FACTORS INFLUENCING LEARNERS' ACHIEVEMENT IN GRADE 10 MATHEMATICS: THE CASE OF NZHELELE CENTRAL CIRCUIT IN VHEMBE WEST DISTRICT IN LIMPOPO PROVINCE

By

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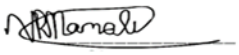
DECLARATION

I, **NTSHENGEDZENI REANETH MAMALI**, declare that:

Factors Influencing Learners' Achievement in Grade 10 Mathematics: The case of Nzhelele Central Circuit in Limpopo province

... is an original piece of work that neither I nor anyone else has ever presented to this university or any other educational institution for the purpose of receiving a degree or taking an examination. All of the sources that I have drawn from or quoted have been cited in the appropriate manner and appropriately recognized through the provision of full references.



26.02.2022

NTSHENGEDZENI REANETH MAMALI DATE

DEDICATION

I would want to dedicate this piece of work to my amazing hubby, Eric Mphedziseni Mamali. You have provided me with a lot of support and have been there for me at all times. You have pushed me to my limits with your tremendous patience and tenacity, as well as your love and compassion. I owe everything that I am today to my children, Mulalo, Rudzani, Pfarelo, and Mukondeleli, as well as to my beloved granddaughter, Vhahangwele. With all of your patience, support, and love, you have made me who and what I am today. God bless you.

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In conclusion, I want to thank everyone who has contributed directly or indirectly to our effort. I'll never forget my siblings Justice, Khathutshelo, Rembuluwani, Phumudzo Gumani, and Vhuhwavho, and my parents Samuel Thanyani Mathivha and Emely Nyawasedza Mathivha for their support and encouragement. Your growing wisdom earns my admiration.

ABSTRACT

Mathematics is one of the disciplines selected by the Department of Education as having the potential to contribute to an increase in the overall quality of education. Educators, parents and the government have expressed concern on the low levels of achievement in mathematics. This study studies the elements that influence the mathematical ability of tenth-grade students and evaluates the qualities that can serve as learning opportunities as well as how students take advantage of these possibilities. This study employed a multimethod research strategy that adhered to the pragmatist paradigm. The population of this study consisted of all department heads, mathematics teachers, and students enrolled in mathematics classes at 13 secondary schools in the Nzhelele Central circuit and Vhembe West area. These schools are located in the Vhembe West region. In the quantitative section of the study, learners' Mathematics grades from the nine secondary schools included in the sample were picked by stratified random sampling. Three secondary schools, three department heads, and six instructors were randomly selected to participate in the qualitative phase of the study. The schools were chosen using a sampling strategy. The sample of qualitative data included two subject advisers, three department heads, and six educators. Interviews were conducted to assemble information regarding these individuals' perceptions of the options for the study of mathematics and how learners utilize these chances. All of the data for this study were collected via a semi-structured individual interview. Learners were picked at random from the community to complete surveys; 30 students from each school were selected. A total of 270 students were questioned. On the qualitative data, thematic analysis was performed, while SPSS was used for statistical analysis of the numeric data. Contact was made with the Vhembe district office to inquire about gaining authorization to conduct the study. Participants in the study were in no way identifiable. The findings of this study indicated that there are opportunities that, if explored appropriately, might considerably improve mathematics instruction and learning.

Keywords: Mathematics; teaching; learning; learner achievement; learning opportunity; opportunity-propensity model

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CHAPTER 1

1.1 BACKGROUND OF THE STUDY

Mathematics is a fundamental subject necessary for many advanced programs of study, including medicine, engineering, and architecture. It's crucial to the nation's socioeconomic progress as a source of scientific and technological expertise (Nkonke, 2012:87). Mathematics is an essential instrument for developing a nation's scientific, technological, and economic capacities (Ncube, 2013: 1). According to Davies and Hersh (2012:13), learners must study mathematics not only to acquire a high school or college degree but also to prepare for the future. Mathematics is tied to everything in the cosmos, from the smallest particles to the most massive stars, according to Mefor (2014:1). Mathematics is fundamental to education and human life, regardless of whether one recognizes its importance. Learners' capacity to learn and apply arithmetic concepts is impeded by a variety of factors, despite its importance in daily life. According to policy documents, understanding mathematics is vital for all South Africans (see DBE, 2013). Despite the topic's importance, pupils' national exam performance has been poor (Nkonke, 2012:87). South African pupils have scored poorly on national and international exams, raising worries about the quality of their mathematical education, which opened the way for science and technology, which is desperately required.

South Africa's mathematics performance is dismal, according to the World Economic Forum (WEF: 2015:1). According to the Trends in International Mathematics and Science Study, South African children scored the lowest of any middle-income countries (TIMMS, 2011:20). The Department of Basic Education considers mathematics to be an important indication of student progress because it is believed to contribute to the country's scientific knowledge advancement. Learner achievement

data can be used to improve classroom learning and teaching, identify and support students who have learning barriers, provide schools with effective methodological support, train and develop schools and teachers who aren't meeting expectations, and inform education policy. In addition, this data can be used to improve classroom learning and teaching, identify and support students who have learning barriers, provide schools with effective methodological support, and train and develop schools and teachers who (DBE, 2013:1).

Enrolment in private additional mathematics programs has also increased. This is partly due to public school education. Spaull (2013:275) says such initiatives aren't enough to solve mathematics education's larger difficulties. As a result, significant improvements in this area of public education are required for both learners' future socioeconomic prospects and the country's overall development (TIMSS 2011:20). Identifying performance concerns is crucial before implementing concrete measures. Mental models, attitudes, and expectations about arithmetic instruction are thought to affect learners' overall educational experience and success (Mohd, Manhood & Ismail, 2011:50). In addition to attitudes toward arithmetic, Mohd, Manhood, and Ismail (2011:50) listed problem-solving, numeracy, reasoning, and thinking skills as influences. This is troublesome because arithmetic seems to revolve around factors. According to Mohd, Manhood, and Ismail (2011:50), mathematics is intended to teach students how to solve problems, numerate, reason, and think. Solving arithmatic problems necessitates critical thinking and decision-making skills from students. The relevance of formative years in the process of gaining mathematical skills has recently increased in South Africa. Because the Department of Education sees mathematics as a way to improve education, it's required in both primary and secondary schools (DBE, 2013:1). There is a definite connection between this topic and other disciplines, especially scientific and technological (Mefore, 2014:1). In 2011, 76% of children lacked basic arithmetic skills such whole numbers, integers, algebraic expressions, and factorizations, according to Spaull. US students provided this data (2013:275). The Department of Basic Education (DBE, 2012:3) has decided to evaluate secondary

school pupils' mathematics skills. They concluded that pupils require a solid foundation to succeed in higher-grade mathematics.

Studies on secondary mathematics education, like those in South Africa, study classroom issues such instructional resources and textbooks (Spaull 2013:275). This omission may cause mathematics learning challenges in Further Education and Training (FET), which must be addressed in GET. Argument premise: To solve problems, it's important to pay attention to the special obstacles of teaching or learning arithmetic.

Integers, algebraic equations, factorizations, geometrical representations, and function theory are considered the "backbone" of mathematics (Machaba, 2013:8). Integers, factorization, functions, geometry, and algebraic equation computations are needed. Because multiplication and division rely on addition and subtraction, mastery of these areas is essential (integers). Multiplication uses factorization and algebraic equations. Developing higher-order mathematics skills would be difficult without these two tactics (Machaba, 2013:8). When kids make the same mistakes, it calls for higher expectations. Learners who are at a loss for what to do tend to generalize the answer and alter the rules. This confuses everyone (Leedy & Ormrod, 2014:375).

Students can suffer from poor self-esteem if they are unable to perform well in mathematics and are not numerate; if the problem isn't noticed and handled early, the student may feel useless for the rest of their lives. A kid with this mental capacity would also be unable to execute basic tasks like counting money. Because of this, he or she would lack skills, have no employment, struggle in school, and acquire low self-esteem, bad attitudes, and a habit of poor performance. All of these variables would lead to greater problems in the future, creating a vicious cycle (Machaba 2013:8). Dowker (2005:324) says that to avoid future mathematics problems, it's important to notice early warning signs and act swiftly. In many countries, low mathematics ability has been addressed with a variety of interventions.

According to data, South African youngsters aren't good at mathematics (Wicks & Child, 2017:1). Historically disadvantaged learners get worse quality education. Due to this personality feature, they struggle to achieve their educational ambitions (Fenza 2012:58). The educational system is investing in learners' mathematics skills in conjunction with business. South African education policy is to provide students of all ages with the best possible education (see DOB, 2011). In response, several efforts to improve education have been started. Assessments demonstrate that the outcomes don't reflect the worth of these inputs (Fenza, 2012:58). Such programs lack crucial information, inhibiting learning and progress. South African mathematics teachers are like builders.; a faulty foundation can lead to problems and poor performance. Strong foundations can prevent many problems (Bayram, 2004:1). Mathematical principles help students go on to related topics. Secondary school mathematics aims to improve thinking, problem-solving, numeracy, and real-world knowledge through arithmetic (Evbuomwan, 2013:1). According to Evbuomwan (2013:1), pupils can apply the following mathematics skills to solve problems. Numbers, shapes, and figures thinking skills This will help students reach their goal. To achieve this goal, the Mathematics Curriculum National Senior Certificate (NSC) recommends developing inquisitive mathematics skills rather than deductive mathematical skills. The goal required this advice. Traditional teaching methods, utilized in most math courses, may not provide students enough time to assimilate knowledge, leading to poor arithmetic performance in the FET band, which may be caused by a weak GET band foundation.. Most GET teachers evaluated learners' mathematics skills (Machaba, 2013:5).

In light of this, I decided to research tenth-grade mathematics achievement. It was thought that highlighting the multiple possibilities for learning mathematics and how to take use of those opportunities would achieve the intended impact.

