, constructivism does not assist one’s emotional control, which affects formation of attitudes. Therefore, the study also used the emotional intelligence theory.

### **2.6.2 Emotional Intelligence**

According to Mayer and Salovey (1997), emotional intelligence is the ability to monitor one’s own emotions to guide one’s thinking and behavior. Studies have shown that how one manages his/her emotions to achieve success determines the level of one’s emotional intelligence. Individuals with high levels of emotional intelligence are those who control their feelings and behaviours so that their ability to think wisely is not impaired (McEnrue & Groves, 2006). The researcher is of the view that learners who have the skills to overcome their emotions perform better in any kind of task assigned to them.

According to Bar-On (2005), learners’ level of emotional intelligence is necessary to contribute to their mathematics achievement. Learners’ attitudes in this case include habits, problem-solving behaviour, mathematics anxiety and attitude towards mathematics. The use of the theory of “Emotional intelligence” in this study is necessary

because emotional intelligence plays a significant role in learners' mathematics achievement and mastering of certain mathematics concepts. "Emotional intelligence affects or influences learners' decision-making and achievement, and a more positive attitude leads to increase in effort and determination" (Van der Walt, 2008 in Maree, Fletcher & Erasmus, 2014). Therefore, emotions of both the teacher and learners need to be controlled to make teaching and learning of mathematics interesting and lovable in order to improve the performance of learners. "Learners' emotions, attitudes towards mathematics and study habits, their experience of the teaching and learning of mathematics, the classroom atmosphere and their family life, all play a significant role in their mathematics achievement" (Maree, 2007 in Maree et al., 2014). The next section presents the conceptual framework for the study.

## **2.7 Conceptual Framework**

"A conceptual framework is a structure which the researcher believes can best explain the natural progression of the phenomenon to be studied" (Camp, 2001 in Adom et al., 2018:439). Peshkin (1993 in Adom et al., 2018:439) notes, "It is linked with the concepts, empirical research and important theories used in promoting and systemizing the knowledge espoused by the researcher". "It is the researcher's explanation of how the research problem would be explored. The conceptual framework presents an integrated way of looking at a problem under study (Liehr & Smith, 1999)" (in Breiteig et al., 2005).

### **2.7.1 Improved socio-economic conditions**

Rothstein (2000) as cited in Engin-Demir (2008) contends that "learning is a product of teaching activities not only from formal schooling, but also from families, communities and peers. Social, economic and cultural forces affect learning and thus school achievement". Studies by Erdogdu and Erdogdu (2015) "suggest that student background, school and home environment and access to Information and Communication Technology (ICT) are among important sets of determinants of

educational performance. There is therefore a relationship between academic success and student background, school and home environment and access to ICT”.

One can argue that attitudes are mostly affected by social background. Children from disadvantaged backgrounds have many challenges, including lack of basic resources such as food, learning resources and many more. As these children face challenges going to schools, they mostly get to schools tired and hungry, and as such, learning challenging subjects like Mathematics is difficult. Most of such learners tend therefore to develop negative attitudes towards mathematics. In addition to that, most disadvantaged communities do not see the importance of mathematics, hence cannot motivate learners to enjoy mathematics. The researcher therefore suggests the need to improve the livelihood of most communities and educate them so that children can start to appreciate the value of mathematics and hence develop a positive attitude towards the subject. This is because Erdogdu and Erdogdu (2015) contend that “influences related to home and school environment affect academic achievement and students’ pre-existing human capital, which includes their unique way of interacting with each type of educational institution, namely family, community, school, peer group, the economy and the culture”.

### **2.7.2 Family involvement in schoolwork**

Schiller et al. (2002, as cited by Engin-Demir, 2008) argue that “regardless of national context, parents who have more education appear to be better able to provide their children with the academic and social support important for educational success when compared to parents with less education”. Parka, Stone and Holloway (2017) cite Engin-Demir (2008) who also state that “as members of a school community, parents may be willing and able to influence the school's learning environment, policies and practices, as well as the achievement of the student body as a whole”. The researcher can argue the need for family support to their children’s education. All children feel motivated if parents or family members show some interest in their schoolwork. There is need for programmes to inform parents that showing commitment to their children’s education helps children develop positive attitudes towards their schoolwork. The area

in which this study was conducted is largely rural, and, as such, efforts to educate families to be part of their children's school work would most likely assist learners to develop positive attitudes generally towards school and in particular towards mathematics.

### **Summary**

Chapter 2 presented the review of literature. I started by presenting literature on sources that help learners develop positive or negative attitude towards mathematics. I then presented literature focusing on the objectives of the study before presenting the theoretical and conceptual frameworks of the study.

## **CHAPTER 3 RESEARCH METHODOLOGY AND DESIGN**

### **3.1. Introduction**

Chapter three describes the research methodology used in this study. According to McMillan and Schumacher (2010:8), "methodology refers to a design whereby the researcher selects data collection and analysis procedures to investigate a specific research problem". This section focuses on the methodology used, the research approach and the design adopted. It also addresses the population, and sample, instruments for data collection, data collection procedure, data analysis procedure and ethical considerations.

### **3.2. Research methodology**

According to Igwenagu (2016:5), "This is a set of systematic technique used in research. This simply means a guide to research and how it is conducted. It describes and analysis methods, throws more light on their limitations and resources, clarify their pre-suppositions and consequences, relating their potentialities to the twilight zone at the frontiers of knowledge". "The methodology section provides enough information to

understand how the study was conducted. It includes how the participants, data collection techniques, and data analysis were selected and used. Such information helps researchers enhance the credibility, validity, and readability of the study” (Jalongo & Saracho, 2016:190). “A methodology does not set out to provide solutions - it is, therefore, not the same thing as a method. Instead, it offers the theoretical underpinning for understanding which method, set of methods or best practices which can be applied to specific case, for example, to calculate a specific result” (Igwenagu, 2016:4). Guba and Lincoln (2005) (in Hannaway, 2017:11) argue that “philosophical assumptions in research consists of a basic set of beliefs or assumptions that guide investigations”.

### **3.3 Research Approach**

“A research approach is a plan of action that gives direction to conduct research systematically and efficiently” (Mohajan, 2017:2). There are three main research approaches as Creswell (2009) (cited in Mohajan, 2018) notes: “i) quantitative (structured) approach, ii) qualitative (unstructured) approach, and iii) mixed methods research”. “Mixed methods research is the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches (e.g., use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the broad purposes of breadth and depth of understanding and corroboration” (Johnson, Onwuegbuzie & Turner, 2007:123 in Mpetta, 2013).

The researcher used a mixed methods research approach in this study; both qualitative and quantitative research approaches were used. According to Ivankova (2006, in Shorten & Smith, 2017:74), “Mixed methods research requires a purposeful mixing of methods in data collection, data analysis and interpretation of the evidence. The key word is ‘mixed’, as an essential step in the mixed methods approach is data linkage, or integration at an appropriate stage in the research process.” Therefore, in this research the mixed methods were used, and the study involved questionnaires that gathered quantitative data and interviews that gathered qualitative data “to discover knowledge

which is directed at explaining relationships” (Creswell, 2009:7 in Mtemeri, 2017:48-49).The mixed methods approach was used at data analyses stage.

### **3.4 Research design**

According to Saunders, Lewis and Thornhill (2012), a research design could be viewed as the overall strategy around the steps that one has to follow in order to give answers to the objective(s) or sub-questions of the study. As such, a research design includes aspects as the specific tactics and procedures that are aligned to the process of collecting data and its analysis. The study made use of a sequential explanatory mixed method design. The first phase dealt with the collection and analysis of quantitative data. As an alternative strategy, “themes that emerged from the qualitative interview data could be transformed into counts or ratings and subsequently compared to the quantitative survey data” (Creswell, Plano-Clark, Gutman & Hanson, 2003).

According to adapted definitions of Teddlie and Tashakkori’s (2009:151) five sets of mixed methods research designs, sequential mixed designs is, in line with Hanson, Petska, Creswell and Creswell (2005), “where QUAL and QUAN strands occur across chronological phases, and the procedures/questions from the later strand emerge/depend/build on the previous strand; the research questions are interrelated and sometimes evolve during the study”. By using this design, one set of data complements the other, helping to overcome any weakness associated with each method (Creswell & Plano-Clark, 2007). This was used to assist in exploring teachers’ and learners’ attitudes and their contribution to unsatisfactory achievement in maths in the Elim Circuit in Vhembe West Education District.

### **3.5 Target population**

The study’s target were senior secondary school teachers and learners in the Elim Circuit in the Vhembe West Education District of South Africa. The target population of this study included all the public secondary schools within the Elim Circuit in Vhembe West District. Elim Circuit had a total number of eight public secondary schools. All public secondary mathematics teachers and learners in FET in these selected schools were targeted by this research. The target population was therefore 600 mathematics learners and 100 teachers from the Elim Circuit of the Vhembe West Education District.

### **3.6 Sample**

Field (2007) views a sample as a proportion of the population which is employed to establish facts regarding that population. The study used both random and convenient sampling. Five public secondary schools were conveniently selected to take part in this research. Only 130 learners and 30 teachers within these five schools voluntarily participated in this study. The selected 130 learners and the 30 teachers who responded to the questionnaires in the quantitative stage were randomly sampled. Cited in Mangan (2019:23), “Saunders (2012) suggests a minimum sample size of between five and twenty-five for semi-structured interviews. Although it appears a contradiction to use a smaller sample size, Patton (2002) argues that small number of diverse cases are a strength, as any patterns that do emerge are likely to provide interesting key themes as well as uniqueness”. For the qualitative data, the researcher just selected those available and volunteering to be interviewed because some of them were not interested in the interview. Therefore, interviewees were 15 teachers.

**Location of study:** The study took place in public secondary schools within the Elim Circuit in Vhembe West District in Makhado Municipality. The choice of the sample for this study was influenced by the fact that the performance in mathematics of secondary schools within the Elim Circuit in Vhembe West District in Makhado Municipality was very low.

### **3.7 Description of instruments**

The study used two instruments. Numerical data was gathered using semi-structured questionnaires distributed to teachers and learners. The questionnaires had differently structured questionnaire items that, however, were related in terms of the information solicited. In other words, I wanted to know the participants’ opinions. On the other hand, qualitative data was gathered by means of open-ended questions, which were used when teachers individually answered interview questions.

The questionnaire for Mathematics teachers was intended to establish contributing elements to low performance in mathematics. It was divided into four sections. First section solicited teachers' demographic data while second section wanted teachers' views and perceptions about mathematics study and Section C was about teachers' professional development. Section D was about teachers' competency for teaching some concepts/topics (Appendix G). The questionnaire for Mathematics learners had two parts. First section solicited learners' demographic information and second section consisted of short mathematics questions for learners to answer (Appendix H). The interview questions for teachers were as in Appendix I. Interviews can be seen as the transaction that takes place between those seeking information and those giving information (Feza, 2015).

### **3.8 Data collection Procedure**

Cohen and Swerdlik (2003) and Patton (2003) define data collection as the procedures that are followed during data gathering and measurement of data on issues of curiosity. They further explain that the process takes place in a way that is pre-established and fashioned systematically in line with specific pacts and laws. To make things simple, a survey instrument was used to gather data from learners. All learners were visited in their schools by the researcher, and their educators administered the questionnaires after school so that there was no interruptions of teaching and learning during school periods. In all the sampled schools, the researcher approached the mathematics Heads of Departments where the questionnaires were left for forwarding to teachers and learners. Only those learners who were willing to take part in this research after their teachers explained to them were the ones that filled up the questionnaire. All participants filled informed consent forms before participating. Under-age learners had their parents filling informed consent forms on their behalf. Questionnaires of both teachers and learners handed to HoDs were collected by the researcher from the HoDs after the teachers returned them to the HODs.

### **3.9. Validity and reliability**

“Validity is defined as the extent to which a concept is accurately measured in a quantitative study” (Heale & Twycross, 2015 in Nguyen, 2017:31). Jansen (2014) notes, “Validity or credibility in qualitative research concerns the accuracy or truthfulness of the findings (Wilson, 2013)”. Muijs (2011 in Ghazali, 2016:149) defines reliability as ‘the extent to which test scores are free from measurement error’. In this study, Cronbach alpha coefficient was used to test reliability of the instrument. On the other hand, a pilot study was conducted to validate the instruments. The supervisor also validated the instruments by going through them.

### **3.10. Data analysis**

Marshall and Rossman (1999:150) describe data analysis as “the procedure of conducting order, structure and meaning to the mass of data gathered. It is described as messy, ambiguous and time-consuming, but also as a productive and interesting process”. This stage is where one has to interpret the findings of their study in order to draw conclusions.

Quantitative data was analysed using the SPSS Version 25. SPSS generated descriptive statistics such as frequency tables, percentages, means and standard deviations that were used to explain all variables under study. For analysing qualitative data, content analysis was applied. Using this analysis method enabled the researcher to identify key words and ideas raised repeatedly by participants.

Items were graded using the following key as used by Yang, Lin and Koo (2013): “Strongly Agree was awarded 5 points, Agree 4 points, Uncertain 3 points, Disagree 2 points and Strongly Disagree 1 point”. Alternative items were graded in the opposite with reversed keys so that Strongly Agree 1 point, Agree 2 points, Uncertain 3 points, Disagree 4 points and Strongly Disagree 5 points. “Reversing the scoring of the negative items has the advantage of reflecting positiveness towards the object in question” (Nyaga, 1997 cited in Kobia & Ndiga, 2013:5). Slightly deviating from Nyaga

(1997 in Kobia & Ndiga, 2013:5), “the maximum score possible was therefore 5 points x 12 items = 60 representing perfectly positive attitude. On the other hand, the lowest score was equal to 12, that is, 1 point for 12 items, representing perfectly negative attitude. A perfectly neutral level was represented by a score of 30”.

### **3.11 Ethical considerations**

There is no research which is viewed as complete without ethical considerations. According to Bryman and Bell (2007:71), “the following points represent the most important principles related to ethical considerations in dissertations:

1. Research participants should not be subjected to harm in any way whatsoever;
2. Respect for the dignity of research participants should be prioritised;
3. Full consent should be obtained from participants prior to the study;
4. The protection of the privacy of research participants has to be ensured;
5. Adequate level of confidentiality of the research data should be ensured, and
6. Anonymity of individuals and organisations participating in the research has to be ensured...”.

As such, issues on ethics are important for every investigation such that failure to abide by them can cause research to fail. The steps mentioned above were taken into consideration in the following ways.

**3.11.1. Permission:** The researcher requested permission from the University of Free State (Appendix A) and the Regional Director for Education (Appendix B) to conduct research in the Elim Circuit in Vhembe West District. Permission was also requested from principals of the sampled schools (Appendix C).

**3.11.2. Consent:** Participant information sheets and informed consent forms were drafted and distributed to participants before the research commenced (Appendix D and Appendix F). The researcher informed participants of the purpose of the research, and that participation was voluntary. For learners below 18 years of age, the researcher wrote informed consent letters to parents (Appendix E) and learners to complete first before learners were handed questionnaires to complete.

**3.11.3 Anonymity and confidentiality:** In this study participants were assured that personal identifiers, such as names, were not to appear anywhere in the research.

**3.11.4 Honest:** The researcher also ensured and guaranteed participants that the report findings were to be truthful and honest, and there would be no twisting of words.

### **3.12 SUMMARY**

The methodology and the research approach adopted for the study were described. The chapter also outlined in detail the research design with emphasis on how it fit the approach. The sampling techniques adopted were also detailed as well the instruments used and the processes adopted to ensure their reliability and validity. The next chapter presents findings of the study.

## CHAPTER 4

### DATA PRESENTATION, ANALYSIS AND DISCUSSION

#### 4.1 Introduction

This chapter presents and analyses the results of the study. Considering that a mixed method approach was adopted, a description of the broad categories produced from the teachers' qualitative data is presented simultaneously with quantitative findings in line with the adopted research design. In this study, the narrations of the interviewed teachers were presented together with learners and teachers' quantitative responses in light of the objectives of the study.

#### 4.2. Data Presentation

The section starts by presenting biographical information of all the participants. Responses from interviews are presented with pseudonyms T1, T2, T3 etc to refer to Teacher 1, Teacher 2, Teacher 3 etc. respectively.

##### 4.2.1 Biographical information of the participants

##### 4.2.2 Biographical information of teachers

The study had 30 mathematics participants who volunteered to participate in the study. Refer to Table 4.1 below for the biographic characteristics of the participants. As indicated in the table below, 16 (53.3 %) of the participating teachers were males while 14 (46.7%) were female. It was interesting to note the gender balance of teachers. This supports beliefs that males are better in Mathematics than females. The table also shows that 70% of the teachers were at least 41 years old while 60% had experience ranging between 10 to 15 years. Furthermore, 57% had taught Grade 12 while 33% had taught Grade 11. This is emphasized by Qing Li (2006), who states that people tend to label mathematics a male territory; this has been replicated in teachers' tendency to value too highly male students' mathematics competence, have greater hopes for male students and more positive attitudes

about male students.