1.2 PROBLEM STATEMENT

Mathematics is important in almost every element of human life. It provided a solid scientific and technological foundation for the nation's socioeconomic development, and it was required for courses like medicine, architecture, and engineering. Society viewed it as a source of scientific and technological information for socioeconomic progress (Nkonke, 2012:87). Mathematics is a tool for understanding complicated structures, relationships, and patterns in order to solve real-world problems (Mohd, Manhood & Ismail, 2011: 50). Mathematics is essential for success at any age. Despite the importance of arithmetic in daily life, students may struggle to acquire and apply mathematical concepts (Anday,2014:84). According to research, South African children aren't doing well in mathematics (Wicks & Child, 2017:1). South Africa's Mathematics pass rate is 30%. (DBE, 2015:1). Even with lesser grades, the youngsters are not successful in mathematics. Despite mathematics' importance in daily life, the country's performance has been weak (Nkoke, 2012:1). Mathematical achievement was the dependent variable, while learner, social-cultural, and school-based characteristics were independent variables. Students are not choosing mathematics in the FET band due to negative perceptions around mathematics, resulting in fewer doctors and engineers. Poor academic performance causes this (Adolphus, 2011:145).

The low level of arithmetic achievement in the Nzhelele Central circuit schools has long been a subject of worry across the country.

1.3 PURPOSE OF THE STUDY

The study's goal was to uncover key characteristics that effect tenth grade learners' academic performance and identify aspects that contribute to the establishment of

learning opportunities. Students' problem-solving in mathematics, the study's goals are:

- To examine the factors influencing learners' achievement in Mathematics.
- To identify opportunities for learning Mathematics.
- To develop the strategies which can be adopted to utilise opportunities that may improve the learners' achievement in Mathematics.

This study's goal was to uncover characteristics that influence learners' mathematical proficiency in both classic and current subjects. It also sought answers on factors that influence mathematics achievement to discover learning opportunities and how learners use them to construct strategies to improve arithmetic performance. This was done to discover learning opportunities and how students create strategies. This study studied student characteristics, socio-cultural factors, and school-based factors as independent variables.

1.4 RESEARCH QUESTIONS

The main research question that guided this investigation was: Which factors influence the accomplishment of Grade 10 learners in Mathematics in the Nzhelele Central Circuit?

In order to address this question, the following questions were established as subsidiary questions:

- Which factors influence the learning of Grade 10 Mathematics in Nzhelele Circuit?
- Which factors serve as opportunities for learning Grade 10 Mathematics in schools in Nzhelele Circuit?
- What strategies can be used to enable learners to utilise opportunities to learn Mathematics?

1.5 DEFINITION OF TERMS

The following concepts, referred to in this study, were defined in accordance with how they were used in this study:

1.5.1 Learner Achievement

Learner achievement is how much a student learns in a given period (Mullis, Martin, Foy & Hooper, 2016:1). Mathematical accomplishment is the ability to learn addition and problem-solving (Mullis, Martin, Foy & Hooper, 2016:1). Széll (2013:55) measures student achievement through academic performance and test scores, which are common indicators of teacher and school effectiveness. A student has low learning attainment if he or she has a disability that prevents him or her from using school-based educational facilities.

1.5.2 Mathematics

The numerical, geometrical, and visual relationships between objects can be understood through the use of mathematical symbols and notations. It is the study of patterns and qualitative links in events ranging from the physical to the social to the mathematical. In addition to this, mathematical relationships are investigated. It helps increase logical thinking and critical thinking, as well as precision and the ability to solve problems, all of which contribute to improved decision-making (DBE,2011:6).

1.5.3 Learning

Heick defines learning as acquiring knowledge or skills (2016:1). Learning can take several forms, such as group simulation and presentation. Learning is the process of gaining knowledge. Lifelong learning transforms information and experience into skills,

behaviors, and attitudes (Eschenbacher & Fleming, 2020:16). Eschenbacher & Fleming (2020:16). Keen and Shapiro (2020:457) define learning as functional behavioural changes or mechanical organism modifications due to experience.

1.5.4 Teaching

Neves (2020:157) defines teaching as the process of transferring knowledge to students. O'Neil (2012) defines teaching as offering professional aid and direction to less experienced or more demanding learners. Biggs (2011:1) defines teaching as the methodical and purposeful collection and review of data on classroom teaching and learning. Instruction is an investigation of classroom teaching and learning. Educators may begin teaching in one direction, but as their knowledge of education and student learning grows, they may decide to change directions. According to this study, teaching includes leading, coaching, counselling, and supporting a student who is learning.

1.5.5 The Opportunity-Propensity Model

One of the more recent developments in the field of mathematics education is something called the opportunity-propensity model, or O P for short (Byrnes & Miller, 2016:34). The model is largely based on a variety of theories, but it also restructures some parts and the way in which those elements interact to determine success. The O-P model is a tool for predicting students' early mathematical abilities (Byrnes & Miller, 2016:34). According to the findings of the opportunity-propensity (O-P) model, indices of opportunities can only explain a portion of the variance in accomplishment because learners make the most of any opportunities they are given. Learners have a greater propensity to capitalize upon available possibilities.

Individual differences in mathematics achievement were studied using the Opportunity Propensity Model, which included antecedent, opportunity, and propensity variables.

1.6. SIGNIFICANCE OF STUDY

The study provided empirical findings regarding opportunities and propensities for learners' achievement in Mathematics and possible remedies. The information was available to the following groups of people:

- Teachers were informed about the learners' opportunities and propensities in Mathematics and developed strategies to overcome them.
- Heads of departments were told about the opportunities and proclivities of students in Mathematics, as well as teaching methodologies, and how they might use this information to help both students and teachers.
- Policymakers were informed about learners' opportunities and propensities facing Mathematics teaching and learning and may formulate policies, which were improved on the systems and avoid or minimise the challenges.
- Learners were having a broader understanding of other subjects because of opportunities brought by the concept of Mathematics, as Mathematics includes all aspects of learning.
- Parents were informed about learners' opportunities and propensities in Mathematics and may use this knowledge to motivate, encourage and support their learners.

1.7. DELIMITATION OF STUDY

The study was conducted at secondary schools in Nzhelele Central Circuit, Vhembe West District, Limpopo (South Africa).

1.8 ETHICAL CONSIDERATIONS

First, I secured agreement from the Vhembe West district of the Department of Education, principals, and department heads. Then I got informed consent from educators. Parental consent documents were discussed with learners under the age of 18. According to Kumar (2015:212), gathering data without participants' agreement is unethical in all fields. Voluntary, uncoerced consent is also required. I told the participants that no one, not even the Department of Education, would know their identities. By delivering a signed document for informed consent, secrecy was strictly observed. I assured them that they may leave at any time if they didn't like it. Those that participated volunteered. The study didn't mention the individuals' names or location to safeguard their privacy.

1.9. OUTLINE OF THE STUDY

The dissertation is organised as follows:

Chapter 1: Introduction of the study

Following the presentation of some facts regarding the history of the study, an explanation of the issue at hand will be given. Following that, the reason for doing the study was explained, and then the research questions, an initial evaluation of the relevant literature, and a glossary of essential words were presented. Following that, a presentation to the audience was given that included a summary of the Research Design and Methodology, Sampling, Quality Control Measures, and Data Analysis. After then, there was a discussion regarding the importance of the study, its limitations, and the ethical concerns that it brought up. The completion of the chapter was marked by the addition of a study plan as the very last stage.

Chapter 2: *Theoretical Framework*

Chapter 2 begins with *an Introduction*. Then, a discussion of the theory informing the study was presented. There was a part of the report that focused on the study's

theoretical framework. A summary of the chapter's findings was provided at the very end.

Chapter 3: Literature Review:

Chapter 3 starts with an Introduction. Factors impacting mathematics achievement were covered in this chapter. The techniques that could be applied in order to make the most of opportunities were then discussed in more detail. The gap (or holes) left by these earlier studies are brought to the reader's attention, and an explanation of how the current study aims to fill the gap is given. A conclusion has been offered as the final portion of this chapter.

Chapter 4: *Research Paradigm, Design and Methodology*

After we finished the section of the chapter devoted to the introduction, we went on to a discussion of the Research Paradigm that was applied throughout the investigation. The pragmatic way of thinking was considered the norm. The presentation included details on the research's methodology as well as its overall design. Taking into account the sequential sequential mixed method design for the goal of providing an explanation was done. In this chapter, we discussed a variety of subjects, including methodology, instruments for data collection, and the dependability, validity, and trustworthiness of the data that were produced by the instruments. Another item that was discussed was the process of data collection. The conclusion, which is discussed in this section, brings the chapter to a close.

Chapter 5*: Data Analysis*

The first part of the chapter was an introduction to chapter 5. The following is a display of the data from the factors that influence the mathematical achievement of learners. First, descriptive statistics are used to present the data. A measurement of the central tendency of a data set in addition to a measurement of the dispersion of the data set.

The evaluation of the qualitative information came next after that. After that, an interpretation of the data was presented, addressing both the quantitative and the qualitative aspects of the findings. At long last, the reader was provided with a synopsis of the previous chapter.

Chapter 6: *Findings, Recommendations and Conclusion*

The study's findings were presented after the introduction of Chapter 6. The researcher delivered the study's Recommendations and Conclusions based on the findings.

CHAPTER 2

2.1 INTRODUCTION

This chapter provides a summary of the theoretical framework of the factors that influence the mathematical achievement of students. Within the review is the theoretical model that will be of value to the current investigation.

2.2 THEORETICAL FRAMEWORK

In this section, the theoretical framework is broken down and discussed.

A theoretical framework is a prism through which a researcher analyses his or her own research, per Robertson and Du Plessis (2015:25). It helps formulate study assumptions and determine how they relate to the world. It works as a lens through which a researcher perceives the world and plans research. It does this by presenting the researcher's point of view, offering context, and allowing research and literature to converse.

This research was framed under the Opportunity-Propensity paradigm because the goal was to understand how educators teach students to restructure various factors and how those elements interact to determine eventual success (Zhao, 2011:9). A blend of factors can indicate mathematics skill. According to past studies, the Opportunity-Propensity (O-P) paradigm can account for 8th-12th grade arithmetic achievement. 22(McElya) This study's goal is to find out what factors affect pupils' arithmetic achievement and whether or not this will lead to better mathematics instruction. This should help mathematics students solve problems. The O-P framework should assist account for individual differences in low-performing learners' early mathematics skills and determine if latent factors derived from measurable variables count for performance in the O-P model's strategy (McElya, 2016:22). According to the O-P framework, high mathematical achievement is influenced by

three types of factors: antecedent (distal) factors like family socioeconomic status, opportunities factors like time spent interacting with mathematical content, and propensity factors like previous mathematical skills (Byrnes & Miller, 2016:34; Zhao, 2011:9).