Table 4.1: Biographic characteristics of the teacher participants

Variable	Characteristic	Frequency	Percentage
Gender	Male	14	47
	Female	16	53
Age (years)	21-30	2	7
	31-40	7	23
	41-50	11	37
	51 and above	10	33
Experience (years)	10-15	18	60
	16-20	4	13
	21-25	4	13
	26 and above	4	13
Grade mathematics taught	10	3	10
	11	10	33
	12	17	57

Fifteen mathematics teachers participated voluntarily without coercion. It emerged that participants were all Curriculum Specialist 1(CS1) teachers of which seven were females while the rest were males. There was therefore, a gender balance. It further emerged that the majority of participants were of aged 41-50 than those aged 51 and above. Table 4.1 also shows that there were more people with 10-15 years of experience.

#### 4.2.3. Biographic data of the learner participants

The mathematics students who volunteered to participate in the study were 130. Table 4.2 presents biographic characteristics of participating learners.

Table 4.2: Biographic data for learners

Variable	Characteristic	Frequency	Percentage
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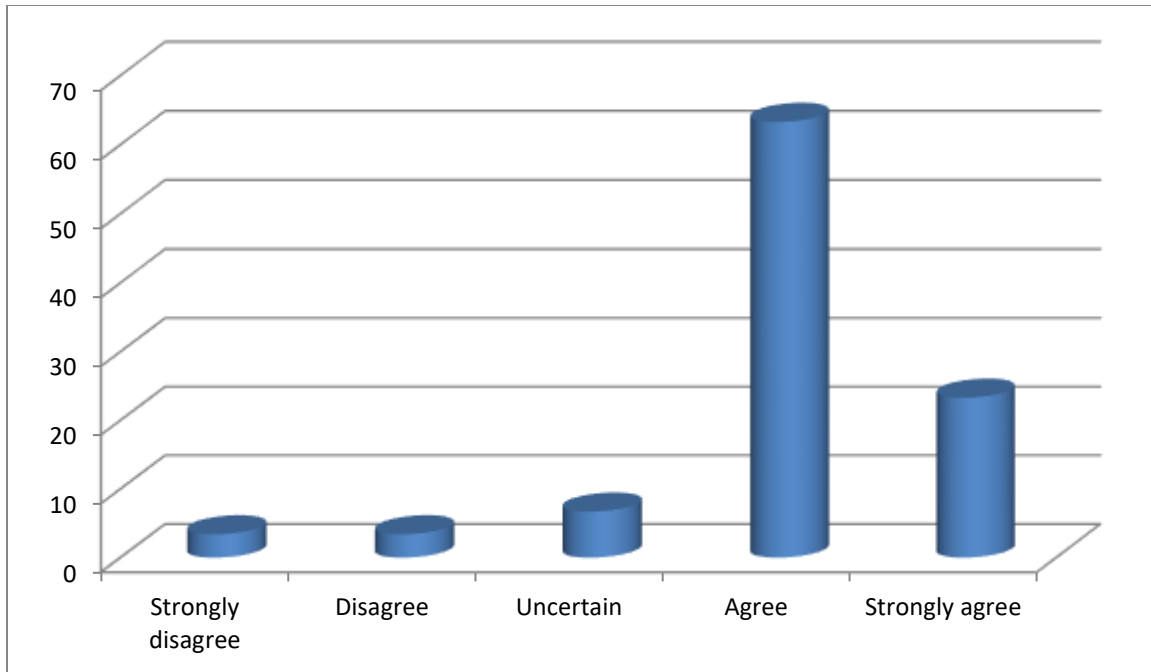
Grade 10	Gender	Male	6	5
		Female	7	5
	Age (years)	14-17	12	9
		18-21	1	0
Grade 11	Gender	Male	37	28
		Female	39	30
	Age (years)	14-17	45	34
		18-21	35	27
Grade 12	Gender	Male	24	18
		Female	16	12
	Age (years)	14-17	5	4
		18-21	35	27

Table 4.2 depicts that 52.3% (68) of the learners were males, whereas 47.7% (62) were females. The data also shows that more male learners than female learners who participated in this study. This implies that this category appears to have more male learners than female learners doing Mathematics. Furthermore, 30% of the learner participants were Grade 12s whereas 58% were Grade 11s. The rest were Grade 10 learners. In addition, 47% of all the participants were learners within the 14-17 year age range while the rest were between 18 and 21 years.

### **4.3 Attitudes of senior secondary school learners towards the study of mathematics**

There are many sources of learners' development of certain attitudes towards mathematics, and they range from teacher-centred to learner-centred as presented below.

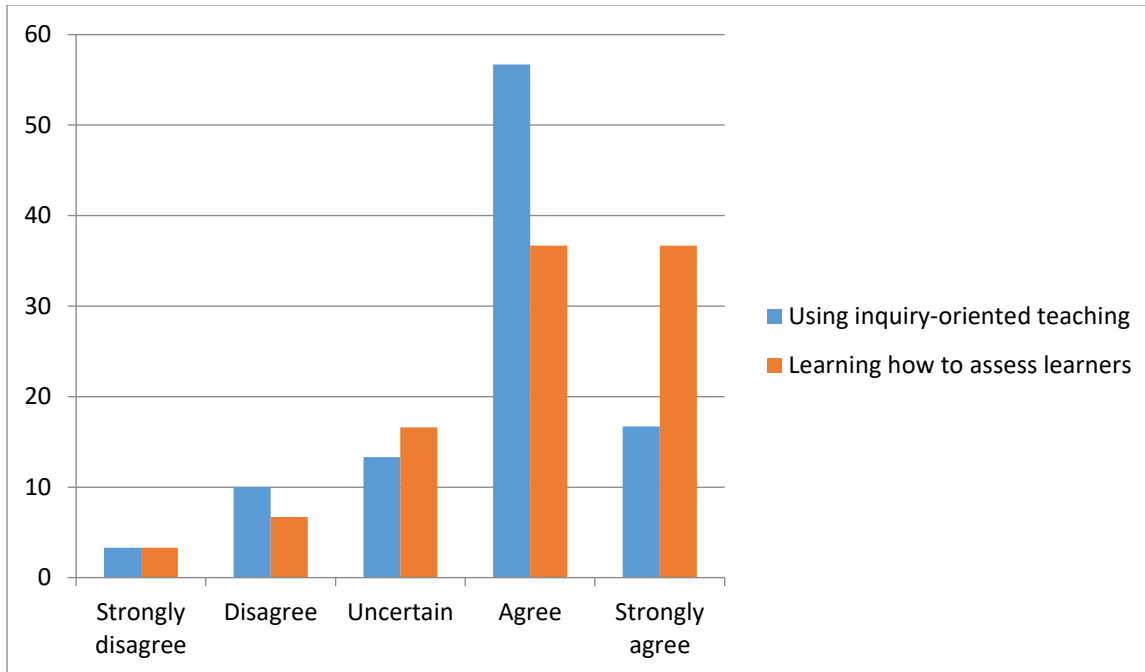
#### **4.3.1 Views on effect of teachers' understanding of learners' thinking in mathematics on developing learner attitude**



**Figure 4.1: Effect of teachers' understanding of learners' thinking on learner attitude in mathematics**

Figure 4.1 above indicates that 86.6% were of a view that understanding learners' thinking in mathematics directly affected learners' development of attitude towards mathematics, both positively and negatively. Furthermore, 7% of the teachers were uncertain; they did not understand learners thinking in mathematics, which also likely affected learners' attitudes.

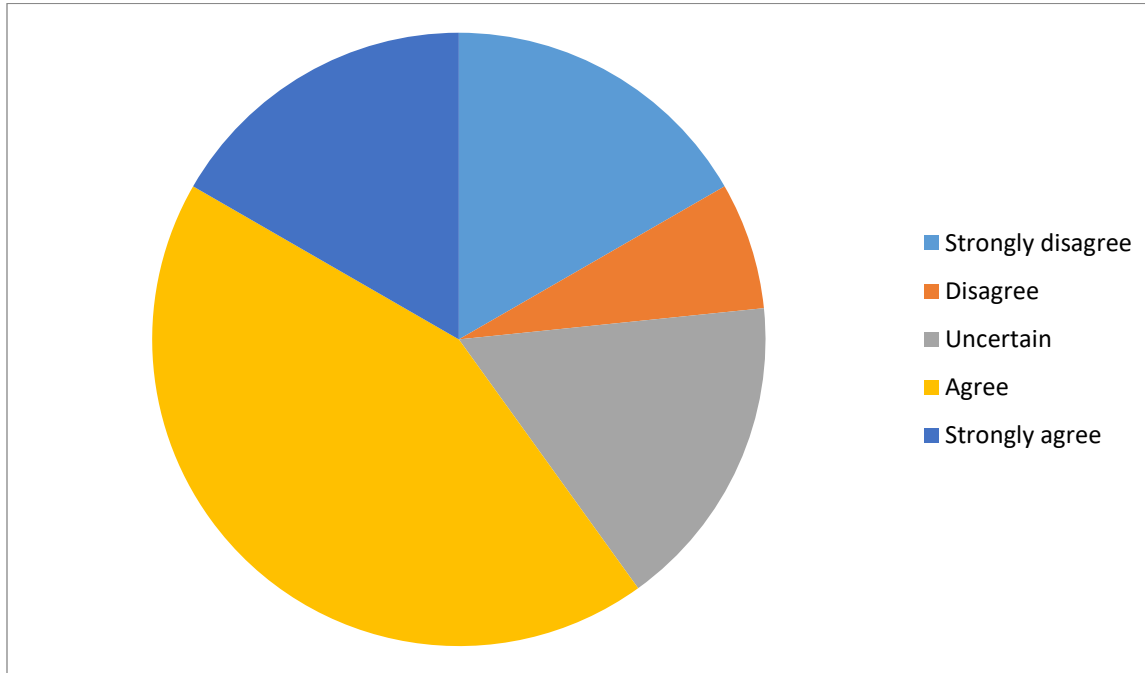
#### **4.3.2 Comparing use of inquiry-oriented teaching strategies versus learning assessment of learners' mathematics learning**



**4.3.3 Fig 4.2: Comparing use of inquiry-oriented teaching strategies versus learning assessment of learners' mathematics learning**

In Figure 4.2 above 73.7% of the teachers indicated that they were still learning the use of inquiry-oriented instruction approaches, followed by 13.3% who were uncertain. Lastly, 3.3% of the teachers disagreed that they were not learning the use of inquiry-oriented instruction approaches, while 3.3% of them were of the view that they were ignorant of mathematics learning instruction. In addition, 90% of the teachers said they were not ignorant of assessing learners' learning in mathematics, followed by 6.7% who were uncertain.

#### 4.3.4 Learning teaching mathematics in an inclusive



**Figure 4.3: Learning teaching mathematics in an inclusive class**

In Figure 4.3, 60% of the participants were of the view that there is need to learn teaching Mathematics in an inclusive class, 23.3% were of an opinion that they did not need to learn that while 16.7% of learners were uncertain. In the qualitative findings, there were several factors, which can cause positive increase in Mathematics learners. The teachers who responded indicated that the number of learners in Mathematics was increasing and indicated the following as contribution factors; learners were motivated by being told about the importance of doing Mathematics and the career they can choose at university level if they chose and pass Mathematics at grade 12. In the qualitative phase, T1 said that *“the number of learners in mathematics increases because learners understand that when they elevate to university mathematics is needed”*. T8 also said that *“there is team work and mutual relationship between learners and teachers”*. T13 said *“learners were motivated and told about the importance of doing mathematics and the career that need mathematics in order to enrol them”*. T15 said that *“The learners did get good basics foundation in mathematics”*.

#### 4.3.4 Lack of enough material for learning Mathematics

Learners' views about availability of enough material for learning Mathematics and how it could affect their attitude is presented below.

Table 4.3: Lack of enough material for learning Mathematics (N=130)

Response	Frequency	Percentage
Strongly disagree	40	30.8
Disagree	28	21.5
Neutral	16	12.3
Agree	25	19.2
Strongly agree	21	16.2
Total	130	100

In Table 4.3, 52.3% of the respondents were of the view that there were inadequate Mathematics materials. As such, that could lead to Mathematics learners to decrease. Mathematics learning material portrays crucial role in the learners' achievement in any subject with Mathematics included. Therefore, the findings of this study tally with the findings of Ojimba (2012), who realized that creation of positive attitude concerning Mathematics, delivery of instructional materials, delivery of libraries and laboratories, methods in teaching Mathematics were other means to improve learners' mathematics achievement.

According to teachers, many learners believed Mathematics was difficult and they opted for Mathematics Literacy or other subjects. Other teachers mentioned that learners, due to their laziness, chose other subjects over Mathematics. The responses from the teachers' interviews included T2 saying that, *"they [learners] said it is difficult for them, they would rather do mathematics literacy"*. T3 indicated that, *"It is because of the persistent problem or statement that says mathematics is difficult"*. T4 responded saying *"shortage of mathematics educators makes us to be piled with more work and end up not delivering well"*. T5 said, *"decreasing is caused by learners who are lazy, they are not interested in the subject and they do not practice"*. T6 also said *"the cause of this is*

learners' laziness". T7 said, "it is decreasing because the learners think that mathematics is difficult, so they go to other streams, but not for mathematics and physical sciences". T9 said "learners are let down by the grade 9 results, when a learner fails to pass grade 9 mathematics, or they pass with a pass mark it then discourage a learner to take pure mathematics in grade 10". T10 said "they are taking mathematical literacy". T11 also responded that decrease of learners was caused by "fear and lack of commitment towards the subject". T12 said the "parents cannot help their children with mathematics assignment and homework, so they force them not to study mathematics". T13 said that "learners have negative mentality of saying mathematics is difficult, [as] every day they need to practice".

#### **4.3.5 Effects of learner performance in Mathematics**

It was not surprising that the majority of teachers indicated that the performance of Mathematics learners was poor to average. That was not only happening in Vhembe District, as even at provincial and national levels learners are not performing well in Mathematics. "Performance is very bad", said T5. T2 said their performance is "50/50". T5, T6, T9, T10 and T11 responded saying, "performance is very bad and is poor". T7 and T13 responded saying their performance is "Average". T12 said, "50% average and 10% do well while 40% fail". T14 said that, "the performance of learners in mathematics is very low". T15 said, "Only a quarter learners do understand the operation of mathematics". With such poor performance, many learners have developed a negative attitude towards mathematics.

On the other hand, T1, T3, T4 and T8 responded that *the performance of some learners is good and satisfactory*. The researcher concluded that this was a true reflection of what is happening within the district, because there are still learners who are getting distinctions. The responses of teachers who are satisfied with learners' performance included T1 who said, "Other learners are good while others are in average". T2 responded saying, "We have few learners who are competent in mathematics class". T3 said, "The performance is satisfactory, not excellent as we have those learners who resist to come out from level one". T4 said, "Is good and satisfied".

#### **4.3.6 Reasons learners quit Mathematics for Mathematical literacy**

T6 mentioned the issue of learners being lazy to think and calculate and that they prefer easy things. T7 mentioned that, *“they come with a negative attitude toward mathematics which makes it difficult for them to cope during teaching and learning”*. T2 added and said the cause is that *“they said mathematics is difficult and mathematical literacy deals with everyday life. It covers all subjects”*. T1 said *“the learners of nowadays are not hard workers, their vocabulary are less participating in education”*. T3 responded saying *“they are misinformed by parents and educators who are not competent in mathematics”*. T4 said, *“Those are the challenges that they come across while dealing with mathematics as it needs them to think critically”*. T5 also said, *“They are most interested in using calculators to do much work as they would have been given”*. T8 said, *“Learners need supervision and support from the community and other stakeholders to pursue their goals”*. T9 said, *“Learners do not like mathematics because it challenges their thinking, learners are lazy to reason, and they don’t like to focus”*. T10 *“Mathematical literacy is easy. Pure mathematics is more difficult”*. T11 also said the *“lack of enthusiasm”*. T12 said that learners do mathematical literacy *“so that they can get help easier, since most of those who study mathematics end up in universities”*. T14 said, *“Learners don’t want to practice mathematics”*, while T15 said, *“basic background is very poor”*. T6 responded saying *“because they are lazy to think and to calculate”*, also while T7 said, *“they are lazy to think and want to do easy things”*.

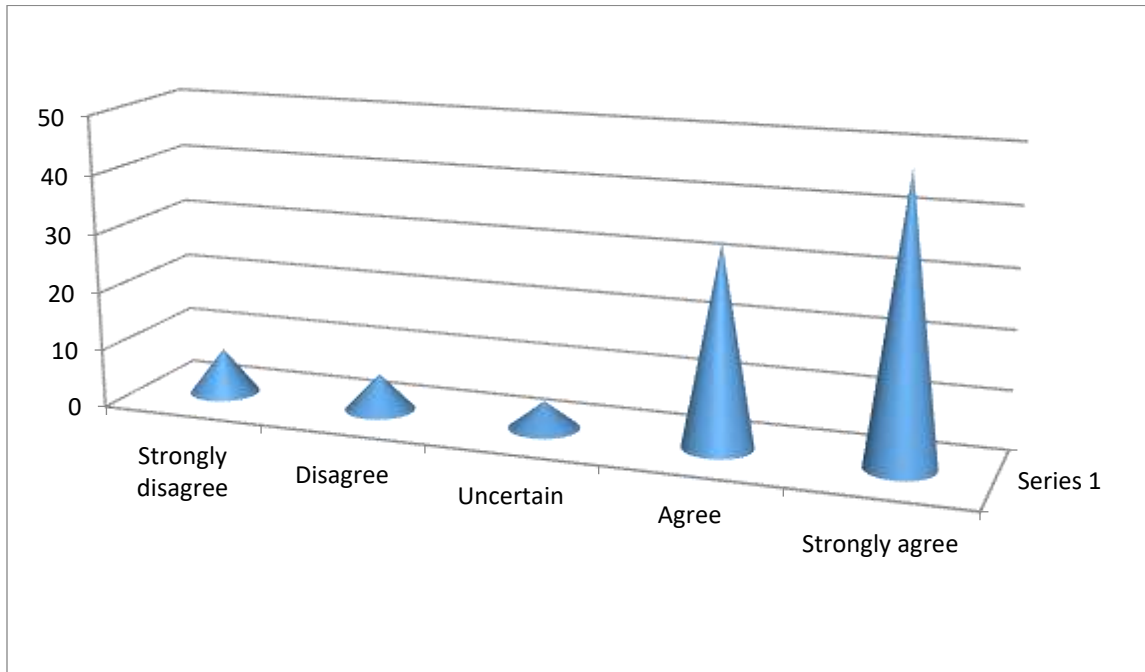
### 4.3.7 Teaching styles and learning motivation

**Table 4.4: Comparing teaching style and learners' motivation to learn (N=130)**

Response	My educator in mathematics goes the extra mile to explain concepts in the subjects		My educator teaches the subject very well, but I do not have an interest in it	
Response	Frequency	Percentage	Frequency	Percentage
Strongly disagree	16	12.3	51	39.2
Disagree	13	10.0	30	23.1
Neutral	19	14.6	13	10.0
Agree	45	34.6	23	17.7
Strongly agree	31	24.5	13	10.0
Total	130	100	130	100

It was interesting to note in Table 4.4 that 63.1% agreed and strongly agreed that their educators in Mathematics went an extra mile to explain concepts in the subject. Research concluded that this can lead to good learners' mathematics achievement. Table 4.2 also depicts that 62.3% were of a view that their educators did not teach the subject very well. Then, 27.7% were of opinion that their educators taught the subject very well but they just did not have an interest in Mathematics. Both cases, however, have negative results on learners' interests in Mathematics. Tsanawi (2009) notes that "In the same vein, Dungan and Thurlow (1989) state that the extent to which learners like their teacher influenced their liking of the subject".

#### 4.3.8 Teacher allows us to ask questions and give us clarity on things we do not understand



**Figure 4.4: Teacher allows us to ask questions and give us clarity on things we do not understand**

In Figure 4.4, 81.5% (N=106) of the learners were of the view that their Mathematics teacher allowed them to ask questions and give them clarity to the things they did not understand. However, 13.9% (N=18) of the learners denied that their Mathematics teacher allowed them to ask questions or provide clarity on the things they did not understand. Only 4.6% (N=6) of learners were uncertain around this issue. This view is consistent with Van de Wale (2007) who emphasised that educator-learners' relations in which learners get vigorously involved in creating mathematical acquaintances as well as thoughtfulness is critical to enhance learning. Discovery learning leads to learners develop problem solving skills. If educators adopt this approach, chances that learners would think better and in real terms are very high, and learners are likely develop positive attitude and interest towards mathematics.

Those teachers that showed excitement responded as follows: T13 agreed saying *“by engaging them in the teaching and learning process which makes them to enjoy it”*. T1 also agreed saying that *“my students are excited in mathematics because I’m satisfied with their performance”*. T4 agreed saying *“because every day they face challenges that end up confusing them. T8 said, “They are excited because the management support with learning resources. T9 agree saying that “, because I will do several examples on the board allow them to recopy, there after I give an activity”*. T10 said *“Yes”*. On the other hand, T2 said, *“some are and some are not, they are forced with providing access to higher education”*. T3 said, *“Some learners are excited when positively motivated by positive educators and parents”*. T14 also stated, *“some are excited especially those who perform well in mathematics.*

The researcher, therefore, found that educators must have adequate knowledge of any subject so as to impart it excellently. As such, it is vital that they have pertinent knowledge of Mathematics. This is supported by Cooney (1999:163) who states that previously, *“our conceptions of educators’ knowledge comprised mainly of understanding what teachers knew about Mathematics. Mathematical knowledge alone does not translate into better teaching”*. Cooney (1999:253) emphasised that *“teachers require knowledge of at minimum three kinds so that they can have a chance to be effective in choosing worthwhile tasks, knowledge of mathematics, creating an environment for learning and analysing their teaching and knowledge of children”*.

#### **4.3.9 Meeting the needs of excited and bored learners in Mathematics classes**

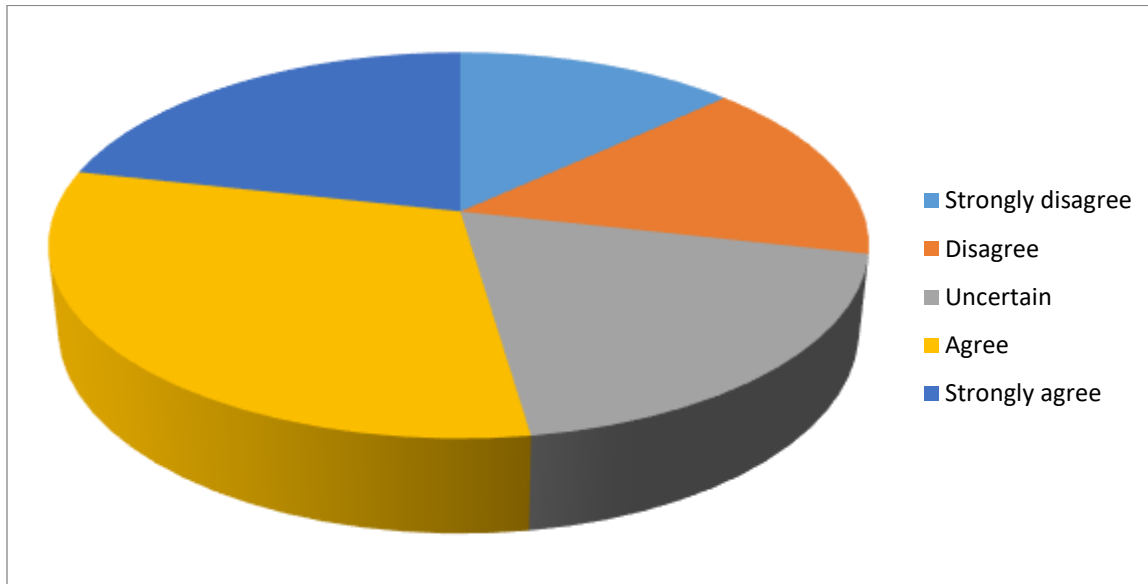
T1 said, *“I always make my learners to be in the same mood chapter in mathematics and we always do practical things and they enjoy the lessons”*. While T2 said, *“I just profile my learners; those with learning problem are given special needs or given support materials”*. T3 said, *“I encourage them to contact any mathematics educator to find solutions for their problems encountered when studying”*. T7 responded by saying that *“Those excited learners I give them more work to do and give less to those that are*

*not excited*". T12 responded that *"The excited ones I give them more practical work and the bored ones I encourage them to study simple chapters and help them"*. Other teachers responded that they catered for the learners who were bored with Mathematics by teaching using practical examples. Teachers should be aware that whatever they do can contribute to poor performance, because those who are being given simple chapters will have to write the same exam with those who are given work that is more practical.

T4 said, *"I always give them problems that challenge them and make them always busy. It is because of the persistent problem or statement that says mathematics is difficult"*. T5 and T6 responding saying *"by arranging them in groups"*. T8 said, *"I always give feedback in time, those who are bored I give them another chance to rewrite and help by their peers"*. T9 and T10 responded saying that they *"give them more exercises"*. T11 responded saying; *"designing real life mathematical problems"*. T13 said, *"By trying to use different teaching strategy and by relating the lessons to real life situation"*. T14 said *"I tried to motivate them so that they always perform well, for those who are bored I encourage them to work hard"*. T15 said, *"try to explain concepts of mathematics by giving examples in reality"*.

In Figure 4.5, 28.5 % (N=37) of learners responded to say that the classrooms in their schools were not conducive to learn Mathematics while around 52% viewed their class sizes as conducive for learning. School and class sizes have been displayed to have an influence on learners' performance. Ryan (2013) emphasized that the classroom environment plays important role in keeping students occupied and permitting them to be successful within the classroom. Congested mathematics classes cause bad performance in the subject. Lee, Smith and Croninger (1997:128) noticed, "Larger schools have a negative impact on academic success in secondary school mathematics". Kufakunesu (2015:100) cites "Patrick, Ryan and Kaplan (2007:83) who found a strong positive correlation between learners' levels of motivation and their perceptions of the classroom environment as being socially supportive".

#### 4.3.10 Class space is conducive for me to learn Mathematics with the rest of the class



**Figure 4.5: Class space is conducive for me to learn Mathematics with the rest of the class**

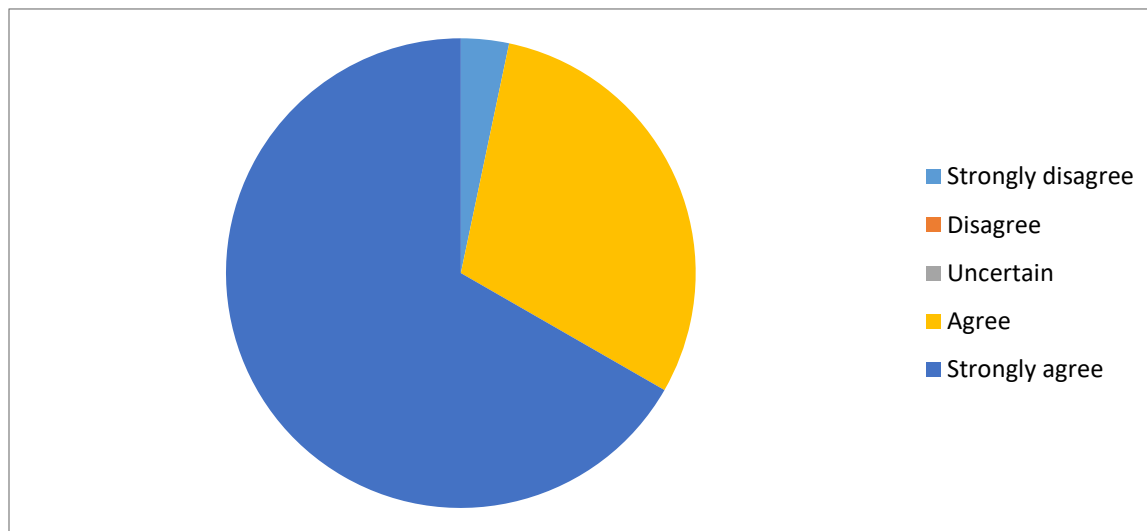
#### 4.4 Attitudes of Mathematics teachers towards mathematics teaching

The study established the following as the main sources for teachers to develop either positive or negative attitudes towards teaching Mathematics.

##### 4.4.1 Teachers' enjoyment of teaching Mathematics

In Figure 4.6, teachers were asked if they enjoyed teaching Mathematics. The majority of teachers (67%) strongly agreed that they enjoyed teaching Mathematics, followed by 30% that agree to be enjoying teaching Mathematics, with only one (3.3%) respondent strongly disagreeing to enjoy teaching Mathematics. Findings from the qualitative data from T4 indicated, *"I enjoy teaching this subject that makes me create good teaching and learning environment that is why I'm comfortable"*, as T7 said, [I'm] *"Very comfortable"*, while T8 agreed, *"I feel comfortable, mathematics learners are competent and ready to learn"*. The same view was also held by T9 who said, *"I am highly comfortable since I can manage to teach all classes during the time frame"*. T10 and T11 respectively agreed, saying *"Comfortable"* and *"Highly comfortable"*. Similar views

were expressed by T12, T13 and T14 who also respectively said, *“I feel comfortable mostly when the learners are participating”*, *“More comfortable because every time I go to class well prepared and ready to teach”*, and *“I feel comfortable with the mathematics classes because they actively participating during the lesson”*.



**Figure 4.6: Teachers' enjoyment of teaching Mathematics**

On the other hand, only 13% (2) of the teachers responded that they were not comfortable with teaching Mathematics. They revealed, *“At some of the classes I am not comfortable at all”* (T5), and *“Not comfortable enough”* (T15). Ogunniyi cited in Yara (2009) specify that “learners’ positive attitude towards Mathematics is enhanced by the following teacher-related factors: teachers’ enthusiasm, teachers’ resourcefulness and helpful behaviour and teachers’ thorough knowledge of the subject matter and making Mathematics considerably interesting”. Mensah et al. (2013:137)’s study in Ghana “disclosed that the attitudes of the Mathematics teachers were related to the attitude of the students towards the subject”.

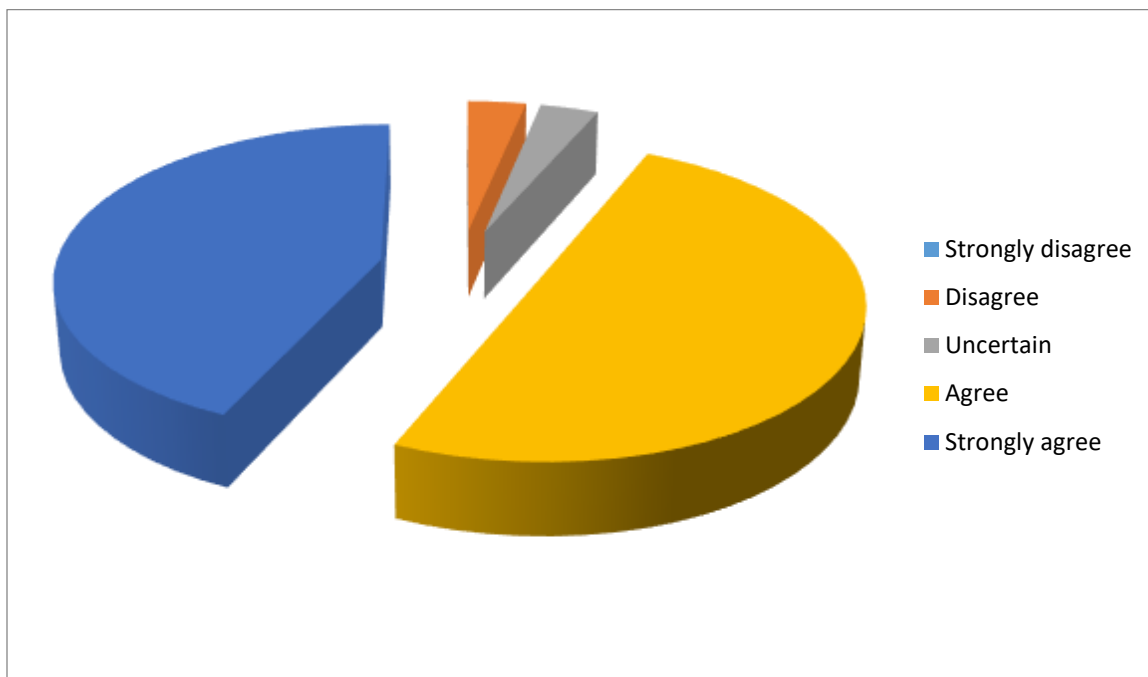
#### **4.4.2 Teacher’s confidence in teaching Mathematics classes**

According to qualitative data, the majority of teachers who responded indicated that they were confident and comfortable to teach Mathematics classes. The reasons included that they had the foundation and all methods to teach, going to class well prepared and learners actively participating during mathematics class. Teachers’

interview responses included: *“I am comfortable to teach mathematics classes because I have foundation and all method to teach”* T1. T2 agreed saying, *“I feel comfortable in teaching mathematics”*, as T3 said, *“I am extremely comfortable when teaching a small group, but with a large group there is no individualism”*.