Using antecedent elements, which work early in learners' lives and explain opportunities and tendencies, was the most accurate strategy for predicting mathematics achievement. Propensity factors measure a learner's self-regulation, motivation, and cognitive level. Opportunity factors measure the learner's Mathematics learning possibilities at home and school. Mathematics achievement is linked to propensity factors (Byrnes & Miller, 2016:34; Zhao, 2011:9).

Zhao (2011:9) divides the opportunity-propensity paradigm into opportunity, propensity, and distal impacts. Opportunity factors are the cultural setting in which a person learns, while propensity factors are internal features and processes that affect learning. Both aspects affect a person's ability to learn. Distal variables explain how opportunity factors influence learners, engage propensity factors, and/or directly affect later achievement. Distal variables affect subsequent success. The model depicts a dynamic system that will be evaluated throughout time. The current degree of achievement should be noted as a future indicator. The propensity components are the most important elements in determining performance, according to empirical investigations utilizing this model (Zhao, 2011:9).

Prior research formed the O-P Model's theoretical foundation. Studies (Byrnes and Miller, 2016; Zhao, 2011) suggest that meeting two prerequisites increases the likelihood of success in mathematics. Learners are able and eager to exploit the many opportunities to acquire information and abilities in that profession (McElya, 2016:22). Opportunities to learn are culturally defined occasions where an individual is given knowledge to learn or practice abilities. Opportunities are tied to information exposure, such as course work or homework, and are available. Inclination is the ability or

readiness to learn knowledge after exposure or delivery in specified settings (McElya, 2016:22). Intelligence, aptitude, cognitive level, and pre-existing talents are cognitive factors.

Distal influences are other things that affect a person's success. Distal variables can explain how opportunities and tendencies manifest (McElya, 2016:22). Socioeconomic position, parental educational expectations, and prior educational expectations all contribute to both opportunity and inclination factors. Prior achievement is a Distal variable since it occurs earlier in the process and can provide insight on both Opportunity and Propensity. The theoretical underpinning will be the model's foundation (McElya, 2016:22). Figure below shows O-P model.

2.3 THEORETICAL MODEL

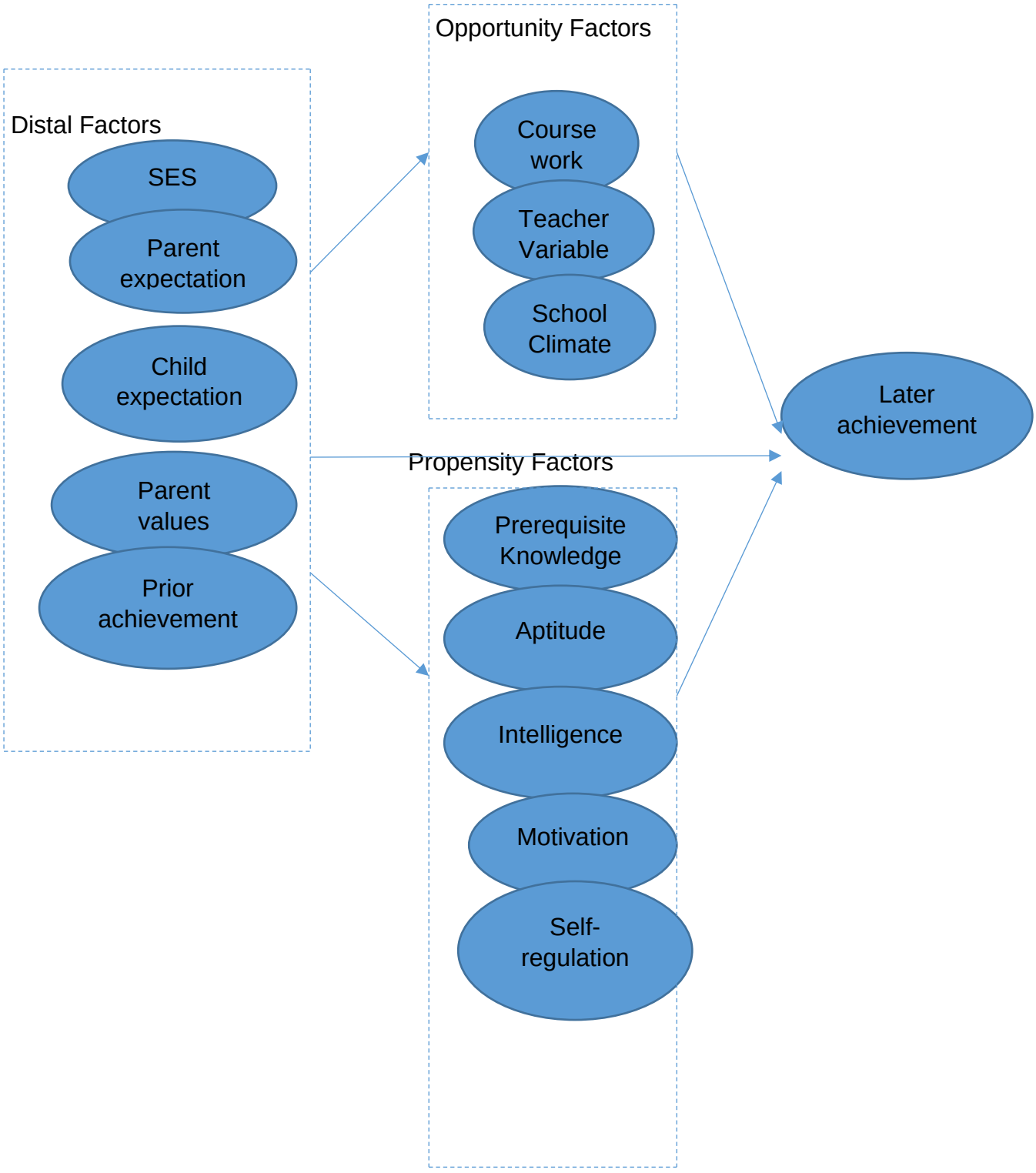

Figure 2.1: The Opportunity- Propensity Model (McElya, 2016:22)

According to Zhao (2011:9) the theoretical model is divided into three main sections: Propensity Factors, Opportunity Factors and Distal Factors.

2.3.1 Propensity Factors

There are three different classifications for propensity factors. To begin, a person's current situation has a direct impact on how easily they are able to take advantage of educational possibilities (pre-existing skills, domain-specific aptitude and intelligence). Second, there is a correlation between propensity features and educational opportunities (motivational aspects such as interest, expectations and self-efficacy). There is a connection between propensity and self-regulation (being organised, allocating study time effectively and effective learning strategies). Knowledge expansion should be maximized when learners enter learning situations with adequate prior knowledge, a strong domain-specific aptitude for studying the subject, and the ability to absorb varied types of material rapidly and intelligently (Baten & Desoete, 2018:667). When students have an interest in the material, believe it is relevant to their education, and are confident in their ability to master it, knowledge expansion (and achievement) will reach its full potential (Zhao, 2011:9). A child's likelihood of acquiring mathematics at home and school is measured using something called a "propensity factor" (Byrnes & Miller, 2016:34).

According to Wang, having prior cognitive skills, motivation, and the ability to self-regulate are essential components of academic achievement (2013:259). The most important factor in determining future performance is one's history of accomplishment in a particular field (in this case, mathematics), followed by one's ability to self-regulate and one's level of drive (Byrnes, 2011:596). When prior knowledge, self-regulation, and motivation are held constant, general ability is a predictor, but it explains less than ten percent of the variance in the data (Wang, 2013:259).

A student's ability to self-regulate and their level of motivation, which includes their goals, interests, and sense of self-efficacy, are directly related to their academic

achievement. Higher levels of attention, task endurance, and active involvement are linked to better performance on standardized tests and a higher level of accomplishment as judged by the instructor. This is the case regardless of the other conditions (Hindman & Cortina 2010:235). According to Wanga (2013:21), the motivation and opportunities that secondary school students have leads to an increase in the number of possibilities, which in turn fosters superior learning tendencies.

Ceulemans et al. (2017:1) wanted to find out whether or not the distal factor, as a latent variable, would have direct, indirect (via the opportunity and propensity factors), and combined effects on the early mathematics skills of low-income learners; whether or not the propensity factor, as a latent variable, would have a direct effect; and whether or not the opportunity factor, as a latent variable, would have a direct effect. In addition, the researchers wanted If all of the latent component indicators do the same analysis on the indices as the earlier research on older students, then these forecasts will be accurate. I had anticipated that my findings would be comparable to those of earlier studies; however, the young age of the learners, their difficult socioeconomic condition, and the absence of a prior knowledge score could lead to slightly different outcomes than those that have been published in previous studies. [Citation needed] (Ceulemans et al., 2017:1). The purpose of this study was to investigate propensity qualities and the ways in which they assist learners in developing genuine motivation to learn.

2.3.2 Opportunity Factors

The opportunity considerations component makes up the second part of the O-P Model (Byrnes & Miller, 2016:34). There are various possibilities to further one's education both inside and outside of the classroom (in the home context). It is possible to establish contexts by providing responses to the following three questions: Have these participants been exposed to material relating to the test? Is there a problem with the information? Byrnes and Miller (2016:34) ask, "Does the material have an

adequate presentation?" In this area are variables that relate to the quality of either the instruction or the exposure (Byrnes & Miller, 2016:34). A child's capacity for self-regulation, motivation, and cognitive ability can all be gauged using opportunity variables (the performance of a learner in a class is affected by the quality of the teacher). Opportunities are: The capacity of a child to learn, as measured by elements such as self-regulation, motivation, and previous cognitive abilities, is referred to as opportunity factors (Byrnes & Miller, 2016:34).