#### 4.4.3 School management support and extent of support needed

Participants were required to confirm their Heads of Departments and School Management Teams’ support.



**Figure 4.7: School management support and extent of support needed**

From Figure 4.7, 93.3% (N=28) of teachers indicated that they received support from other mathematics teacher's and the management of the schools. However, only 6.7% teachers said they were not getting any support. In the qualitative stage, majority of teachers responded that they were getting support from Mathematics HoDs and SMTs, and the other didn't indicate whether there was support or not. It was good to know that most of teachers were being supported and T4 responded to saying, *“Yes as they organize workshops for us and they motivate us to attend mathematics workshops like Association for Mathematics Education of South Africa (AMESA), Aims Schools Enrichment Centre (AIMSSEC).It is because of the persistent problem or statement that*

says *mathematics is difficult*". T1 said "My HOD do quarterly cluster meeting with all mathematics teachers to analyse and give support to all we need to improve our results". T2 agreed saying, *they organize workshops to develop us as teachers*". T3 said, "Support is there in the form of meetings, workshops, seminars and conferences". T6 respond agreed "group discussion for different topics". T8 "There are few supports, I suggest mathematics enter competitions". T9 said "Yes, because I have the necessary material to can use on my mathematics lessons e.g., different textbook, overhead projector, proper green board etc". T10 "Yes, more study guides needed". T11 said responding "Yes, to the fullest extent". T12 "Yes, they provide with test and broken tools of mathematics (no quality material for mathematics)". T13 "Yes, it makes my job easily". T14 "Yes, there is support from HOD and SMT, the workshops always needed to support the mathematics teacher". T15 "Yes, if had some difficulties in solving some problems. It is because of the persistent problem or statement that says mathematics is difficult".

While limited backing by school management could indicate deprived school governance from management of that school, only one teacher responded to say there was no support from HoD and SMT. T7 responded by saying "No, I do not have mathematics resources". However, majority of the teachers did not respond if they needed support and to what an extent. Only T5 said, "I need support in the form of motivation and participate in group discussion". The current study findings contradict Sinyosi's (2015:69) conclusion that "mathematics teachers were not receiving adequate support from school management teams" and "lack of support from principals might be indicating poor leadership skills amongst principals".

#### **4.4.4 Mathematics workshop for educators**

The study sought participants' input if their department of education organized workshops for them and thirteen teachers responded by saying the department organized workshops for mathematics teachers. The research is concluding that the

department is putting effort to improve the performance of Mathematics learners in the province.

Table 4.5: DoE gives support and organises workshops for educators

Response	Frequency	Percentage
Strongly Disagree	1	3.3
Disagree	2	6.7
Uncertain	3	10.0
Agree	16	53.3
Strongly Agree	8	26.7
Total	30	100.0

In Table 4.5, 80% of the teachers were of the view that the Department of Education was giving mathematics educators support, with 10% saying they did not get support from the department while 10% of teachers were uncertain. When asked in the qualitative phase about the number of workshops organised and attended, very few indicated that they attended 1 to 2 workshops per year, while the majority indicated that they the department organised 3 or 4 workshops in a year. T1 responded that, *“The department provides with many workshops every quarter of the year”*. T2 also agreed saying *“Yes, three times per quarter”*. T3 said *“It is done once per quarter”*. T4 agreed saying, *“Yes, twice per year (2019), one for annual assessment plan and the other for dealing with probability topic, the rest was memo discussions”*. T5 said, *“Yes, they are available mostly three times per quarter”*. T6 said *“Yes, four times (one on each term)”*. T7 also agreed saying, *“Yes, maybe three times”*. T8 said, *“Yes, possibly three times per year during first weeks of each quarter”*. T9 said, *“Yes, probably say three times (each term there is a workshop)”*. T10 agreed and said *“Yes, Once a year”*. T12 said *“Yes, once per term”*. T13 responded saying *“Yes, about three or four times per year”*. T14 said *“Yes, there are works that held from the Department of Education each term, from term 1 to term 3 (approximately 3 times)”*. With the figures about it shows that the Department of Education strategy is to organize one workshop per quarter.

According to the DoE (2005:1), “To defeat complications such as under-qualified educators and too limited learners’ taking Mathematics associated subjects, several initiatives and programmes have been established at provincial and national levels together with the higher education institutions. School project Dinaledi has a mandate is to increase the total of learners learning Mathematics in Grades 10–12; to add the number of higher grade learners in these subject, especially girls and formerly underprivileged learners; to increase the pass rate and achievement in mathematics in these grades; to increase the capacity of the Mathematics teachers”.

T15 responded by saying “*No workshop has been conducted*” and the T11 responded to say “*Yes, not sure*”. Tsanwani (2009:43) indicates, the “lack of adequate in-service training opportunities for some teachers is a barrier to learners’ academic achievement in mathematics”. Furthermore, Tsanwani (2009:43) quotes, “experienced teachers did not have adequate opportunities to improve their knowledge and skills, and that in-service training opportunities for teachers were “second rate (US Department of Education, 2000:32)”. According to Tsanwani (2009:43-44), “The report cites the following problems regarding the in-service training of teachers: In-service training remains largely short-term and non- collaborative and in-service training is often unrelated to the teachers’ needs and the challenges faced by their learners”.

#### **4.4.5 Support from the parents of learners in Mathematics**

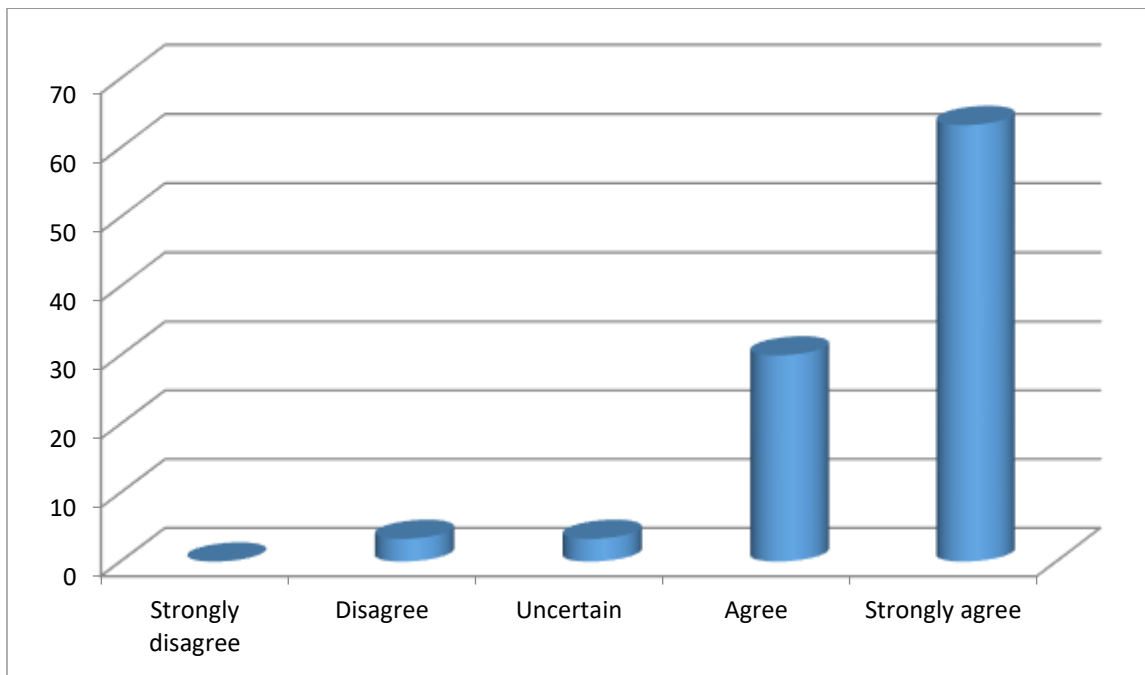
Majority of teachers responded that they were not getting support from parents of the learners or the support is minimal. T3 said, “*Few parents give support as compared to the illiterate parents from rural areas*”. T5 said, “*Not many of the parents participate in their children’s progress in mathematics*”. T6 responded saying “*no support from parents at all*”. T9 also expressed that “*the support from parents is very minimal, for example, you may summon a parent to school regarding the issues that concern a learner, the parent sent someone while seated at home*”. T10 responded saying, “*None*”, T11 and T12 responded saying, “*no support at all*”. T13 said, “*They don’t provide support*” while T15 said “*no support from parents.*”

On the other hand, however, T5 responded, *“the parents involved themselves by controlling all works I gave to learners and help them by assignments and projects. They also sign learners’ books”*. T2 respond saying *“the support we get from the parents is when arranging their children to attend extra lesson”*. T4 said, *“Parents always need to know their children’s performance and they organize extra lessons for their children during the night and on holidays.”* T7 said they [parents] were called if there was a problem to explain to them. T8 said *“parents need mathematics extra classes and they contribute funds to encourage teachers”*. T14 said, *“The parents give support because they take their learners to their extra classes”*. The fact that parents encouraged progress of learning is consistent with Tsanwani’s (2009) view that *“learners tend to centre on such performance goals as obtaining favourable judgment of their competence from teachers, parents, and peers or avoiding negative judgments’ of their competence (Ames & Archer, 1988; Duda & Nicholls, 1992)”*. For instance, *“classrooms in rural schools are often in a poor condition. It turns out to be difficult for good learning and teaching to take place in such environments. The school conditions can influence educator’s efficiency in the classroom” (Dhigra & Manhas, 2009:59).*

#### **4.4.6 Mathematics materials for teaching and learning, and effect on teaching**

The question above required the teachers to respond if they had enough material that supported mathematics teaching and learning and how that affected their teaching.

Figure 4.8 shows that 93.3% of the teachers were of the view that teaching Mathematics is easy when using correct resources for Mathematics. Accessibility of materials such as textbooks, slides and notebooks to meet the academic requirements of the curriculum enforced on teachers increase the performance in mathematics. In South Africa, the DoE (2009:54) suggested that, *“each learner must be offered their own textbook in relation to the availability and use of textbooks in the studying of Mathematics”*.



**Figure 4.8: Teaching Mathematics is easy when using correct resources for mathematics**

In the qualitative phase, eleven teachers revealed that they were not receiving enough Mathematics materials. Two teachers, T10 and T13 said, *“Not at all, especially when we deal with measurements, we don’t have three-dimensional objects that we can show our learners”*. Another teacher, T12 said *“no, some of the material are not available for example, there is no enough textbooks and study guides”*. Fourth Industrial Revolution (FIR) is here, so Department of Education should consider going paperless. This saves money for delivery of different textbooks and time to deliver them to school. Further responses obtained from the teachers throughout the interviews had T1 responding saying, *“as the economy of South Africa is not always good at school, we lack teaching materials, but we have just few at school”*. T2 said, *“No, some do have some cell phones where we can transfer information and previous exam”*. T4 also said, *“No, we don’t have materials as learners learn most of the topics theoretical instead of doing it practical”*. T5 said, *“No, materials are not enough which is the reason why kids fail/not enjoying the subject”*.

In addition to the above comments, T6 *responded saying, “No, the classroom we are using is not conducive for some of the materials we are using”*. T7 said, *“No, I do not have materials at all”*. T8 also said, *“No, we are not allowed to make copies of activities (informal) because they are saying we are wasting resources and time to write in class is limited”*. T10 and T14’s responses were just *“no”*. T11 also said, *“No, the teaching material does not cater for learners with special needs”*. From the fifteen teachers who were interviewed, four responded to say their schools had textbooks in their school. This is what T9 said, *“Yes, textbooks are there from different authors. The set of protectors, meter stick ruler and other things such as overhead projector are there”*. Some of the teachers encourage learners to use smart phones to share Mathematics material and to access previous exam papers. T3 responded saying, *“Yes, different LTSM materials are utilised as well as the internet or media”*. T12 and T15 respectively respond positively saying, *“the schools have most of the materials needed in mathematics”*, and *“Yes, [we have] text books, calculators and mathematical instruments”*.

Zaaiman (1998) notes that due to several interconnected explanations, a number of the underprivileged households in South Africa have greater concentration in countryside and in the peripheries of urban areas known as squatter camps and townships. Zaaiman (1998) further argues that it can therefore be concluded that learners who go to under resourced schools in South Africa have been academically underprivileged due to nonexistence of prospects to gain admission to excellent educational services. The schools that are most under-resourced are those that are located in the formerly blackonly educational system. Mabila, Malatje, Addo-Bediako, Kazeni and Mathabatha (2006:1) also cite Zaaiman’s (1998) stance that *“In South Africa, a student can be regarded as ‘disadvantaged’ if s/he had inadequate access to quality education service, resulting in a lack of opportunity to fully develop their academic potential”*.

#### **4.4.7 Availability of conducive Mathematics classrooms for teaching and learning**

As shown in Table 4.6, only 16.7% indicated that their Mathematics classes were not conducive for teaching and learning, with majority having conducive classroom. When asked about availability of Mathematics classrooms for teaching in the qualitative stage,

it emerged that most teachers said the classrooms were not enough, saying the Department of Education was not prioritising the issue of infrastructure in schools.

**Table 4.6: The class for Mathematics is a conducive for teaching and learning**

Response	Frequency	Percentage
Strongly Disagree	3	10.0
Disagree	2	6.7
Uncertain	2	6.7
Agree	18	60.0
Strongly Agree	5	16.7
Total	30	100.0

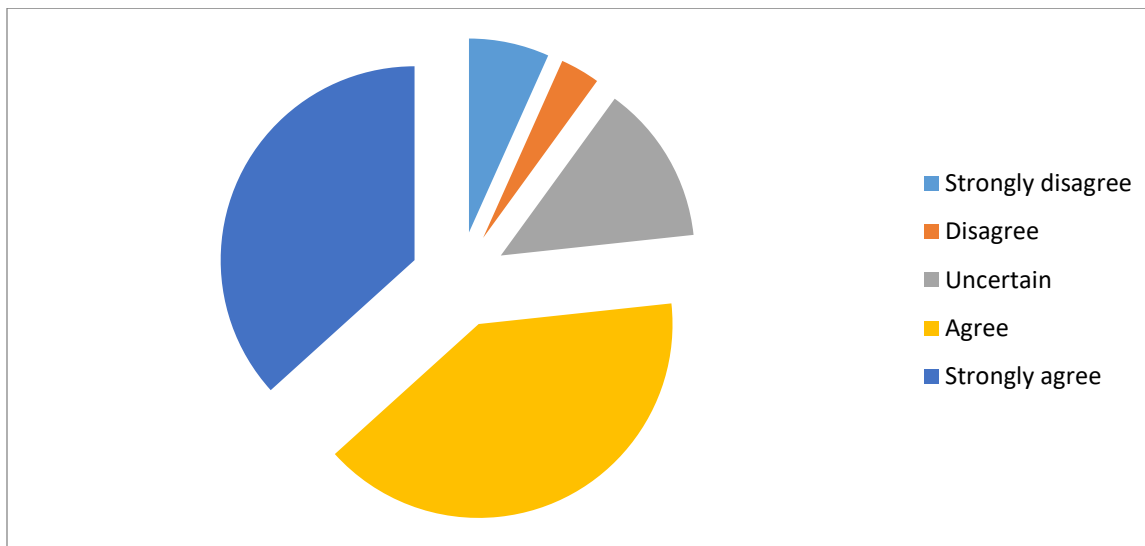
Seven teachers emphasised the issue of overcrowded Mathematics classrooms, as T1 said, *“The population of learners is high but we try by all means to make teaching and learning to be conducive”*. T2 responded saying, *“No, we also use mobile classes which were provided by the government for classroom”*. T3 said, *“Our classes are congested with learners in the region of  $\pm 65$  per classes”*. T4 also said, *“No, classes are overcrowded with 52 Grade 12 learners inside one class”*. T12 said, *“Space is limited because we have a lot of learners in the classroom”*. T5 and T10 responded saying, *“no”*. T6 responded saying, *“No, there are many learners in one classroom”* T7 and T8 responded saying, *“no, classes are overcrowded”*.

This is line with Masilo and Ramorola’s (2013) findings in which educators are still facing challenges of overcrowded classrooms and it is problematic for teachers to arrange their classrooms to be favourable to learning in this context. Congestion in the classroom also causes lacking resources and infrastructure. Infrastructure was also indicated to be major obstacle to the effective teaching of Mathematics. In the majority of government, schools’ classrooms are usually used for all subjects, and this makes it problematic for other subject teachers.