According to this study, programs that are school-based or teacher-initiated are considered to be lower-class options for early mathematics learning. These are some early opportunities in mathematics. Counting out loud and practicing different shapes and patterns are two of the activities that are conducted by the teacher. These include activities conducted by the instructor, such as making use of music or creative movement to gain a better understanding of mathematical topics (Ceulemans et al., 2017: 1). Studies that observe lower-class teachers and programs suggest that lower primary students receive a comparatively limited amount of mathematics instruction. The year preceding elementary school is essential for the development of mathematical skills (Ceulemans et al., 2017:20). Reading was found to be the primary focus of the majority of lower-class curricula, with relatively little time being devoted to mathematical instruction, according to research on the subject (Wang, 2013:259). As a response to this, a number of academics performed studies to investigate the effect that a structured early mathematics curriculum had on the mathematical knowledge and performance of students from lower-class backgrounds (Clarke et al., 2011:701). These structured early mathematics curricula ranged from the Early Learning in Mathematics program's 120, 30-minute lessons on numbers and operations, geometry, measurement, and vocabulary to the supplemental building blocks for Mathematics program, which integrated mathematics learning into the learners' daily activities such as online mathematics activities and circle time. The Early Learning in Mathematics program's 120 lessons on numbers and operations, geometry, measurement, and vocabulary lasted for a total of 720 minutes. It took 6 hours and 30

minutes to cover the topics of vocabulary, numbers and operations, geometry, and measurement for a total of 120 lessons (Clarke et al., 2011:701). On tests, the academic performance of students participating in a structured early mathematics program was superior to that of students participating in comparison or control groups.

Most mathematics classes are unstructured and consist of several assignments (Ceulemans et al., 2017:20). Participation in teacher-initiated counting, shape identification, identifying and completing recurrent patterns, and integrated Mathematics activities were stronger predictors of mathematical achievement than for grades 10 to 12. In the past, instructors' assessments were used to measure learners' motivation and engagement. Recent study suggests integrating reviews from both teachers and parents could improve these measures (Mathieson & Banerjee, 2010). "Opportunity factors" refer to conditions and circumstances that allow children to gain new knowledge, such as their home life and classroom teaching methods.

- **Opportunities Variables for enhancing learning in Mathematics that may Contribute to Achievement.**

a. Teachers Variables

Adino (2015:13) defines teacher variables as policies and processes that give aspiring teachers the information, attitudes, behaviours, and talents they need to be effective in the classroom, school, and community. Despite the fact that teacher education should be viewed as a continuous process, it is usually divided into the stages listed below. Induction, which provides training and assistance to new teachers throughout their first few years on the job, and initial teacher training and education are examples of pre-service courses. Teacher development is an in-service training program for currently employed teachers (Adino, 2015:13). Most teachers didn't understand mathematics' goals. The teachers' viewpoints on the lesson's objectives impacted its success. A rational curriculum design begins with clear and precise goals and objectives, and then identifies the tools, content, and procedures to attain them.

Teachers must know what must be done before the end of each lesson to apply the curriculum. According to a 2011 TIMSS poll, 72% of mathematics teachers continue to employ expository teaching approaches. Only 28% of these lessons were learned-cantered. Incompetent teachers boost student dropout rates in underdeveloped countries (Miles, 2011:643). Underqualified teachers in underdeveloped countries can't uncover learners' talents or boost academic progress (Miles, 2011:643). This is especially true of teachers' topic, pedagogical, and instructional knowledge (Miles, 2011:643).

b. School Climate Variables

The school climate elements were entered in two steps. This has important policy implications (Moe, 2011:1). Steps were taken to improve starting teacher training. In less developed countries, efforts are made to upgrade in-service teachers (Moe, 2011:1). The probability of getting assigned to the Mathematics learning issues group varies by region's economic growth. Low-income students are more likely to struggle academically. Previous studies couldn't prove a link between learning performance and learning problems, according to Zhao (2015:227). Zhao (2015:227) advises reassessing the prior findings and examining if high-performing pupils in a low-income school mask economic discrepancy. Even ordinary pupils risk falling behind in developing countries (Zhao, 2015:227).

c. The impact of coursework on academic achievement

According to Karim (2008:65), one of the many factors that contributed to academic performance was a focus on coursework assignments. Several studies have examined the TIMSS 2011 results and reached the same conclusion as prior research: school-level factors and parents' work levels influence secondary mathematics achievement. The findings show how parents and students compensate for a less-than-ideal circumstance.

Both parents' and learners' mathematics performance is marginally affected by homework (Zhao, 2011; 200). Classwork's impact on academic success depends on the student's school's urbanization level and their parents' job level. Extensive coursework increases the likelihood of a pupil being a high achiever only in households where both parents make low wages. Blue-collar learners have an advantage. When students choose their own curriculum and grades, they have a better chance of succeeding. Households and society respect education highly (Zhao, 2011:200). Completing assigned coursework has long been acknowledged as a way to improve overall academic ability. Coursework affects achievement, but too much can stress students and limit their academic advancement (Zhao, 2011:200). According to studies, this is why even primary school students spend so much time on homework (Zhao 2011;200). Both youngsters and their parents feel that putting in a lot of effort, such as offering assignments, will make up for a bad position. However, the findings demonstrate that this is only partially true. This means those in charge of education should be aware of the situation and make extra efforts to compensate for the poor origins of some students. According to TIMSS 2011, parents' and learners' extra efforts may not boost their future prospects.

2.3.3 Distal Factors

The O-P Model ends with distal components (Byrnes & Miller, 2016:34). Prior achievement is a distal element, study shows. High-achieving students in earlier grades either choose or are chosen by teachers to participate in more advanced learning programs (McEleya, 2016:22). Also, the SES of one's parents influences one's learning potential (McEleya, 2016:22). As stated previously, distal variables appear before propensity or opportunity factors and may influence those variables. Distal variables may lead to Opportunity and Propensity factors that boost success (McEleya, 2016:22). Distal variables play a role in a young child's chances and proclivities (Baten & Desoete, 2018:667).

According to the findings of the research, the distal factor variable, which is a term that refers to early experiences that influence academic achievement, is accurate (McEleya, 2016:37). In order to gain a better understanding of the factors that influence early accomplishment in children from low-income families, researchers investigated the connections that exist between age, birth weight, early cognitive functioning, parent expectations, and mothers' schooling years. The O–P Framework has never been used to determine a learner's age, despite the fact that there is a clear correlation between age and the ability to perform mathematical tasks (Miller & Zimmerman, 2010:45). For instance, older students are frequently provided with a greater number of possibilities than younger students, and certain students are more likely to make use of these opportunities when they are presented to them (an increase in cognitive skills due to brain maturation).

In the vast majority of cases, a young student will begin their mathematical education with fundamental mathematical concepts and will gradually advance to more advanced mathematical concepts as they progress through their schooling. This is notably true during primary school, when a student's mathematical skills progress from identifying small groups to counting in sequence to early arithmetic. During this time, a student's ability to perform early arithmetic also develops. Beginning with the ability to recognize small groups and progressing to counting in sequence are two major steps in the progression of a student's mathematical abilities during these years (Wang, 2013: 259). Given that a student's age might change by 11–12 months during the course of a single school year, it is an essential factor in education (Wang, 2013:259). There is a correlation between having a low birth weight (less than 2499 grams), which is frequent among students from low-income families, and having cognitive delay at age 2, poor language abilities, lower test scores, and academic fallout (McEleya, 2016:37). McEleya (2016):37 Previous research on the O–P Framework did not take into account low birth weight; nonetheless, this factor is a strong contender for an antecedent trait that could help explain opportunities and

propensities. (Example:) When parents have high expectations for their children's education, their children have a greater chance of going to college, taking more required classes, having better attendance, and doing better academically. When parents have high expectations for their children's education, their children are more likely to attend college (Wang, 2013:259).

Even when the child's family's economic situation is taken into account, the expectations of the child's parents can still explain a significant amount of the child's possibilities, dispositions, and successes (Wang, 2013:259). The O–P Framework was utilized in earlier study to investigate learner expectations; however, this variable was not investigated in students enrolled in non-basic education programs. There are both direct and indirect connections between goals and accomplishments in the fields of music, creative movement, and cuisine. Recent studies have shown a strong correlation between early participation in mathematical activities that include analysis and reasoning and higher mathematics test results for primary school pupils from families with lower incomes. New evidence demonstrates that low-income primary students have varying exposure to even traditional mathematics learning options in the early years, despite the fact that many academics have criticized the standard mathematics programs that are taught at the lower primary levels (Enu, 2015:34). The amount of variance in arithmetic test scores owing to classrooms that could be attributed to teaching was just 4% for all students, but the amount was significantly higher for students attending high-poverty schools. This was the case regardless of whether or not the students had a teacher. Along with activities connected to worksheets, tasks that strengthened students' analytical and reasoning abilities were found to be significantly associated with higher test scores in schools serving students from low-income families (Enu, 2015:34). According to Wang (2013:259), low-income students are less likely to take part in activities that require analysis and reasoning. This remark gives the impression that this group has a variety of early learning opportunities in mathematics. However, little is known about the prevalence and nature of typical mathematics exposure in the year before senior phase among low-

income students, as well as the relationship between FET phase mathematics exposure and mathematics achievement. Since 2002, national organizations have emphasized the importance of accessible mathematics education for children aged 3 to 6 years old. Since 2002, national organizations have been emphasizing how important it is to provide children aged 3 to 6 with easy access to mathematical instruction. According to Enu (2015:34) and Wang (2013:259), the difficulties that learners face are the result of a lack of mathematical knowledge and an ineffective activation of that information. Learners do not have the metacognitive skills necessary to regulate, monitor, and reflect on the process of finding solutions. As a result of these difficulties, a great number of children develop negative attitudes about mathematics, which makes it more difficult for them to learn and to achieve their objectives (Efklides, 2011:25). In this particular investigation, SES is a secondary factor. The socioeconomic status of a person is one factor that helps explain why some people have better possibilities for education than others.