Only 33% of the teachers indicated that they have enough classrooms. T9, T11, T13 and T14 responded saying, *“Yes, the space is enough for teaching and learning of*

*mathematics*". T15 said, "Yes, teacher and learner's ratio is 1:40". These findings support Rutter (1983) who observed "that the relationship between the class size and learners' achievements are not well-defined for classes with 20 to 40 learners. Class sizes of below 20 learners have been found to be advantageous for disadvantaged learners" (Mamali, 2015). Mamali (2015) further argues, "In this respect, Rutter (1983) argued that small school size facilitates social interaction and inhibits teacher specialisation". The researcher is of the view that the Department of Education should play their role to ensure that schools have enough infrastructures and to ensure balance between teachers to learners' ratio in mathematics classrooms.

#### 4.4.8 Decision making contribution of Mathematicsteachers in schools

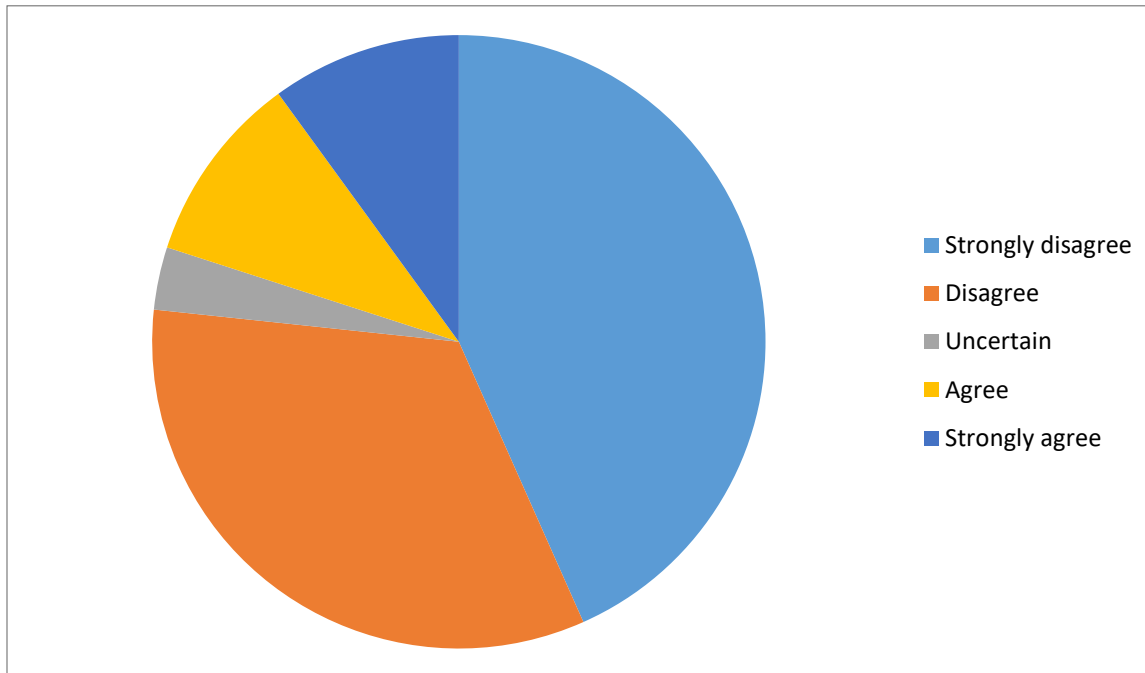


**Figure 4.9: Most Mathematicsteachers in this school contribute actively to making decisions about the Mathematicscurriculum**

In Figure 4.9, findings of this study whereby 76.7% of the teachers reported tallied with those of Concord Consortium (2005:9)'s study when 53% of the mathematics educators "were of the view that most Mathematics teachers in their schools contribute actively to making decisions about the Mathematics curriculum". With 10% of teachers disputing that mathematics educators from their school contribute to planning of the Mathematics curriculum.

#### 4.4.9 Availability of a good foundation in Mathematics

Teachers were asked if they have good foundation in Mathematics, Figure 4.10 shows that 76.7% of teachers responded that they did not have good foundation in Mathematics, 3.3% were not sure if they had good foundation or not and with only 20% indicating that they had a good foundation in Mathematics.



**Figure 4.10: Availability of a good foundation in Mathematics**

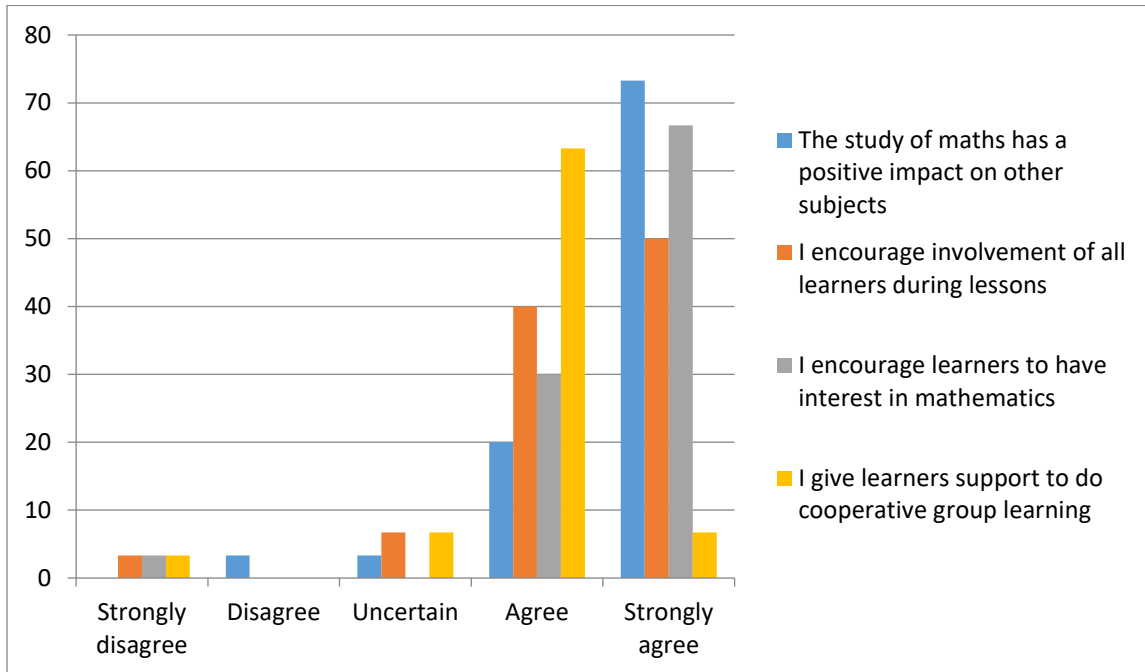
The researcher concluded that this could lead to learners underperforming, because it will be challenging for teachers without good foundation to produce performing learners.

#### **4.4.10 Motivation strategies used by teachers for Mathematics learners**

The study also assessed ways which teachers used to motivate Mathematics learners and found the following.

In Figure 4.11, 73.3% respondents were of a view that they strongly agreed that studying Mathematics has a positive impact on the study of other subjects like Physical Sciences, Life Sciences, and Accounting. Twenty percent (20%) of educators agreed to that while 3.3% indicated that they were uncertain and a similar number disagreed that studying Mathematics has impact on studying other subjects. Figure 4.11 also shows

that 50% of the teachers strongly agreed and 40% agreed that they encouraged participation of both male and female learners during lesson for Mathematics class.



**Figure 4.11: Motivation strategies used by teachers for Mathematics learners**

Only 6.7% of the teachers were uncertain while 3.3% strongly disagreed. This is encouraged since failure to involve and treat both males and females the same can lead to division in class and poor performance among those who feel neglected. It is also shown that 66,7% of teachers strongly agreed that they encourage learners to have interest in mathematics, supported by 30% who also agreed to the view that they encouraged learners. Only one (3.3%) teacher strongly disagreed. This is in line with Kufakunesu (2015:311) who emphasised that “Mathematics classroom practitioners can encourage learners to view any challenges they encounter as they study Mathematics as obstacles which can be overcome”. Figure 4.12 also shows that 90% of respondents were of the view that they gave learners support to work cooperatively in learning groups in Mathematics. Bulut (2002:126) discovered that “learners educated by means of cooperative learning methods have higher test scores in probability than learners taught by traditional learning method”. Mamali (2015:46) notes “Forsyth, Lolliffe and Stevensens (1999:1) emphasized some of the intentions of cooperative learning method, such as actively including learners in the learning process, increasing their

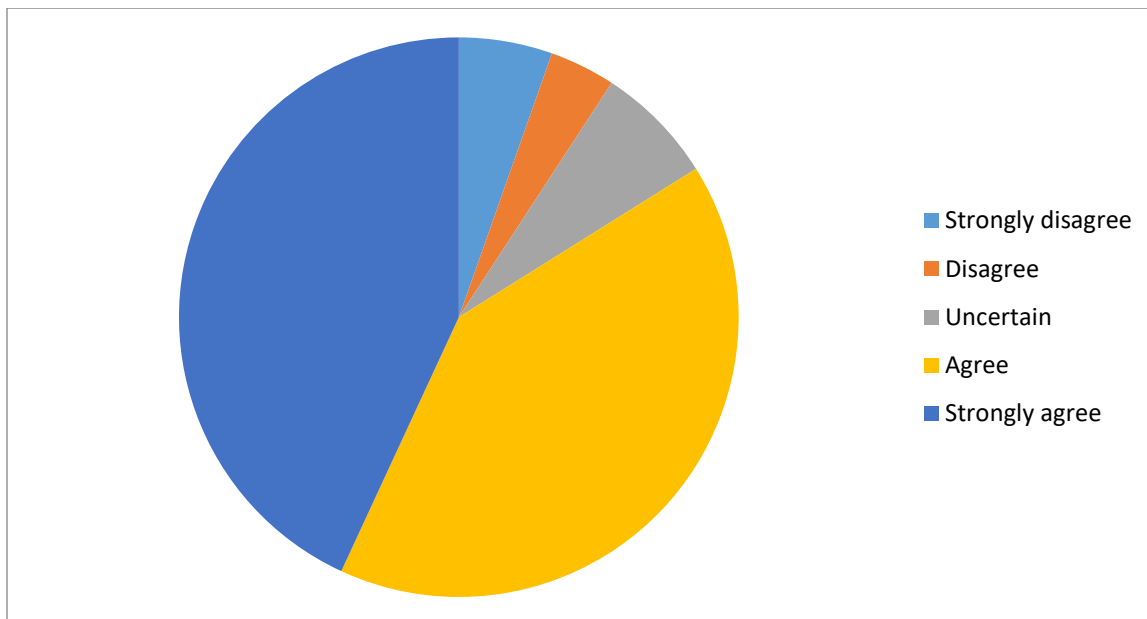
motivation, inspiring learners to learn from one another, giving learners the chances to voice their views and thoughts, advancing oral communication among the learners, permitting learners to work independently of the larger group, and supporting learners to take accountability for their own education”.

#### 4.5 Effect of learners’ attitudes towards Mathematics achievement

There are different ways through which learners’ attitudes affect their mathematics achievement, including the following.

##### Learners’ likeness of Mathematics

The graph below shows the extent to which learners like maths.



**Figure 4.12: Learners’ likeness of Mathematics**

In Figure 4.12, 83.9% (N=109) of the learners responded that they liked mathematics. On the other hand, only 9.2% responded that they did not like mathematics. Therefore, it was obvious that the attitude of learners towards mathematics was positive though that did not play a positive role in the performance of learners.

#### 4.5.1 Learners' enjoyment of Mathematics

**Table 4.7: Learners' enjoyment of Mathematics**

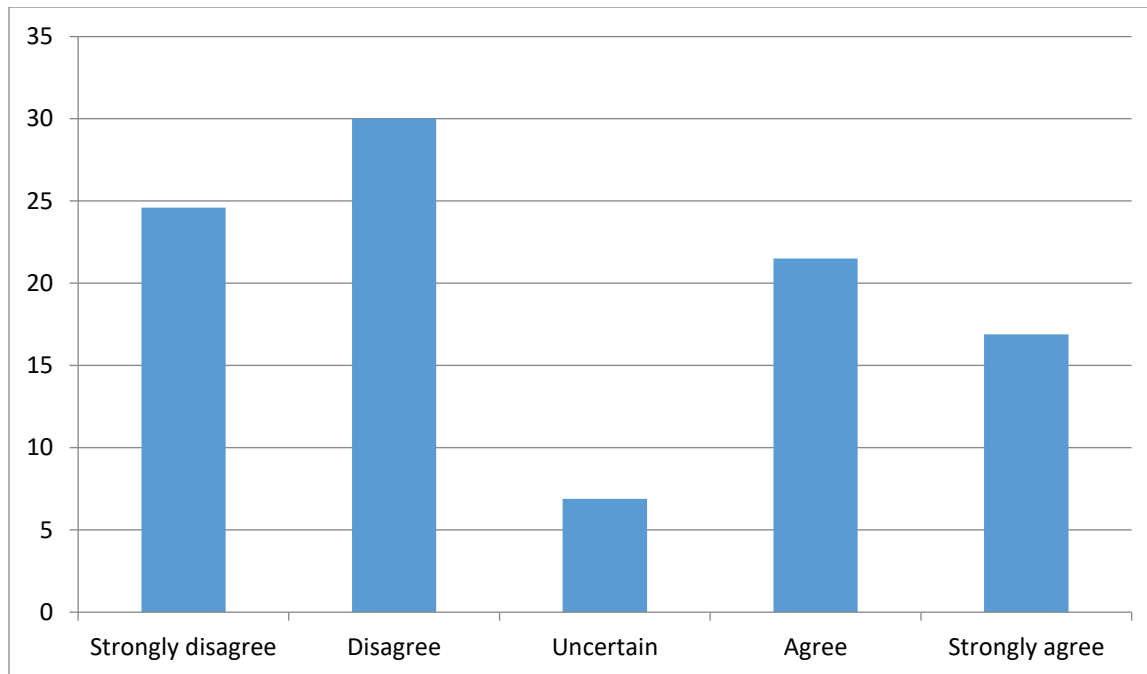
Response	Frequency	Percentage
Strongly Disagree	14	10.8
Disagree	14	10.8
Uncertain	17	13.1
Agree	48	36.9
Strongly Agree	37	28.5

In Table 4.7, out of 130 learners who participated, 28 (21.6%) of those learners responded to say they did not enjoy mathematics, with 17 learners responding that they were uncertain, and majority of learners are enjoying mathematics. This is in line with Mamali (2015) who argues that "Learners who enjoy and have ability in mathematics achieve well than those who hate it". Ma (1997:17 in Mamali, 2015) notes that "in the case of trigonometry learners, the attitude that Geometry was significant and pleasant was significantly linked with success in Mathematics".

#### 4.5.2 Not enjoying Mathematics because of lack of understanding

The study also wanted to find out whether a lack of understanding during lessons made learners not to enjoy mathematics.

Regarding the question asked if learners enjoyed mathematics because of lack of understanding, Figure 4.13 depicts that 54% of the learners were in disagreement in relation to them not enjoying because of lack of knowledge. However, about 40% agreed that they did not enjoy mathematics as they lacked understanding, hence were prompted to develop undesirable attitude concerning the subject.



**Figure 4.13: Not enjoying Mathematics because of lack of understanding**

In the qualitative findings, the results from teachers indicated that the majority of learners were not excited about mathematics. The responses included T5 who said, *“They are not excited”*. T6 added, *“Most of them are not excited, but only those that are gifted once are excited.”* T7 said, *“Some are excited because they want to know more”*. T11 agreed, *“No, they do not express interest”* T12 said, *“Sometimes because some are not yet ready to study”*, while T15 said, *Only quarter of a class [were excited]”*. Tsanwani’s (2009) investigation shows that “factors such as learners and teacher’ commitment and motivation, attitudes and self-concept, learners’ career prospects, learners’ perceptions of peers and teachers, and teachers’ perceptions of learners appear to influence disadvantaged learners’ decisions to persist and achieve in mathematics in spite of their difficult circumstances”.

#### **4.5.3 Changes in numbers of Mathematics learners affect motivation to do Mathematics**

Quantitative findings showed that 26.9% (N=30) of the learners were of the view that increasing Mathematics learner numbers was demotivating them while 65.4% responded that they were demotivated by the decreasing numbers of mathematics

hence developed a negative attitude towards mathematics. In the qualitative stage, it was found that since the introduction of Mathematics literacy, the number of learners doing Mathematics was decreasing. *“Decreasing because their parents do not encourage them to do mathematics”*, said T12. T2 said, *“Decreasing, they are interested in mathematical literacy”*. T3 also said, *“The number of learners doing mathematics is decreasing repeatedly in FET band”*. T4 also noted, *“It is decreasing year by year”*. T5 said, *“It is not increasing because learners are doing the so-called mathematical literacy subject”*. T6, T7, T10 and T11 responded saying that learners are *“decreasing”*. T9 said, *“It is not increasing, it remains the same”*. T12 responded saying learners are *“decreasing because their parents do not encourage them to do mathematics”*. T14 said the *“number of learners decreasing because they fail”*. T15 also said, *“The learning process is very slow”*.