- **Distal variables that may influence achievement and opportunities to improve mathematics learning**

a. Socio-Economic Status

Enu (2015:68) says a person's socioeconomic class is influenced by their parents' education, work, and money. Socioeconomic position is one of the most important elements in predicting academic performance, according to most research. Enu (2015:68) says a person's education is influenced by their parents' socioeconomic status. Enu (2015:68) says children with socially, academically, and economically successful parents are motivated to be successful themselves.

Baker and Jones (2005: 149) claim a link between low socioeconomic status and bad school mathematics performance. Their research revealed this. Research shows that home resources and previous experiences, not socioeconomic status, impact mathematics success. Low student success rates are driven by unstable households,

drug abuse, and teenage pregnancies, according to Dhurumraj (2013:19). It's hardly surprising that pupils from wealthy homes with highly educated parents do better than those from less fortunate homes with less educated parents (Byrnes, 2011:9). High-income parents can provide their children a better education since several factors are present in their households. Low-income households don't have similar problems (Dhurumaraj, 2013:19).

One study found that the likelihood of a low-income pupil having a learning handicap is 1.5 times that of a high-income student (Zhao, 2011:207). In addition, socioeconomic status is linked to a variety of human qualities (biological, psychological, and emotional) that may contribute to learning difficulties (Zhao, 2011:207). Socioeconomic position and performance are linked in various ways. Less fortunate students, for example, receive less stimulus. Socioeconomic position may influence brain maturation, contribute to health issues, stress, and inadequate parenting (Hanson, Wolfe, Pollak, 2011:8). Students from low-income homes are four times more likely to begin school at a lower level than students from middle-income families (Baker & Jones, 2005:149).

b. Prior Achievement of Learners

According to Byrnes (2011:9), a student's level of knowledge on the first day of school is the best predictor of knowledge growth throughout the academic year. Because pupils acquire new knowledge faster when they are familiar with it. Prior knowledge acts as a foundation for further education. In a stream with dissolved salts, a small crystal and a giant crystal would grow considerably faster and larger than the small crystal. As a result, the best strategy to reduce inequalities between groups at the end of the school year is to ensure that everyone understands the same things on the first day (Byrnes, 2011:9). Prior achievement is another learner-related aspect, according to Efklides (2011:25). This relates to learners' mathematics understanding. At the lower secondary level, arithmetic skills are crucial to student success. It also predicts

future academic performance. "Mathematical pre-achievement" refers to learners' mathematical foundations and general development (Archaya, 2017:1). Learning was difficult for students who lacked prior information, according to Efklides (2011:25). High school students who failed arithmetic must retake it.

c. Parents Values

Archaya (2017:1) claims that some schools today have unacceptable family values. Educators and parents must work together to improve mathematics instruction for students. According to Mosibudi (2012:18), parents can impact their children's educational outcomes if they support their academic ambitions. Parents can help their children by ensuring they finish their homework, providing them with appropriate literature to read, applauding good instructors and confronting weak teachers, and ensuring their children do not disrupt their teachers. First home is also first school, and school is second home. Archay (2017:1) says it's crucial to consider parents' education, economic position, and assistance when studying mathematics. Lesson teachers are vital, but so are parents' awareness, excitement, and knowledge on how to handle and guide their children at home. This impacts the learner's education (Mosibudi, 2012:18). Mosibudi says illiterate individuals can't understand the importance of arithmetic and can't push pupils to learn it.

d. Learner Expectation

Adino (2015:16) claims that the way mathematics was taught influenced learners' attitudes towards the subject. They generated a natural expectation about the issue, which affected their class success. When students perceived the content to be studied as interesting, fun, significant, and relevant to their life, they became motivated to learn, and their attention was heightened to absorb the material offered by the instructor. Adino (2015:16) links a happy mindset to better overall performance. Several Kenyan secondary school stakeholders determined that repeated failure in

arithmetic may be due, at least in part, to student and instructor attitudes (Adino, 2015:16). Having high expectations is one of the most critical elements affecting performance, according to this study. Positive expectations affect a learner's performance, say Manoah, Indoshi, and Othuon (2011:965). Students who have high expectations for themselves perform well on examinations, proving that it is an important component of the Mathematics curriculum. According to research on the role of expectation, it is an important aspect in determining how well a curriculum is implemented in educational institutions, especially in mathematics (Manoah, Indoshi & Othuon, 2011:965).

According to this idea, high accomplishment is the outcome of three sorts of elements: opportunity, predisposition, and distal influences. Coursework is one such factor. Prerequisite skills, motivation (SES) are propensity factors (Byrnes & Miller, 2016:34). The model will be used to investigate possibilities for learning arithmetic and how students use those chances to develop reasonable responses to problems. Combining these three components will speed up the study's integrative theory building.

2.4 THE CURRENT STUDY

The O–P paradigm has been used to investigate the collective influence of sets of predictors, in addition to analyzing the individual contributions of many factors that can be used to forecast a person's mathematical abilities. To begin, the majority of prior study has concentrated on the predictive capacity of numerous factors impacting the arithmetic achievement of learners in their tenth year of school. Predicting success in mathematics requires looking at factors such as socioeconomic standing, prior mathematical achievement, parental expectation, learner expectation, and parental support. In addition to that, mathematical ability. Second, make the most of these opportunities to better kids' mathematical abilities. The purpose of this research was to investigate several methods by which children's mathematical abilities can be

improved. Because the O–P model has never been tried out on students in the tenth grade, doing so now serves as a reliable test of the applicability of the model. In many different contexts, a mismatch results in the discovery of new information and the modification of theoretical frameworks. All of the previous research that was done on the O–P Framework included variables from specific theoretical categories (such as "opportunity factors" or "propensity factors"), but they never evaluated whether these components could be combined into consistent latent factors. The researcher wished to discover, in accordance with the O–P Framework, if these latter accomplishment qualities may be utilized to predict early mathematical abilities.

The results of previous studies show that learning activities that are both teacher-initiated and integrated should be employed to instruct fundamental mathematical abilities. The pre-existing cognition of the child as well as the parental evaluation of the child's capacity for self-regulation are examples of the latent tendency component. The results of previous studies can be used to make predictions about how parents and instructors would evaluate a child's ability to self-regulate. According to the O–P Framework, students in the 10th grade who spend their final year studying arithmetic have a better chance of developing early mathematics skills than students who do not. It's possible that they don't have access to possibilities like these back home. Both are driven, and they stand to benefit from this.

2.5 CONCLUSION

This chapter highlights the theoretical framework model on variables affecting 10th-grade mathematics achievement. The Opportunity-Propensity model (O-P) was established to encompass all of the results about student mathematical growth. The O-P framework assumes that students will do well in arithmetic if they are given opportunities to develop their skills and are motivated to do so. This is O-central P's idea (propensity). The hypothesis considers distal (demographics, prior

accomplishments), propensity, and opportunity components (example, coursework and course rigor). The next chapter reviews the topic's previous research.

CHAPTER 3

LITERATURE REVIEW: FACTORS INFLUENCING LEARNERS' ACHIEVEMENT IN GRADE 10 MATHEMATICS: THE CASE OF NZHELELE CENTRAL CIRCUIT IN VHEMBE WEST DISTRICT IN LIMPOPO PROVINCE

3.1 INTRODUCTION

This section examines the elements that influence pupils' mathematics performance in grade 10. This review discusses student success in mathematics, factors that influence mathematics performance, techniques to improve mathematics performance, and learning opportunities.

The researcher built the research instrument using the study's methodological foundation, which was used to review pertinent earlier research. Mathematics should be obligatory curriculum for all students because it is a necessary life skill (Frey, Fisher & Smith, 2019). Conducting a literature review can help mathematics learners overcome problems.

- Determine which areas of mathematics are most difficult and how teachers resolve them to build and support a planned set of events and tactics to increase learners' arithmetic achievement and find learning opportunities;
- Determine which areas of mathematics are most difficult and how teachers resolve them to build and support a planned set of events for mathematics students, as well as ways for doing so;
- Nzhelele's central circuit has had a mathematics difficulty for years.

To obtain high levels of mathematical achievement, researchers must investigate the elements that influence student achievement.

Mathematical difficulties in kids can sometimes be traced back to prior information not fully understood (Feza, 2013:200). Early learning should facilitate learning by presenting a thorough picture of the relationships met earlier and later in the process, according to Angel (2016:99). Senior-year students must take mathematics. The exposure youngsters get in high school is inadequate and hurts their mathematics skills (Spaull, 2013:1). According to Kühne et al. (2013:1), pupils' performance differences date back to primary school. This report confirms Spaull's conclusions. According to Feza (2013:200), well-prepared teachers can better engage their learners' mathematical curiosity. Opinion pieces (Harris, 2012; Kühne et al., 2013; Feza, 2013: 200) support learner-appropriate practices such purposeful play, learner-directed activities, scaffolding, and intuitive mediation. Primary education is the cornerstone of human development, according to the South African White Paper 1 on Education and Training (DoE, 2001:1).

Several studies on student achievement reveal that academic performance in urban and rural areas varied for a variety of reasons (Durak, 2019:492). Echazarra and Radinger (2019:1) link learning challenges to low socioeconomic status. Urban kids outperform rural ones, too (Durak, 2019:492). Education does not exist in a vacuum; it reflects the nation's social, economic, and political framework. In South Africa, the previous black education system was tied to the country's development plan and political solutions. The school system was also tied to apartheid (Giliomee, 2012:86; Tshiredo, 2013:74). Since education is frequently done in a political setting, the two are linked (Giliomee, 2012:86; Tshiredo, 2013: 74). These disparities in academic attainment are believed to reflect cultural realities including poverty, politics, and socioeconomic concerns. [Needs citing] (2013).

Durak says this is in line with how South African teachers are expected to teach (2019:492). They facilitate, mediate, and support learning. Facilitators should always consider learners active learners. Teachers must provide learning help if pupils experience problems during this technique (DoE, 2003:65).

3.2 CONCEPTUAL FACTORS AND LEARNERS' ACHIEVEMENT

Early identification of non-learners is key to helping them make progress and become participating members of society, according to Rahiem (2021:120). This is because such youngsters can take advantage of early possibilities. It's important to rapidly identify students with learning problems so they can receive help. On the other hand, it is vital to avoid labelling young children in a way that decreases their expectations. If a pupil has learning issues, they have a better chance of academic success if identified early.