On the other hand, T1 said, *“the number of learners who do mathematics has increased because they realized that mathematics is a key of life”*. T8 also said, *“The number is increasing because they outsource teachers”*. T13 just said the number of students was *“increasing”*.

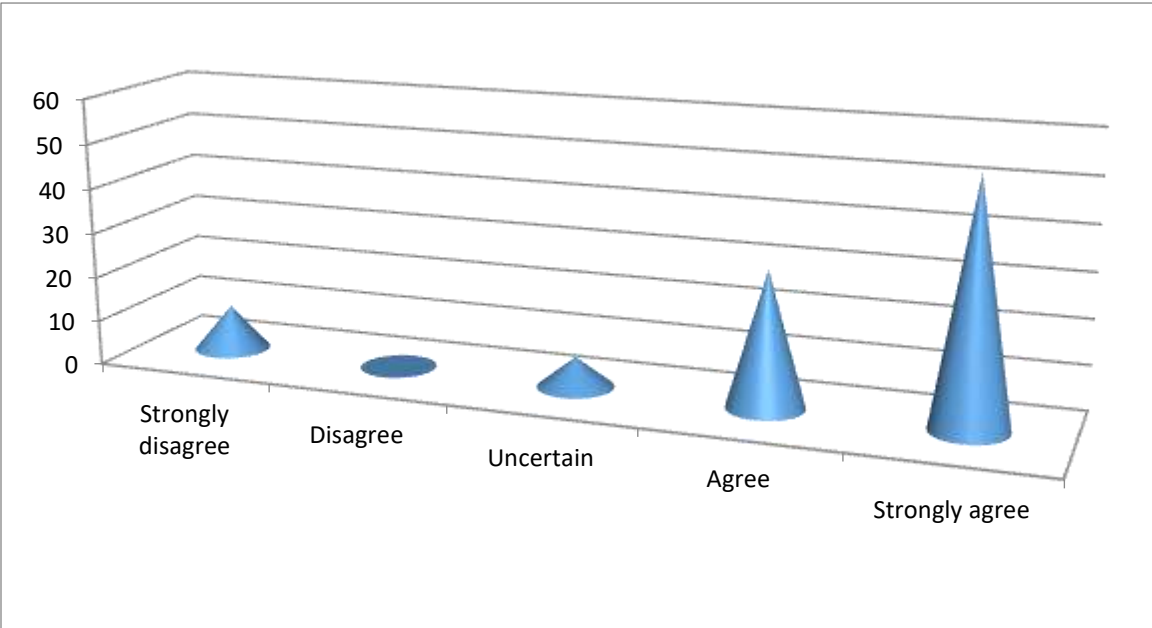
### **My Mathematicsteacher encourages us to take Mathematicsseriously as it is the one giving many chances in real life situation**

It was interesting to note that in Figure 4.14, 90% of the participants were of the view that their Mathematics teacher encouraged them to take mathematics seriously because Mathematics opens career doors. However, 7.7% were of the opinion that their mathematics teachers did not encourage them to take Mathematics seriously while 2.3% of the learners were uncertain about this question.



**Figure 4.14: My Mathematicsteacher encourages us to take Mathematicsseriously, as it is the one giving many chances in real life situation**

**4.5.6 Mathematics helps to develop the mind and it helps a person think faster**



**Figure 4.15: Mathematics helps to develop the mind and it helps a person think faster**

Figure 4.15 shows that 83.3% teachers were of the opinion that mathematics helps to develop the mind and it helps a person think faster, while only 16.7% teachers did not agree that mathematics helps to develop the mind and a person think faster. Teachers therefore used the above views to motivate learners and help them develop positive attitudes towards mathematics. During the interviews, teachers were asked the extent to which learners worked harder and appreciate mathematics in order to develop their mind and think smarter. It was interesting to note that out of the 15 teachers who responded, only one, T2, pointed teachers as the ones contributing to poor performance, saying *“teachers lack understanding of the topics, teachers not finishing the syllabus, [and] lack of commitment amongst learners”* were the reasons contributing to learners’ poor performance in mathematics. Other teachers mentioned laziness, ignorance, not putting effort, not motivated, lack of learning materials as the contributing factors. T1 responded saying, *“mathematics need more practical and the learner must have interest and involve him/her to any part of mathematics”*. T3 responded that, *“lack of practice almost every day”*. T4 said, *“Our learners are lazy, lack of practice, lack of motivation, lack of learning materials. T5 also stated, “Learners are lazy to practice, to do more activities for themselves”. T6 said that, “learners are too lazy to learn, they don’t want to practice or study”*.

T7 said that, *“our learners do not practice; they spend more time in the social media than doing school work”*. T8 added that, [they are] *“not doing their homework in time and they copy answers from other learners, and they fail to practice every day”*. T9 responded saying, *“Learners are lazy to practice, and learners hate the challenge from mathematics problems”*. T10 also noted, *“Most of them are not ready to tackle a complex problem”*. T11 responded saying, *“Minimal effort towards the subject”*. T12 responded saying, *“less motivation from home”*. T13 said, *“Misunderstanding of the questions and the way they interpret those questions”*. T14 said, *“The low performance of learners caused by the ignorance from the learners, they don’t have time to practice”*. T15 concluded saying, *“Some learners naturally are not good in figures”*. It was evident that almost all teachers were negative about learners’ work effort, hence did not find it motivating to teach them higher order, challenging problems. Such contradict Inglis and

Attridge (2016) who stated that learning higher Mathematics (at the progressive secondary and college stages) does lead to an increase in logical capability. Mathematics learners become more sceptical in their thinking, they start to reason more critically.

#### **4.6 Association between learners’ attitudes and their performance in Mathematics**

The study also wanted to find out from the teachers and learners if there was a connection between learners who are excited about Mathematics and good performance, because if you like something you will give effort to it.

##### **4.6.1 I enjoy working with other learners during Mathematics class**

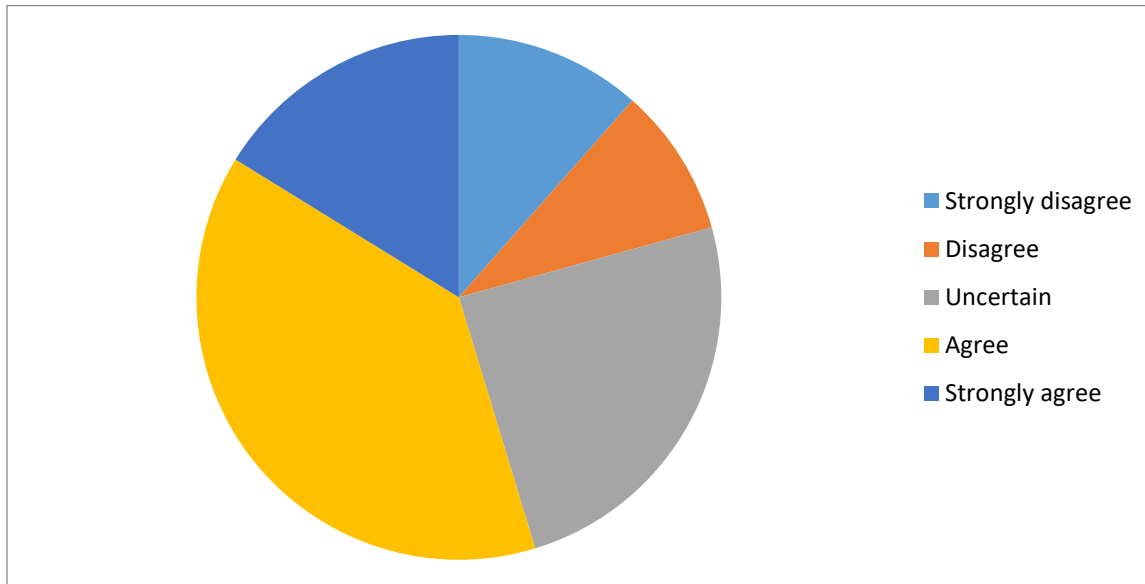
The learners’ responses are outlined in the section below.

Table 4.8: I enjoy working with other learners during Mathematics class

Response	Frequency	Percentage
Strongly Disagree	7	5.4
Disagree	8	6.2
Uncertain	11	8.5
Agree	45	34.6
Strongly Agree	59	45.4

From the 130 learners who responded, Table 4.8 indicates that 80% responded to say they agreed and strongly agreed that they enjoyed cooperative learning. Cooperative learning influences constructive attitudes of learners regarding Mathematics. According to Rikhotso (2015:40), Walmsley and Muniz (2003:113) notes, “cooperative learning assists learners understand how to work with each other, increase confidence and create positive mind sets towards their peers, and gain knowledge from each other”.

#### 4.6.2 I keep trying repeatedly to complete work in Mathematics without achieving desired results

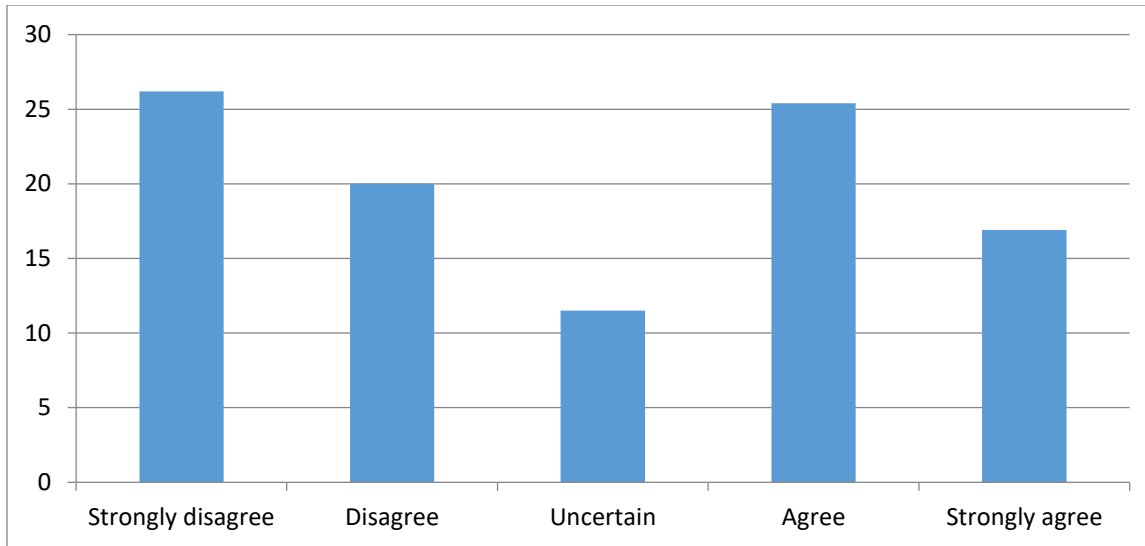


**Figure 4.16: I keep trying repeatedly to complete work in Mathematics without achieving desired results**

In Figure 4.16, 54.7% (N=71) of the participants said that they stopped trying repeatedly to complete work in Mathematics if they did not achieve the desired results. This meant learners were not persistent enough. On the other hand, only 20% believed that if they put more effort, they would achieve the desired results. This is in line with Mensah, Okyere and Kuranchie (2013:132) who are of the view that “it has been realised that many students have developed negative attitude towards the study of Mathematics because of mass failure of students of the subject”.

#### 4.6.3 My educator teaches the subject well, but I find it difficult to understand

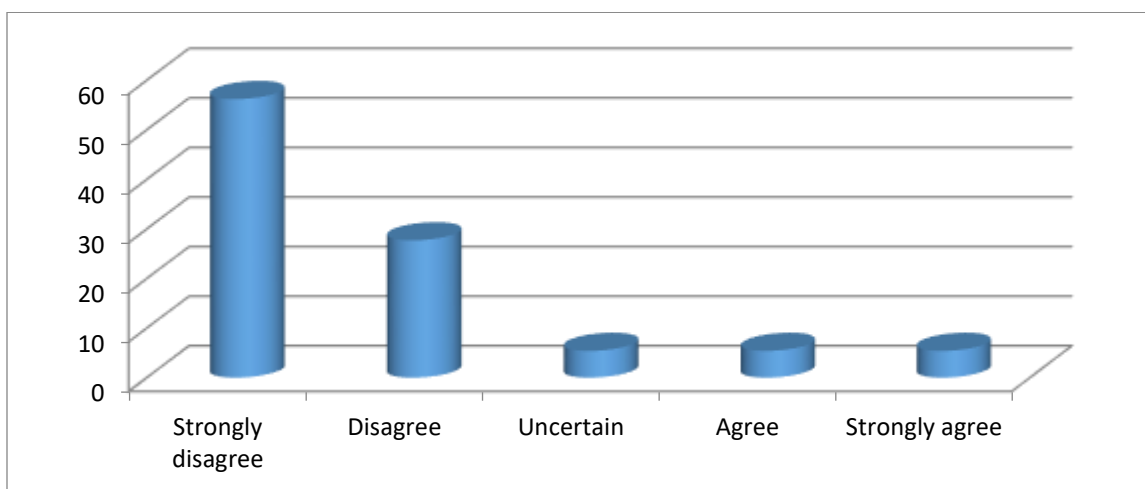
In Figure 4.17, 46.2% of the respondents were of the view that their educators did not teach Mathematics well, with 42.1% agreeing that their teachers knew the subject very well and admitted that they found it difficult to understand Mathematics.



**Figure 4.17: My educator teaches the subject well, but I find it difficult to understand**

The outcome of this study correspond with the findings of Alkan, Bukova–Güzel and Elçi (2004) who found that a lot of students believed that Mathematics was a difficult subject and they worried that they could not be successful in Mathematics, which disturbs the attitudes concerning Mathematics in a negative way.

#### **4.6.4 My educator in Mathematics does not know the subject so the subject is boring and difficult**



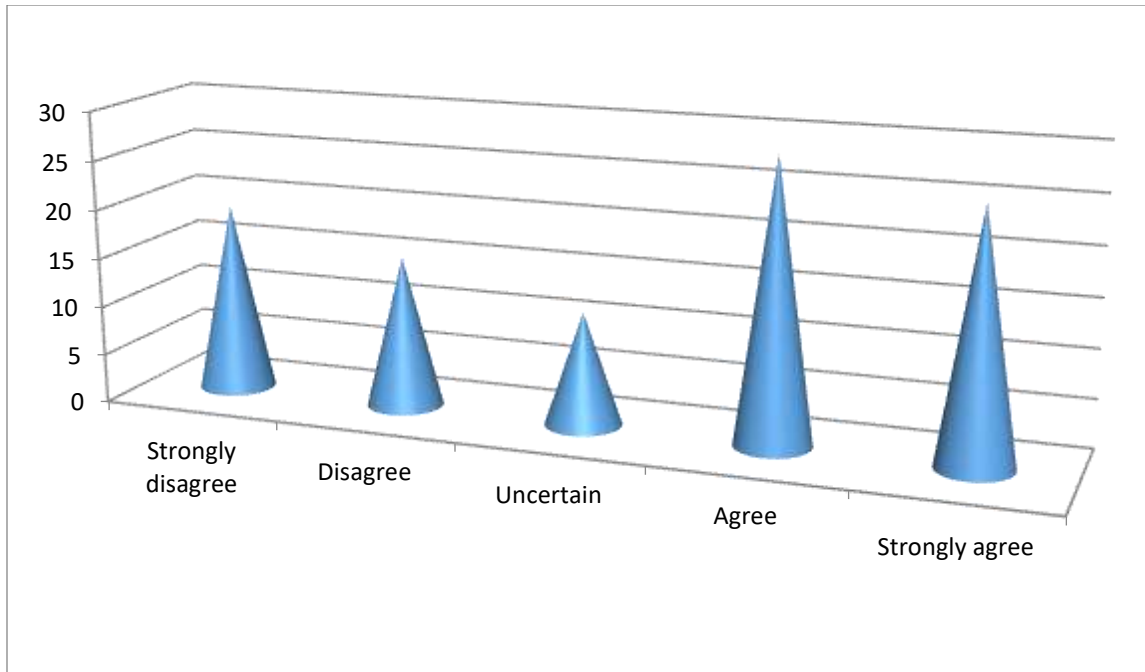
**Figure 4.18: My educator in Mathematics does not know the subject so the subject is boring and difficult**

In Figure 4.18, 83,8% of learners strongly disagreed and disagreed that their educators in Mathematics did not know the subject, and that they found subject to be boring and difficult. However, 10.8% of learners agreed to that view while 5,4% of the learners were uncertain. According to Sun, Rye and Selmer (2010:70), “Elementary teacher education programs are in great need of consolidating the content and pedagogy courses to meet the requirements of living in the 21st Century. Meaningful mathematics instruction needs a subject matter context and oftentimes there is insufficient time for science instruction. Thus, elementary school teachers need to be able to create integrated mathematics and science instruction”.

Middleton and Goepfert (2002) said that the methods that are used to teach educators need to be reconsidered. For instance, in a traditional mathematics class, the teacher would start with correcting the previous homework, then overview of new concepts, mainly with the educator as lecturer, and the learners in the listening role, possibly taking notes. When the lesson is about to end, a few examples are practised, and then in the final 15 to 20 minutes, the learners remain practising a set of problems from the text book on their own. This method of learning does not encourage the learners.

#### **4.6.5 Mathematics is difficult, and it takes time to understand the concepts**

Learners' views about the above are presented in Figure 4.19.



**Figure 4.19: Mathematics is difficult, and it takes time to understand the concepts**

Figure 4.19 shows that 53.9% (N=70) of the learners were of the view that Mathematics was difficult, and it took time to understand the concepts. On the other hand, 34.6% did not consider mathematics as a difficult subject. The outcome of this study relates with findings by Gafoor and Kurukkan (2015) who opined that Mathematics is regarded as a difficult subject by majority of the learners because of aversive teaching style, understanding the instruction, difficult to know the Mathematics, and difficulty in memorizing its equations and techniques to solve problems.

#### **4.6.6 Home influence versus teacher effort and learner attitude**

It is interesting to note that Table 4.9 shows that 88, 5% of learners indicated that they were not forced to choose mathematics, with 3.8% saying they were not sure if they were forced or not. It was 7.7% of the learners who said they were forced by parents or guardians to study mathematics. Shafika (2007:13) emphasised that “parents have an influence on student’s choice of major. The evidence regarding the influence of others, for example, parents and friends is also inconclusive”.

Table 4.9: Home influence versus teacher effort and learner attitude

Response	My parent/guardian is forcing me to take mathematics		My educator teaches the subject very well, but I do not have an interest in it	
	Frequency	Percentage	Frequency	Percentage
Strongly Disagree	84	64.6	57	43.8
Disagree	31	23.8	41	31.5
Uncertain	5	3.8	10	7.7
Agree	7	5.4	13	10.0
Strongly Agree	3	2.3	9	6.9

Studies such as Tan and Laswad’s (2006:24) indicate, “parents, followed by instructors, had a strong influence on learners’ choice of major”. Table 4.9 also shows that 75.4% of learners responded that their educators did not teach well mathematics, but they did not have an interest in mathematics. While 7.7% were uncertain, 16.9% of learners said their teachers knew mathematics well.

#### **4.7 Findings in relation to Research Objectives and Research Questions**

Having discussed the general findings of the study that were identified from the data analysed, it became important for the researcher to go ahead and categorize some specific findings according to the aim and objectives of the study. The aim of the study was to investigate the influence of teachers’ and learners’ attitudes in mathematics performance in Vhembe Education District of Limpopo province of South Africa. This section deals with the findings that specifically relate to the objectives of the current study as stipulated by the researcher. The findings, in relation to Research Objectives and Research Questions are outlined below.

#### **4.7.1 Research Objectives**

**Research Objective 1** – Investigation of the attitudes of senior secondary school learners towards the study of Mathematics: This objective was addressed by administering questionnaires to extract information from the selected teachers and learners about their attitudes towards the study of Mathematics. The questionnaires were collected from the learners by the researcher through HoDs for analysis. The quantitative findings from the data presented for learners and teachers were analysed concurrently and triangulated with the qualitative findings. The majority of the respondent learners exhibited both positive and negative attitudes towards the study of mathematics depending on the situation prevailing. Kufakunesu (2015:100) cites “Patrick, Ryan and Kaplan (2007:83) who found a strong positive correlation between learners' levels of motivation and their perceptions of the classroom environment as being socially supportive. The way teachers interact with learners can determine the quality of teaching and learning. In an attempt to shed more light on classroom management, leadership and management are described before attention is directed at some leadership styles, which may be employed in the classroom. The implications of each leadership style with regard to learners' academic achievement in Mathematics are also highlighted”. As such, teachers and learners are more likely to develop negative attitude towards school in general, and subjects in particular if they conduct their education in dilapidated school infrastructure. On the other, good school infrastructure is more likely to develop positive attitude towards learning. According to Tsanwani (2009:24-25), “Newman and Schwager (1993) found that at all grades a sense of personal relatedness with the teacher is important in determining a learner's frequency in seeking help from the teacher”. This fulfilled the first objective of the study.

**Research Objective 2** – To establish the attitudes of mathematics teachers towards the teaching of mathematics. This objective was addressed by administering separate questionnaires for them (teachers) to answer. The response of each learner in that Section for the teachers was compared with his/her learning use of inquisitive-based instructional approaches and assessment of the ways learners learn mathematics. A

detailed description of the data collection, data compilation and the analysis processes were discussed in Chapter 3 and first section of Chapter 4 of this study. It emerged from the study that most teachers exhibited positive attitude towards teaching of mathematics. This confirms the view that “the school condition can influence educator’s efficiency in the classroom” (Dhigra & Manhas, 2009:59). Tsanwani (2009:40) writes, “Sarason (1993) maintains that if one wants to change the education of learners, one need to first change the education of the teachers. According to Sarason (1983), it is necessary to prepare educators for what life is like in classrooms, schools, school systems and society”.

**Research Objective 3** – To ascertain how learners’ attitudes influence their performance in mathematics.

The attitudinal responses of the learners’ responses to the questionnaire were compared with the learners’ performance (scores) in the responses given by them in that Section of the questionnaire. The results indicated that the majority of the learners exhibited a positive attitude towards the study of Mathematics. There was no statistical association in terms of learners’ attitude and their perceived performance (scores) in the study of Mathematics. In terms of quality of performance, most of the learners scored below the 50% mark. The outcome of the research confirmed the summary of the results that beliefs play an important part in mathematics learning and teaching. The learning outcomes of learners are strongly related to their beliefs and attitudes about Mathematics (Furinghetti & Pehkonen, 2000). Jacobs and Durandt (2016:69) acknowledge that “Yara (2009) confirms that teachers with positive attitudes towards the subject stimulate favourable attitudes in their learners”. Ma and Wilkins (2002 in Jacobs & Durandt, 2016:69) “put the vital role of teacher attitudes and beliefs into perspective, by positing that learners who believe that teachers have high expectations of them, tend to have a more positive attitude towards mathematics”.

**Research Objective 4** – To determine if there is an association between learners’ attitudes and their performance in Mathematics:

The attitude responses of the learners' responses to the questionnaire were further compared with the learners' performance (scores) in the responses given by them in that Section of the questionnaire. The results also indicated that the majority of the learners exhibited a positive attitude towards the study of Mathematics. The study found that learners indicated that they tend to dislike Mathematics after trying for some time without success. This supports "Nicolaidou and Philippou (2003) who showed that negative attitudes are the result of frequent and repeated failures or problems when dealing with mathematical tasks and these negative attitudes may become relatively permanent. According to these authors, when children first go to school, they usually have positive attitudes towards mathematics. However, as they progress, their attitudes become less positive and frequently become negative at high school" (Imasuen, 2016:122).

Thuo (1985) noted that in Kenya, learner's attitude towards mathematics expectations and aspirations contributed to achievement. The learner who showed negative attitude in mathematics spent less time in the subject and perform badly. A learner feels bored with the subject. A negatively inclined learner considers it as time consuming to spend much time in a subject they do not perform well. On the other hand, learners who showed a positive attitude in Mathematics spent more time on the subject and they performed well. Different socio-economic factors, lack of basic mathematics skills and lack of resources influence performance of learners in the teaching and learning of mathematics (NCTM, 2000). According to Arends, Winnaar and Mosimege (2017:2-3), "Efklides (2009) argues that students' problem-solving difficulties are not always an outcome of a lack of mathematical knowledge, but commence from ineffective activation of student knowledge, since students lack the metacognitive skill needed to control, monitor and reflect on the solution process. As a result, cognitive/meta-cognitive difficulties cause many students to develop negative feelings towards Mathematics, thus hindering learning and achievement (Ef-klides, 2011; Efklides & Petkaki, 2005)".

#### **4.7.2 Research Questions**

The main research question of the study was; “What is the influence of teachers’ and learners’ attitudes towards Mathematics performance in selected rural secondary schools in Vhembe West District? In an attempt for the researcher to find answers to the main research question posed, the following sub-questions were asked. To get the detailed findings in order to arrive at the definitive conclusions of the current study, the research ensured that each of the sub-research questions was related to each objective of the study as discussed below:

**The first question: What are the attitudes of senior secondary school learners towards the study of Mathematics?**

As indicated by the researcher in the previous chapters of the current study, the purpose of the first question was to address the first objective of the study. This was achieved through the administration of the questionnaires to the selected learners and the in depth analysis of their responses as outlined in the previous sections of Chapter 4. The findings indicated that the majority of the learners displayed a positive attitude towards the study of mathematics in the Vhembe Education District. Ma (1997) confirmed that learners who have more enjoyable experiences while learning Mathematics achieve higher scores. This meant that most of the learners were somehow committed to studying of Mathematics, thus, the findings from the first question helped to achieve the first objective of the study.

**The second question: What are the attitudes of Mathematics teachers towards the teaching of Mathematics?**

The second question pertained to the second objective of the study. The responses of the teachers were used to establish whether there was any association between teachers’ attitudes of mathematics and their teaching of the subject Mathematics. Thus, to establish whether teachers’ attitudes towards Mathematics influence their teaching of the subject Mathematics in schools. In terms of teachers’ responses, this study revealed that teachers’ positive attitudes reflected a steady increase in terms of their attitudes

towards teaching of the subject. This was supported by the findings of Martin (2000), who states that African American learners identify Mathematics as their favourite subject and, therefore, perform better in the subject. Tsanwani (2009:26) notes “Similar studies in South Africa show that most of the learners have positive attitudes towards mathematics (Howie, 2001)”. This further supported by Mensah, Okyere and Kuranchie’s (2013:137) study in Ghana who disclosed that “the attitudes of the Mathematics teachers were related to the attitude of the students towards the subject. A significant relationship was found between teacher attitude and student attitude towards Mathematics. The more positive the attitude of Mathematics teachers towards the subject, the more positive the students’ attitude towards the study of the subject. The attitude of the teacher resonates in the attitude of her students toward the subject. Teachers’ attitude towards Mathematics, therefore, matters as it has a powerful influence on student attitude formation”. Thus, research question two (2) was also addressed in this study. According to Ngeche (2017:8), “This connotes that irrespective of the Mathematical capability of students, if teachers display a negative attitude towards Mathematics, students may not develop a positive attitude towards the subject and vice versa”.

**Third question:** How do learners’ attitudes influence their performance in Mathematics?

The study revealed that the majority of the learners surveyed displayed a positive attitude towards the study of the subject and, therefore, influenced their performance in Mathematics. This positive attitude was, therefore, somehow linked directly to their performance in the study of Mathematics in different ways such as learners’ likeness of Mathematics, and learners enjoyment of Mathematics as shown in Table 4.7 and F4.12 respectively. This is supported by the findings of Martin (2000 in Tsanwani, 2009), who states that “African American learners identify mathematics as their favourite subject and therefore perform better in the subject. Similar studies in South Africa Howie (2001) show that most of the learners have positive attitudes towards mathematic”. Hence, the

research question three (3) was addressed. The outcome of this research compared well with the results outlined in Table 4.7 and F4.12 in Chapter 4 of the study.

**Fourth question:** What is the association, if any, between learners' attitudes and their performance in Mathematics?

The study revealed that the majority of the responses of the learners indicated no association between learners' attitude and their performance in Mathematics. This absence of association is in line with Mamala's (2015) acceptance of Rammala's (2009:19) view that "negative attitudes towards learning could result in learners performing poorly, thereby preventing them from obtaining the results required for university entrance. This means that the relationship between attitude and achievement is based on the concept that the better the attitude a learner has towards a subject or task, the higher the achievement or performance level in that subject or task". This implies that negative attitudes can lead to low performance, and positive attitudes, to high performance.

#### **4.7 Summary**

This chapter presented the findings of the study. The researcher presented both quantitative and qualitative findings at the same time. The chapter also analysed the findings of the study as they were presented. The presentation of the findings was in line with the objectives of the study. Discussions of the findings were also conducted in this chapter. The next chapter presents the summary, conclusion and recommendations.

## **CHAPTER 5**

### **SUMMARY, CONCLUSION AND RECOMMENDATIONS**

#### **5.1 INTRODUCTION**

The previous chapter presented and analysed the data gathered for this study. In this chapter, findings of the study are summarised and conclusions are drawn. The chapter ends by presentation of the recommendations out of the lessons drawn from the study.

#### **5.2 SUMMARY OF THE STUDY**

The following section presents the summary of findings for the study.

- Learners' attitudes are triggered by various factors that range from teacher-centred to learner-centred.
- Teacher's understanding of learners' thinking in Mathematics has an effect on developing learner attitude.
- Nearly three quarters of teachers were learning how to use inquiry-oriented teaching strategies and around 90% were learning how to assess learners in Mathematics.
- Learning how to teach Mathematics in a class that includes learners with special needs is important in order to understand their needs.
- Inadequate material for learning Mathematics generates negative attitude.
- Poor learner performance in Mathematics leads to dislike for Mathematics.
- Teaching styles influence motivation to learn.

- Allowing students to ask questions fosters learning.
- Meeting the needs of excited and bored learners in Mathematics classes engenders interest in the subject.
- Teachers should be aware that whatever they do, they can contribute to poor performance, because those who are being given simple chapters will have to write the same exam with those who are given work that is more practical.
- Class space was conducive for learning Mathematics with the rest of the class.

### **5.3 CONCLUSION OF THE STUDY**

- Teaching style and learners' motivation to learn affected attitude towards Mathematics.
- Educators taught the subject very well but learners did not have an interest in Mathematics.
- The majority of teachers were confident and comfortable in teaching Mathematics classes.
- Teachers indicated that they received support from other Mathematics teachers and the management of the schools.
- The Department of Basic Education was building teacher capacity through Mathematics workshops.
- The majority of teachers responded that they were not getting minimal or no support from parents of the learners.
- Teaching Mathematics is easy when using adequate and appropriate resources for Mathematics.
- The class for Mathematics was conducive for teaching and learning.
- Most Mathematics teachers in the school contribute actively to making decisions about the Mathematics curriculum
- Most teachers responded that they did not have a good foundation in Mathematics.

- There were different ways through which learners' attitudes influenced their performance in Mathematics. Some of these ways were Learners' likeness of Mathematics, not enjoying mathematics because of lack of understanding.
- Changes in numbers of Mathematics learners affect motivation to do Mathematics.
- Encouraging learners to do Mathematics facilitated positive results.
- Learners enjoyed working with other learners during Mathematics class.
- Learners kept trying repeatedly to complete the Mathematics without achieving desired results.
- Mathematics is difficult, and it takes time to understand the concepts
- Many learners believed Mathematics is difficult.
- Some learners, due to their laziness, chose other subjects over Mathematics.
- Some learners were of the opinion that their educators taught the subject very well but they just did not have an interest in Mathematics.

#### **5.4 RECOMMENDATIONS OF THE STUDY**

In line with Tsanwani (2009), the research outcomes of “this study are crucial for both Mathematics teachers and learners at schools and tertiary institutions. Therefore, the following recommendations from this study may contribute to the improvement of performance of learners in Mathematics”.

##### **5.4.1 Recommendations for practice**

- The Department of Education (DoE) could support the Mathematics by building enough classrooms and hire more Mathematics teachers. This will make the Mathematics classroom to be conducive for learning.
- The DoE may consider ensuring that a manageable number of learners are in the classroom to minimise overcrowded conditions. Overcrowding makes it difficult for teachers to be effective as they may not be able to mark work for every

learner or monitor each learner's performance. As that should improve learners' performance.

- DoE could also provide enough learning materials and consider utilisation of electronic materials to save paper, money and the environment.
- Parents may consider supporting the teachers by being involved in their learner's education; they should buy their children mathematics materials, assist them with homework and arrange extra classes for them. If teachers and parents work together to assist these learners, their performance can improve.
- Mathematics is one of vital subjects in this country, careers such as engineering; doctors, accountants, scientist and statistician require mathematics. Department of Education should encourage learners have interest in Mathematics from foundation phase, they must also introduce more Mathematics competition this will attract more learners to do maths.
- Teachers should make learning Mathematics to be fun and assist those who find Mathematics to be difficult, by applying different teaching methods.
- Parents should also advise learners the importance of studying mathematics and career paths they can choose if they have mathematics.
- Learners need encouragement to change their negative attitude towards mathematics; they need to take responsibility for their studies.
- Those learners who are not performing well should associate themselves with those who are performing better in Mathematics, this can help them to improve in concepts they are struggling with.
- DoE could ensure that teachers are competent in Mathematics, so that they can be able to transfer relevant information to the learners.