Early learning detection According to Outhwaite (2019: 284), arithmetic problems help at-risk students build a foundation for later learning and academic success. He also says that identifying students who struggle with learning early on increases their chances of reaching their full potential. Early identification helps learners avoid secondary concerns like discontent and worry, and it reduces the probability of future issues.

Early intervention can prevent or treat developmental issues in young children before they become more serious and costly problems, including associated costs. Early intervention can prevent or treat developmental issues in young children before they become costly. Students who struggle to learn may fail classes, engage in disruptive conduct, and eventually drop out of school if not discovered and helped promptly.

Early diagnosis of learning challenges will improve educational opportunities and outcomes for all learners enrolled in the normal school system with complex prerequisites or special learning impairments. Teachers often deal with youngsters who are unsuccessful in school or quit, but this doesn't mean they can't learn.

These students may have poor vision, hearing impairments, or reading or writing difficulty. Handwriting may be a problem. Handwriting-challenged students may find it

difficult to copy, especially at a distance (such as when they are copying from the chalkboard). They may have trouble arranging when writing or copying. Students' handwriting may be upside down, right side up, too close together, or too far apart. The child's letters or numerals may appear twisted or rotated (Machaba, 2014:165)

The Department of Basic Education (DBE) wanted an impartial view, thus AMESA produced a report on the 2013 grade 9 mathematics exam. According to (Luneta, 2013:1), the paper examined mathematics learners' knowledge and skills. Even if the questions were varied, this is the case. It was a well-balanced paper that appealed to many learner skills, so students from diverse backgrounds may profit. The article's cognitive and difficulty levels matched the learner's framework, and the questions were thought-provoking, presented clearly, and explicitly stated (Luneta, 2013:1). According to AMESA, most of the vocabulary and concepts were intelligible to ESL students (2013:1). The committee concluded that pupils had enough time to complete the question paper (AMESA, 2013:1). The committee concluded that the work must be fair because it was written to a reasonable, acceptable, and sufficient standard (content coverage, cognitive level balance, language, and time). Students who were properly trained and worked hard should have had little issue addressing most of the study's concerns.

As a result, low student accomplishment can't be blamed on a difficult task. This article examines causes of poor student performance and presents our findings. Concerns have been made that grade 9 learners' learning problems would deteriorate throughout their academic careers, preventing them from completing needed curriculum in later years (Luneta, 2013:1). According to Spaull, all available information implies that many South African learners sustain catastrophic learning deficits early in their schooling careers, which leads to underperformance in later years (2013:1). In South Africa, teens who don't do well in arithmetic in high school have a harder time getting subsequent training.

Spaull (2013:1) proposes early intervention to prevent, detect, and correct certain learning disabilities. He thinks this is the only answer. This inspired the research.

3.3 FACTORS AND LEARNERS' ACHIEVEMENT IN MATHEMATICS.

3.3.1 Mathematics Teacher Pedagogical Content Knowledge

Wittmann (2021:263) defines content knowledge as a topic's structure, such as mathematics. Pedagogical content knowledge is about learners and instruction, while content knowledge is about mathematics and mathematics representations (Wittmann, 2021:263). According to Machaba (2013:38), pedagogical content knowledge includes different ways of representing and formulating the subject to make it understandable to others, an understanding of what makes specific topics easy or difficult to learn, and the conceptions and preconceptions that learners of various ages and backgrounds bring to the learning of commonly taught topics and lessons.

As defined by Machaba (2013:38), "pedagogical content knowledge" is the knowledge, attitudes, behaviours, and abilities that prospective teachers need to properly perform their obligations in the classroom, school, and wider society. Teacher education is sometimes split at different times, despite being a continuum. According to Machaba, initial teacher training and education (a pre-service course before entering the classroom as a fully responsible teacher), induction (the process of providing training and support during the first few years of teaching as the first year in a particular school), and teacher development or continuing professional development (CPD) are the three categories of teacher training and education. Induction is the process of providing training and assistance during the first few years of teaching (2013:38).

Alidino (2015:13) says most educators don't understand stated mathematics goals. The teachers' opinions of the class's objectives affected the learners' achievement. Acharya (2017:1) said that rational curriculum development must begin with clear and

defined goals and objectives, then work backwards to determine the means, material, and procedures for accomplishing those goals. This proved Acharya's point. Teachers must know what must be done before the end of each lesson to apply the curriculum. A 2011 poll found that 72% of mathematics teachers still use expository methods. Only 28% of the classes emphasized the student as the primary organizer of the material (Alidino 2015:13).

Ayinde (2021:74) says teachers must have a deep comprehension of a subject before teaching it. Mathematical understanding isn't required to educate successfully. To pick desired activities, arrange discussion, create a learning environment, and analyze their own teaching and learners' learning, teachers need three categories of knowledge: mathematics, mathematics pedagogy, and learning settings (Machaba, 2013:38).

The teacher must successfully communicate with the class. Skipping this step makes mathematics problems harder for kids. Ayinde (2021:74) says a teacher's knowledge is key to good mathematics education.

3.3.2 Educational Resources at Home

According to Anderson (2013:1), a learner's background in terms of educational materials at home, such as books, TV, computer, study desk and table, and general academic assistance at home, is crucial to the learner's performance in mathematics. Books, electronic resources (TV, computer), study desk and table, and general academic help at home are examples. Learners with access to such resources will be better informed about current events, which will boost their mathematics performance in school. Low-income students will still have to write the same exam (Machaba 2013:38).

As a result, students from low-income families who lack access to mathematics-related educational materials will struggle to keep up with their peers who do. Even though our students may watch inappropriate programming, there are many educational mathematics shows on TV (Machaba 2013:38). Internet-connected PCs would help our students with mathematics homework and projects.

Home environment is also significant for mathematics education. Home is the learner's first school, and the mother is usually the first teacher. Home and community influence a student's education. Uninformed people who don't know the value of mathematics in the learner's life can't inspire students to learn arithmetic (Acharya, 2017:13). All mathematics students rely on their home surroundings and absorb family traits (Acharya 2017:13).

According to Saun (2014:13), supplying kids with high-quality materials at school can help them succeed in arithmetic, and the learning environment at home, including the education of the learner's parents, influences the learner's overall performance. Learning results can be affected by books, charts, and other visual aids. Consider the house as a learning setting. Children with highly educated parents do better academically, research shows (Saun, 2014:13). Parents' influence on their children's metacognitive aspects of schooling, like study habits and achievement pressure, may affect their academic success (Anderson, 2013:1).

Relevant learning resources are a must in activity-based teaching tactics. It's important to use available tools to help pupils learn mathematics and enjoy it through practical assignments. Participating in activities that utilise multiple resources increases learners' mathematics comprehension. The educator must determine in advance the resources needed for a lesson and the purpose of the teaching/learning materials (Wekesa, 2013:18). Mathematics education requires textbooks, teacher aids, and a curriculum outline. According to Alidino (2015:13), course syllabuses and educator guides encourage educators to utilize investigative or activity tactics that stimulate

inquiry, creativity, manipulation, and physical talents. These strategies assist students engage in physically demanding learning activities.

3.3.3 Overcrowded Classrooms

Marais (2016:1) says that overcrowded courses make it harder to create effective learning settings with suitable teaching and evaluation approaches. This challenges teachers. Teachers don't have access to higher-order inquiry and active learning tools. Teachers have little options besides "chalk and talk" (Marais, 2016:1). In addition, teachers cannot differentiate their emphasis among students in packed classes (Imtiaz, 2014:251). Sosibo and Nomlomo (2014:89) agree, claiming that teachers disregard non-participants since they can't persuade or hold them accountable.

According to Wekesa (2013:18), reducing the student-teacher ratio can improve classroom education. The class size affects the manner of instruction. The teacher's methodology is crucial. The educator creates learning environments, defines learning activities, and selects appropriate learning resources (Marais, 2016:1). Educators' methods must overcome inadequate presentation, quick work, inappropriate learning resources, improper topic sequencing, and language levels (Wekesa, 2013:18).

According to Imtiaz (2014:251), overcrowding has numerous disruptive effects on student behavior. Students can't pay attention or participate fully because their classmates are boisterous and anxious, which negatively impacts their academic progress. Students can't count on individualized attention from teachers (Mustafa et al., 2014:178), which is problematic when they need more aid. The learning environment should encourage group and individual learning. Small-group work boosts student engagement and academic achievement. Ikediaskhi and Amaechi (2012:160) claim that fewer students per instructor can attain a higher quality of education. Researchers at Nigerian secondary schools reached this conclusion. Too many students in a classroom makes it harder for teachers to motivate them. Too

crowded classes compel teachers to react and pupils to passively learn, which can demotivate students. Overcrowded classrooms, according to Imtiaz (2014:251), are unsupportive of student growth and may be damaging to learners' physical health. According to them, overcrowding in classrooms is unhygienic since it raises the risk of other pupils getting sick from a sick classmate. Students require space to write tests without bumping into each other; otherwise, they may copy each other's work. As a result, students may skip earlier grades without creating the essential foundations. These 12th graders suffer the repercussions. Overcrowded classes may have low graduation rates. Bayat et al. (2014:53) recommend that the Department of Basic Education cut the teacher-student ratio to 1 to 25.

3.3.4 Language Problem in Learning of Mathematics

Prediger et al. (2019:11) point out that language is a significant learning medium in mathematics classrooms for communicative and epistemic aims, hence it must be incorporated as a learning target. Robertson and Graven (2019:101) claim it is difficult to move the language from problem-oriented to resource-oriented, and then to convert this difficulty into real pedagogical implications for mathematics instruction. It requires strategic and expert preparation. If mathematics instructors do not have rules and practices in place that take advantage of learners' linguistic resources, they will see language as a hindrance to their study. Edmonds argues that exploring techniques to make language learning a goal in mathematics classrooms is not part of teacher education (2017:63). Prediger (2019:11) says well-researched concepts can be broadly used. I'll highlight a couple in the final section of the study, when we deliver language-responsive mathematics education.

According to Edmonds (2017:63), many grade 8 students in South Africa's secondary schools have academic and learning issues due to inadequate language abilities. A pupil with limited language skills may need to study and comprehend more slowly. Ineffective communication causes learning problems. A student needs expressive and

receptive language abilities to understand and complete arithmetic assignments (Edmonds 2017:63). Learners should be able to recall what they've learnt when needed. It's well-known that GET pupils would struggle with language abilities. As a result, teachers must be patient when teaching children about integers, factorizations, and exponents.

When students must finish schoolwork in a foreign language, education becomes more difficult. TIMSS found an association between lower mathematics achievement and home language, which is different from classroom language (Baker & Jones, 2005: 149). Students must establish topic literacy when learning in a second language (Dhurumraj, 2013:20). It is far more difficult for kids to learn when they are obliged to use a language they do not understand (Dhurumraj, 2013:20). Language is key to understanding mathematical terms, which impacts pupils' overall mathematics success (Dhurumraj, 2013:20).

Mathematical terminology is vital for students who are not taught in their home language. These pupils can benefit from a visual representation of what is being discussed in class, which will boost their knowledge. With the right resources, educators can demonstrate angle measuring.

3.3.5 Attitude of Learners and Teachers Towards Mathematics

According to Baroody, Clements, and Sarama, the practice of teaching and learning mathematics is influenced by the teachers' mental contents and schemes, particularly their system of beliefs about mathematics and its teaching and learning, the social context of the teaching situation, particularly the restrictions and possibilities it provides, and the teachers' level of reflection thought processes (2019:274). These include teachers' conceptual contents and plans, their mathematics teaching and learning principles, and the social context.

Kids' mathematics attitudes have been studied extensively. A positive attitude toward arithmetic is vital for improving pupils' mathematics skills. According to Baroody, Clements, and Sarama (2019:274), teachers' judgments of their learners' arithmetic skills affect how they teach, which affects how students learn.

Students find mathematics lessons tough, and they often express hatred for the subject, reflecting their negative views of mathematics (Wekesa, 2013:43). Other terrible mathematics attitudes include arriving late to class, dozing in class, and refusing to engage. This is disengagement. Learners must feel welcomed, valuable, protected, and able to make decisions. Once these prerequisites are met, the learner may become more interested in any activity (Wekesa, 2013:43).

Dhurumraj (2013:18) used TIMSS to study how mathematics attitudes affect mathematics achievement. Trends in International Mathematics and Science Study (TIMSS) argues that encouraging children to like mathematics should be a core goal of mathematics education. Many kids avoid mathematics because they're afraid and lack self-confidence. This negative mindset can lead to low student performance and failure to meet university GPA requirements (Dhurumraj, 2013:18). Students' impression that mathematics is difficult has led to a decline in secondary and postsecondary enrollment (Gough 2009:183). When I taught mathematics at a public school in the Vhembe District Southpansberg cluster, many of my students despised the subject and called it "a killer topic." According to Dhurumraj (2013:18), students from higher-income families are more motivated to excel academically.

Learners' perceptions of the learning environment can be used to infer personality, pedagogy, and content. According to Anderson (2013:1), low interest in mathematics in the UK can be linked to difficulty perception, lack of self-confidence, dislike, boredom, and a belief that the subject is irrelevant to their lives. Their choice directly affects their perception of mathematical concepts. Others quit mathematics because they find it boring, difficult, and pointless.

How students feel about mathematics affects how much time and effort they put into acquiring and developing mathematical skills (Enu, 2015:68). Enu (2015:68) argues that a student's academic competencies and expectations are linked to extracurricular engagement and emotional states that assist or impede academic performance. As a result, mathematics teachers must maintain a positive attitude towards mathematics if they want their students to succeed in higher grades (Enu, 2015:68).

3.3.6 Role of Educators in Addressing Mathematics Problems

Sauna (2014:13) says teachers are the most important influence in student learning. Evidence suggests it moderates other risk factors such as parental education, student gender, and sociocultural and socioeconomic backgrounds. Evidence reveals it affects the type of learning and experiences students have daily, as well as their educational aspirations and personality development. Content-focused professional development influences student outcomes. According to Sauna (2014:13), children whose instructors participated in professional development opportunities outperformed pupils whose teachers did not. Anderson (2013:1) claims that absent or non-teaching teachers had some of the lowest mathematics test scores. Educators' mathematical knowledge, dedication to the profession, and continual professional development can all boost children' arithmetic achievement. According to Sauna (2014:13), teachers' mathematical expertise affects their learners' achievement.

Frenzel and Becker-Kurz (2018: 628) say teaching approaches should be rethought. In a traditional mathematics class, the teacher grades homework assignments before presenting new ideas. This phase of the course will largely involve the teacher teaching while students listen and take notes. After the lecture, students will practice a few examples before working individually on a series of textbook problems for the last 15–20 minutes of class. This instructional method isn't engaging (Frenzel & Becker-Kurz, 2018:628). Machaba (2013:38) argues that constructivist teachers emphasize active learning in a compelling context.

- Learners in these classrooms are more likely to take part in hands-on activities than to listen to the teacher; • Learners prefer to discuss their approach to problem-solving with other learners rather than expecting the teacher to tell them the right answer.
- Rather than rehearsing mathematics rules in a receptive manner, students choose to work constructively in small groups to develop and reformulate their ideas.
- To encourage active learning and engagement, students are grouped together rather than having their desks lined up.
- Educators have the sense that their expertise and skills are being put to good use.

3.3.7 Mathematics as an Interesting Subject

According to Schoenfeld (2019:3), mathematics is today considered as a set of human sense-making and problem-solving activities based on numerical representation of reality. This shift in perspective is due to changes in mathematics education. It is vital that children learn via comprehension rather than memory. To help children understand arithmetic topics, teachers should use accessible language and real-world examples.

In the new curriculum, teaching by rote and emphasizing repetition are not recommended. Educators who use this method hinder their learners' mathematics learning, making the issue harder. These teachers need more training to effectively help their students. Mathematical things don't have a physical presence, according to Fagnant (2005:355). Symbols are needed to communicate mathematical concepts. In mathematics classrooms, teachers utilize counters to help pupils add and subtract using tangible items. For youngsters to grasp mathematics, symbolic representations must be described in simple, correct language, and they must be shown relevant

examples from their immediate surroundings. Instructor involvement is crucial. The process of signifying and making meaning should be emphasized over the symbols themselves and their meanings. A teacher who lacks the language or skills to transmit knowledge will be a barrier for students. Education in a language different than the student's native tongue is risky. Because of this problem, South African children need better mathematics education.

3.3.8 Teaching Effectiveness of Mathematics Teachers

Effective teaching allows students to reach their greatest potential while attaining outcomes (Khan, 2012:109). Successful education prepares students to take in new information, connect it to earlier information, and build a chain of knowledge to work in a changing context.

Ismail (2015:1) defines teacher effectiveness as how well a teacher achieves student goals. Teacher success is judged by student achievement, dedication, and resilience in the face of adversity. Best practice is a teaching method that provides the intended results and develops deep learner understanding (Ismail, 2015:1). Khan admits that some Mathematics teachers are better than others (2012:109). Effective Mathematics teachers have a few things in common, whether they prefer student-directed or teacher-directed techniques (Ismail, 2015:1).

Effective instruction is the only method to prepare students for mathematics's rigors (Khan, 2012:109). The role of educators and students has evolved as teaching has become more all-encompassing, diverse, and complex. In the new learning-teaching paradigm, teaching involves preparing students for a complicated future that will require them to think in new ways to stay up with change. That is, educating now involves preparing kids for a future in which they will need to think differently to keep up. Only effective instruction can prepare students for such difficulties. Mathematics tests learners' capacity to think critically and understand difficult topics. Mathematics

is a topic that requires not just conceptual understanding but also procedural understanding and the ability to connect previous and present facts. Insufficient domain knowledge may hinder mathematics education (Khan, 2012:109). Competent mathematics instruction requires an effective mathematics teacher, who must be informed and able to communicate that information to students. Any mathematics education program must be able to engage and inform students about mathematics (Khan, 2012:109).

Lecturers with a mathematical background and a mathematics-focused teacher education program often teach mathematics in the classroom (Khan, 2012:109). Institutes for teacher preparation pay great attention to the research and work hard to produce knowledgeable, effective mathematics teachers.

3.4. STRATEGIES TO UTILISE OPPORTUNITIES TO IMPROVE LEARNERS' ACHIEVEMENT IN MATHEMATICS

3.4.1. Motivations

Robertson and Graven (2019:101) define motivation as the amount of time spent studying or striving to learn Mathematics because of a desire to do so. Mathematics requires drive. Robertson and Graven (2019:101) say mathematics teachers can't adequately educate if they don't comprehend motivation's impact on mathematics acquisition. Motivation is based on a person's intrinsic goals and desires. Learners who excel know how to use their abilities to compensate for mistakes. Enthusiasm is key to mathematics success (Posamantier, 2017:1). Motivating students to be actively receptive is a crucial part of any curriculum. Effective professors help both motivated and unmotivated students. Here are nine intrinsic and extrinsic mathematics incentive approaches (Posamantier, 2017:1).

a. Extrinsic and Intrinsic Motivation

Extrinsic incentive involves uncontrollable rewards. Small monetary rewards, peer approbation, avoiding "penalty" by performing well, praise for good effort, etc (Posamantier, 2017:1).

Many learners are intrinsically motivated to comprehend a topic or concept (task-related), surpass others (ego-related), or impress others (social-related). Final goal combines intrinsic and extrinsic drive. Posamantier (2017:1) discovered the following astounding achievement goals for increasing student enthusiasm in Mathematics during a research project at the George Lucus Educational Foundation:

- **Call attention to a void in Learners' knowledge**: By revealing a gap in learners' comprehension, you can capitalize on their desire to learn more. For example, you could provide a few short activities with common scenarios before moving on to unexpected situations on the same topic. The more severe the gap in knowledge is revealed, the more effective the motivation becomes.

- **Show a sequential achievement:** Having learners appreciate a logical sequence of concepts is closely related to the preceding technique. This strategy varies from the previous one in that it is based on the learners' desire to expand rather than complete their knowledge. How special quadrilaterals lead from one to another in terms of their attributes is an example of a sequential process.