#### **5.4.2 Recommendations for further research**

- To conduct research on checking why in the same province rural schools are not performing well in Mathematics than in urban schools.
- There is need to examine learning approaches which are effective for learners to encourage learners' performance in Mathematics.

- To evaluate Mathematics teacher education in light of real time experience in the first three years of school teaching.
- To study the motivation for learning Mathematics that can be helpful in terms of needs and goals.

## **5.5 CONCLUSION OF THE CHAPTER**

This chapter presented a summary of the findings of the study. The chapter also presented conclusions that can be drawn from the study. Recommendations were suggested for practice as well as for further research about the issue of Mathematics teachers and learners attitude.

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**APPENDICES**  
**APPENDIX A: APPROVAL FROM INSTITUTIONAL ETHICS CLEARANCE**  
**COMMITTEE TO CONDUCT STUDY**



**General Human Research Ethics Committee**

30-Aug-2019

Dear **Mr Michael Mafhenya**

Ethics Clearance: **The influence of teachers and learners attitudes in mathematics performance**

Principal Investigator: **Mr Michael Mafhenya**

**MODIFICATIONS REQUIRED**

Your research proposal with title: **The influence of teachers and learners attitudes in mathematics performance** has been considered by the Ethics Committee. However, the committee will only be able to approve this research once a revised application or supplementary documentation is received as per the following provisions:

- Check spelling mistakes in your teacher questionnaire.
- grammar "teachers should indicate whether they qualify enough(are competent) to teach each of the topics at the grade they are teaching".
- DoE Approval required

Please note that your application will be withdrawn if you do not respond with these modifications in 30 days time.

Yours sincerely

**Prof Derek Litthauer**  
Chairperson: General/Human Research Ethics Committee

Digitally signed  
by Derek  
Litthauer  
Date: 2019.08.30  
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**APPENDIX B: APPROVAL FROM LIMPOPO PROVINCIAL DEPARTMENT OF  
EDUCATION FOR PERMISSION TO CONDUCT STUDY**



**LIMPOPO**  
PROVINCIAL GOVERNMENT  
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF  
**EDUCATION**

**VHEMBE WEST DISTRICT  
ELIM CIRCUIT**

Ref : 81035713  
Enquiry: Maluleke J.J  
Cell : 082 868 2666  
Date : 10-10-2019

P.O. Box 149  
Elim Hospital  
0960

To: Mr Mafhenya M.M  
RIVUBYE HIGH SCHOOL  
P.O BOX 105  
VALDEZIA  
0935

**APPLICATION FOR PERMISSION TO CONDUCT RESEARCH IN THE ELIM CIRCUIT  
SCHOOLS: YOURSELF.**

1. The above matter refers.
2. Receipt of your letter dated 09-10-2019 is hereby acknowledged.
3. Be informed that your request to conduct research in the Elim Circuit schools is hereby granted.
4. Wishing you the best of luck in your study direction.

Yours Faithfully

**CIRCUIT MANAGER  
/D**



*10-10-2019*

**DATE**

**APPENDIX C: APPROVAL FROM SCHOOLS FOR PERMISSION TO CONDUCT  
STUDY**

Enquiry: Mr Muthivhithivhi N.S.  
Cell: 082 405 1805  
E-mail: [ozias.dav@gmail.com](mailto:ozias.dav@gmail.com)  
Tel: 015-519 9571



Ozias Davhana Sec. School  
Private Bag X 351  
Elim, 0960  
Fax: 086 657 5784

15 OCTOBER 2019

**RE: PERMISSION TO CONDUCT A RESEARCH**

Mr. Mafenya M. requested to conduct a research on learners' and educators' **ATTITUDE TOWARDS MATHEMATICS AS A SUBJECT.**

The SMT in its seating of the 14<sup>th</sup> October has granted permission to MAFHENYA M. to conductor such a research to our grades 10, 11 and 12 learners. The research is to be conducted during the month of October 2019.

Yours Faithfully

Mr. Muthivhithivhi N.S.



# Muthuhadini Combined School

P.O.Box 2118  
Elim Hospital  
0960



Mphent Block A

Ref: 931331155  
Email: muthucombinedschool@gmail.com  
Enq: Mudau N.N. Mr  
Cell: 082 409 9273

15 October 2019

Human Research committee  
University of Free State  
P.O. Bo 330  
Bloemfontein  
9300

## LETTER OF CONFIRMATION

To whom it may concern

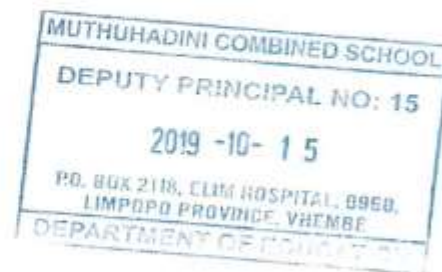
### CONFIRMATION LETTER FOR A PERMISSION TO CONDUCT RESEARCH AT THE ABOVE MENTIONED SCHOOL.

This letter serves to confirm that **Mafhenya Michael of Student No: 2018263901** was given a permission to conduct a research about the influence of teachers and learners attitudes in Mathematics at the above mentioned school.

Hoping that you will find this letter in order.

Yours Faithfully

Mudau NN (School Principal)



**APPENDIX D: INFORMED CONSENT FORM FOR TEACHERS**

**Title: The influence of teachers and learners attitudes in mathematics performance**

Teacher’s consent form to take part in research

I.....voluntarily agree to participate in this research study.

I understand that I can withdraw at any time or refuse to answer any question without any consequences of any kind, even if I agree to participate now.

The purpose and nature of the study was explained to me in writing and I have the opportunity to ask questions about the study.

I understand that there is no cost involved for me on participating in this study.

I understand that I will not benefit directly from participating in this research.

I understand that all the information gathered will be written down.

I understand that all information I provide for this study will be treated confidentially.

I understand that as the participant I will receive a summary of findings on request.

I understand that in any report on the results of this research my identity will remain anonymous. This will be done by changing my name and disguising any details of my interview which may reveal my identity or the identity of people I speak about.

I understand that I am free to contact any of the people involved in the research to seek further clarification and information.

For any information required pertaining the study contact the researcher at 073 006 3620

Signature of research participant

-----

Signature of participant

Date

Signature of researcher

I believe the participant is giving informed consent to participate in this study

-----

Signature of researcher

Date

## **APPENDIX E: INFORMED CONSENT FORM FOR PARENTS**

### **Parental Permission for Children Participation in Research**

**Title: The influence of teachers and learners attitudes in mathematics performance**

The purpose of this form is to provide you (as the parent of a prospective research study participant) information that may affect your decision as to whether or not to let your child participate in this research study. Read the information below and ask any questions you might have before deciding whether or not to give your permission for your child to take part. If you decide to let your child be involved in this study, this form will be used to record your permission.

If you agree, your child will be asked to participate in a research study about the influence of teachers and learners attitudes in mathematics performance.

If you allow your child to participate in this study, he will be asked to complete the questionnaire.

Your child will receive no direct benefit from participating in this study; however, this will benefit the society as there will be a better future performance in mathematics.

Neither you nor your child will receive any type of payment participating in this study.

Know that your child's participation in this study is voluntary. Your child may decline to participate or to withdraw from participation at any time.

Your child's privacy and the confidentiality of his/her data will be protected.

#### **Signature**

You are making a decision about allowing your child to participate in this study. Your signature below indicates that you have read the information provided above and have decided to allow them to participate in the study. If you later decide that you wish to withdraw your permission for your child to participate in the study you may discontinue his or her participation at any time. You will be given a copy of this document.

\_\_\_\_\_  
Printed Name of Child

\_\_\_\_\_  
Signature of Parent(s) or Legal Guardian

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature of Researcher

\_\_\_\_\_  
Date

**APPENDIX F: INFORMED CONSENT FORM FOR LEARNERS**

**Title: The influence of teachers and learners attitudes in mathematics performance**

Learner’s consent form to take part in research

I.....voluntarily agree to participate in this research study.

I understand that I can withdraw at any time or refuse to answer any question without any consequences of any kind, even if I agree to participate now.

The purpose and nature of the study explained to me in writing and I have the opportunity to ask questions about the study.

I understand that there is no cost involved for me on participating in this study.

I understand that I will not benefit directly from participating in this research.

I understand that all the information gathered will be written down.

I understand that all information I provide for this study will be treated confidentially.

I understand that in any report on the results of this research my identity will remain anonymous.

Signature of research participant

-----

Signature of participant

Date

Signature of researcher

I believe the participant is giving informed consent to participate in this study

-----

Signature of researcher

Date

## APPENDIX G: TEACHERS' QUESTIONNAIRE

### EXPLANATION OF SYMBOLS

SA	Strongly agree with the statement
A	Agree with the statement
U	Uncertain about the statement
D	Disagree with the statement
SD	Strongly disagree with the statement

### Questionnaire

This questionnaire consists of four sections: Section A deals with teachers' personal data, Section B deals with teachers' views and perceptions about mathematics study, Section C is about teachers' professional development, and Section D is about teachers' competency for teaching some concepts/topics.

To retain anonymity, please do not give your name.

### SECTION A: DEMOGRAPHIC VARIABLES OF TEACHERS

#### Personal details

Indicate your particulars by means of a tick (√)

1. Gender	Male	Female	
2. Age	25 - 30	31 - 40	41 - 50
3. Teaching experience	10 - 15	16 - 20	21 - 25
4. Grade / educational level	10		11
5. Teaching subject	Maths	English	P.
6. Type of school	Private school		Government

### SECTION B: TEACHERS' VIEWS AND PERCEPTIONS ABOUT MATHEMATICS STUDY

For each question/statement below, please place a tick (✓) in the box of your choice on the five-point scale, according to your response.

Please provide your opinion about each of the following statements.

SD	D	U	A	SA
----	---	---	---	----

1. I enjoy teaching mathematics

2. Most mathematics teachers in this school contribute actively to decisions about the mathematics curriculum.

SD	D	U	A	SA
----	---	---	---	----

3. Mathematics helps to develop the mind and helps a person think faster

SD	D	U	A	SA
----	---	---	---	----

4. I do not have a good foundation in mathematics

SD	D	U	A	SA
----	---	---	---	----

5. The study of mathematics has a positive impact on the study of other subjects, like physical sciences, life sciences accounting, etc

SD	D	U	A	SA
----	---	---	---	----

6. I encourage both male and female learners to be involved in mathematics lessons

SD	D	U	A	SA
----	---	---	---	----

7. I encourage learners to have interest in mathematics

SD	D	U	A	SA
----	---	---	---	----

8. I give learners support to work in cooperative learning groups in mathematics

SD	D	U	A	SA
----	---	---	---	----

9. Teaching mathematics is easy when you use the right resources for mathematics

SD	D	U	A	SA
----	---	---	---	----

10. I receive support from other mathematics teachers and the management of the school.

SD	D	U	A	SA
----	---	---	---	----

11. The department of education supports us as mathematics teachers.

SD	D	U	A	SA
----	---	---	---	----

12. The class for mathematics is conducive to teaching and learning

SD	D	U	A	SA
----	---	---	---	----

### Section C: TEACHERS' PROFESSIONAL DEVELOPMENT

When you consider all the professional development you participated in as a teacher over the last years, was each of the following emphasised?

SD	D	U	A	SA
----	---	---	---	----

1. Understanding how learners think about mathematics
2. Learning how to use inquiry/ investigation oriented teaching strategies
3. Learning how to assess learners' learning in mathematics
4. Learning how to teach mathematics in a class that includes learners with special needs.

SD	D	U	A	SA
SD	D	U	A	SA

SD	D	U	A	SA
----	---	---	---	----

## Section D: TEACHERS' COMPETENCY FOR TEACHING CONCEPTS/TOPICS

### EXPLANATION OF SYMBOLS

HC	Highly competent
AC	Average competence
MC	Marginally competent
NC	Not competent at all

In your estimation, how competent are you to teach each of the following topics at the grade you are teaching?

1. Numeration and numbers

NC	MC	AC	HC
----	----	----	----

2. Estimation

NC	MC	AC	HC
----	----	----	----

3. Measurement

NC	MC	AC	HC
----	----	----	----

4. Algebra

NC	MC	AC	HC
----	----	----	----

5. Geometry

NC	MC	AC	HC
----	----	----	----

6. Functions

NC	MC	AC	HC
----	----	----	----

7. Data collection

NC	MC	AC	HC
----	----	----	----

8. Probability

NC	MC	AC	HC
----	----	----	----

## APPENDIX H: LEARNERS' QUESTIONNAIRE

### EXPLANATION OF SYMBOLS

SA	Strongly agree with the statement
A	Agree with the statement
U	Uncertain about the statement
D	Disagree with the statement
SD	Strongly disagree with the statement

### Questionnaire

This questionnaire consists of two sections. Section A is about learners' biographical information and Section B consists of short mathematics questions for learners to answer.

### SECTION A: LEARNERS BIOGRAPHICAL INFORMATION

Indicate your particulars by means of a tick (√)

1. Gender	Male	Female		
2. Age	10-13	14 -17	18 - 21	22 years and above
3. Current grade	7-9	10	11	12

### SECTION B: LEARNERS' QUESTIONNAIRES ON THEIR ATTITUDE TOWARDS MATHEMATICS

1. I enjoy mathematics	SD	D	U	A	SA
2. Not enjoying mathematics because of lack of understanding	SD	D	U	A	SA
3. I do like Mathematics	SD	D	U	A	SA

4. My educator in mathematics goes the extra mile to explain concepts in the subject

SD	D	U	A	SA
----	---	---	---	----

5. My educator teaches the subject very well, but I do not have an interest in it

SD	D	U	A	SA
----	---	---	---	----

6. There is enough material for learning mathematics

SD	D	U	A	SA
----	---	---	---	----

7. The class space is conducive for me to learn Mathematics with the rest of the class.

SD	D	U	A	SA
----	---	---	---	----

8. My mathematics teacher allows us to ask questions and give us clarity to the things we do not understand

SD	D	U	A	SA
----	---	---	---	----

9. I enjoy working with other learners during mathematics class

SD	D	U	A	SA
----	---	---	---	----

10. My mathematics teacher encourages us to take mathematics seriously as it is the one giving many chance in real life situation

SD	D	U	A	SA
----	---	---	---	----

11. Trying repeatedly to complete the mathematics without achieving desired results

SD	D	U	A	SA
----	---	---	---	----

12. My educator teaches the subject well, but I find it difficult to understand

SD	D	U	A	SA
----	---	---	---	----

13. My educator in mathematics does not know the subject so the subject is boring and difficult

SD	D	U	A	SA
----	---	---	---	----

14. Mathematics is difficult, and it takes time to understand the concepts

SD	D	U	A	SA
----	---	---	---	----

15. My educator in mathematics does not know the subject  
so the subject is boring and difficult

SD	D	U	A	SA
----	---	---	---	----

16. My parent/guardian is forcing me to take mathematics

SD	D	U	A	SA
----	---	---	---	----

17. My educator teaches the subject very well, but I do not  
have an interest in it

SD	D	U	A	SA
----	---	---	---	----

**APPENDIX I: INTERVIEW SCHEDULE FOR TEACHERS**

**Question 1a:** How comfortable are you with mathematics classes you are teaching?

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.....  
.....

**Question 1b:** Is there any support you find from HOD of mathematics and SMT(School Management Team) .To what extent do you think you need support?

.....  
.....  
.....  
.....

**Question 1c:** Is there any mathematics workshop for teachers held by the department of education and if yes how many times per year?

.....  
.....  
.....  
.....

**Question 1d:** How do you get support from the parents of learners in mathematics?

.....  
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.....  
.....

**Question 1e:** Do you have enough material that support mathematics teaching and learning? Explain your answer.

.....  
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.....  
.....  
**Question 1f:** Do you have enough spaces (classrooms) conducive for teaching and learning of mathematics in your school?

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.....  
.....  
**Question 2a:** Do you see the number of learners who are doing mathematics increasing or decreasing in your school?

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.....  
**Question 2b:** If the number is decreasing what do you think is the cause of this or if the number is increasing what is the cause of it?

.....  
.....  
.....  
.....  
**Question 2c:** How is the performance of learners in subject mathematics?

.....  
.....  
.....  
.....  
**Question 2d:** What do you think is the reason why learners are quitting mathematics and do mathematical literacy?

**Question 2e:** Do you think your students are excited about mathematics? Explain your views

.....  
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.....

**Question 3a:** How do you meet the needs of the learners in your mathematics class who are excited and those that are bored?

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**Question 3b:** What do you think is the causes of the low performance of learners in mathematics?

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