- **Discover a pattern**: Setting up a staged circumstance that leads to learners discovering a pattern can be quite motivating since they enjoy discovering and then owning an idea. Adding the numbers 1 to 20 is a good illustration. Instead of adding the numbers in order, students add the first and last (1 + 20 = 21), followed by the second and next-to-last (2 + 20 = 22), and so on. Then all they have to do is solve 5 10 = 50 to acquire the required total. The activity will

provide children with an educational experience that will last a lifetime. Some patterns can be inspiring, particularly if they are discovered by the students with the help of the teacher.

- **Present a challenge:** When students are intellectually challenged, they respond enthusiastically. The challenge must be chosen with great consideration. The difficulty (if it's that kind of challenge) must lead to the lesson and be within the learners' grasp. The challenge should not detract from the lesson, but rather should lead to it.

- **Entice the class with a "gee whiz" mathematical result**: Mathematics is full of examples that are often counter-intuitive. By their very nature, these concepts can be motivating. A class discussion of the famous birthday dilemma, which yields a surprisingly high probability of birthday matches in relatively small groups, is a particularly effective inducement to encourage basic confidence in probability. The effect is incredible, even astonishing, and will astound the class.

- **Indicate the usefulness of a topic**: At the start of a course, show the class a practical application of genuine interest. For example, in the geometry topic, a learner might be asked to find the diameter of a plate with only a section of the plate smaller than a semicircle as information. The applications chosen should be simple and quick to motivate rather than distract from the lesson.

- **Use recreational Mathematics**: Puzzles, games, paradoxes, or the school building or other adjacent structures can all be used to motivate students. These devices must be brief and simple in addition to being chosen for their specific motivational benefit. Learners will be able to complete the recreation with little effort if this technique is used correctly. Again, the amusement that

these recreational examples generate should be carefully managed so that the lesson is not compromised.

- **Tell a pertinent story:** Telling a story about a historical event (for example, how Carl Friedrich Gauss added the numbers from 1 to 100 in one minute as a 10-year-old in 1787) or a made-up circumstance might drive students. Teachers should not rush through the story; a rushed presentation reduces the strategy's potential motivation.

- **Get learners actively involved in justifying Mathematical curiosities:** One of the more effective strategies for engaging students is to ask them to defend one of many relevant Mathematical oddities, such as when the sum of a number's digits is divisible by 9, the original number is likewise divisible by 9. Before you ask the students to defend their mathematical curiosity, make sure they are familiar with it.

Oroujlou and Vahedi (2011:996) state that mathematics teachers must understand their pupils' basic motives. The instructor can leverage these motivations to boost student engagement and teaching effectiveness. Using learners' motivations and affinities, mathematical puzzles and scenarios can be developed. Fair and beneficial if they generate genuine interest in a topic.

Posamantier says students learn better when they're engaged and appreciate what they're learning (2017:1). Mathematics-hungry pupils dedicate more time to the topic and are more persistent in completing projects (Oroujlou & Vahedi, 2011:996). They may also be more inclined to attend mathematics classes and pursue mathematics-related careers (Oroujlou & Vahedi, 2011:996). As a result, student motivation affects their arithmetic performance. Mathematical motivation is a dynamic rather than static learner trait.

3.4.2 Influence of Parents

Mosibudi (2012:18) says progress and learner accomplishment depend on school-parent contact. Parents are more involved in school since they know school growth affects their child's mathematics achievement. Mosibudi (2012:18) says parents should encourage children to finish homework, attend teacher meetings, and join parent organizations. According to the HOD of a secondary school in Nzhelele, the school would run smoothly due of his relationship with the parents (Mosibudi, 2012:18). Mosibudi (2012:18) says parental engagement is crucial in learners' Mathematics performance because the school and parents share responsibility for their success. Many parents benefit from meeting with teachers, completing homework, and following teacher recommendations. Teachers have a major challenge as well, one that comes from a tough to reach family member.

SASA stresses parental involvement in learners' education through SGBs. A public school's governing council must promote the school's best interests and provide quality education to all students, according to SASA (RSA 1998). To reach parents, schools should use techniques that encourage significant parental participation, such as flexible scheduling of home-school conferences, says Mosibudi (2012:18). Families and schools must work together to accomplish common goals and share academic success. The South African Schools Act emphasizes that teachers know schools serve the community (RSA 1998).

Home and school are culturally different for many African students (Cholewa & West-Olatunji, 2008:54). This separation between home and school can affect learners' achievement, engagement, and learning.

Section 20 of SASA 84 of 1996 (RSA 1998) lists governing body responsibilities. Other factors also affect school boards' success. Financial origins, reading level, and distance to school all affect parental involvement in school governance, especially in rural areas.

Allo (2020:10) discovered that international students respect their parents' and career counsellors' input while choosing a major. These findings jibe with the World Bank's

conclusions that Asian students value their parents' counsel more than other relevant references.

Santagata and Yeh (2016:49) say learners' views are influenced by their own and others'. In underdeveloped nations, mathematics teachers, parents, relatives, and friends impact students. According to studies, teachers don't affect learners' majors. Santagata and Yeh (2016:49) say referents influence learners' major decisions. Parents and friends' influence is also inconclusive. According to Allo, parents and teachers influenced learners' major choices (2020:10).

South Africa promotes parental participation. Secondary school teachers desire increased parental involvement. Students supported by their parents also showed progress. DoE created SGBs to involve parents in their children's education.

3.4.3 Teaching and Learning Resources

Developed countries can swiftly deploy resources to their schools to cover Mathematics targets. Teachers in these countries decide what resources to utilize in their classes (NCTM, 2000:10).

Teachers learn to select textbooks. In South Africa, the Department of Education (DoE) advised giving each pupil his or her own Mathematics textbook (2009:54). The Education Department committed to develop explicit regulations for textbook retrieval to improve classroom procedures. Better and more instructional resources will help teachers.

The availability, provision, and use of teaching and learning materials all improve academic attainment. Enu (2015:68) claims a link between using prescribed textbooks and academic success. Enu (2015:68) found that employing manipulative materials results in higher achievement than not using them in secondary mathematics activity-based learning. They also note that familiarity with concert educational materials boosts student achievement and attitudes. Enu (2015:68) also claimed that effective teaching and learning relied greatly on the capabilities of its people resources as well as the material resources required for knowledge transmission.

3.4.4 Support Offered by Department of Education to Educators

Schools need the help of district offices and professionals to function. Some people should make references. When general educators and support teams are unable to help struggling learners, they should refer them to experts who can help them. Special school teachers are supposed to serve learning-disabled kids in full-service schools. Some schools have specialists. Therefore, district-level aid is now available at school. The District Based Support Team consults specialists in schools that lack them. District Based Support Team (DBST) is a group of departmental experts tasked with promoting inclusive education through training, curriculum delivery, resource distribution, detecting and addressing learning impediments, leadership, and general administration. They go to schools to support troubled pupils using Institutional Level Support Teams. According to the Department of Education (2008:88), District Based Support Teams are crucial to the development of an inclusive education support system.

For each impaired kid, the Ohio Department of Education's Office for Exceptional Learners Operating Standards for Ohio Educational Agencies (2008:124) requires school districts to design and implement documented policies and procedures. According to Santagata and Yeh (2016: 49), support services in Norway examine children with exceptional needs, provide diagnostic reports so they can access additional resources, and write Individual Education Programs for special education students. The district is being more creative with projects like specialized training programs. These programs make teachers more inclusive. Other projects help families overcome obstacles to community inclusion. According to Allo (2020:10), assistance for pupils with special disabilities is generally provided by certified persons and coordinated at the district level.

A DBST could include district/regional authorities responsible for Education Support, Curriculum, Institutional Development, Special Needs Education, Assessment, and Examination.

3.4.5 Teachers' Impact on Students' Learning

The teacher effects student learning the most. According to data, it moderates the effect of other risk variables such parents' education, student gender, and socio-cultural and socio-economic backgrounds (Anderson, 2013:13). Teachers determine daily learning and experiences, as well as educational goals and personality development. Student achievement is greatly impacted by teachers' content-focused professional development. Students whose teachers participated in mathematics development programs did better. Anderson (2013:13) concluded that teachers' mathematical proficiency correlated with student growth. Mathematics exam scores were lowest for teachers who were absent or didn't teach. Thus, instructors' mathematical expertise, dedication, and professional progress can all help raise mathematics achievement (Anderson, 2013:13).

3.5 CONCUSION

In conclusion, the literature analysis identified various elements that contribute to Mathematics success and showed the growing emphasis on achievement in secondary schools. These characteristics affect all learners' academic progress, especially low-income South Africans. Various factors have direct and indirect effects on mathematics achievement, according to many studies. International and local literature show this is a global issue. The study also proposed an intervention strategy to help pupils improve their mathematics skills. The study's findings should offer a model that best fits secondary student data. Next, we review the study's design and methodology.

CHAPTER 4

RESEARCH PARADIGM, DESIGN AND METHODOLOGY

4.1 INTRODUCTION

The methodology employed in the study was provided in this chapter. The goal of this chapter is to highlight the research paradigm, research design, population, sample, sampling procedures, data collection approaches, including the research instruments used and methods for ensuring the validity and reliability of collected data, data analysis procedures, quality control measures, and ethical considerations in the research. The research objectives are used to justify the use of research methodology. The variables to be examined and the data collection methods are explained in this chapter. An overview of the paradigm utilized for this research is offered before addressing specific procedures used in the study to shed insight on the researcher's study structure and methodological choices.

4.2 RESEARCH PARADIGM

A paradigm, according to Cameron (2011: 96), is a method of seeing the world. Research is regulated by particular paradigms since it is the paradigm that governs the researchers' thoughts and attitudes about the world and how it should be understood and researched (Denzin & Lincoln, 2011:20). A research paradigm, according to Scotland (2012:16), is an all-encompassing system of interconnected practice and thinking that determines the nature of inquiry along these three dimensions. Ontology, epistemology, and methodology can all be used to define or describe paradigms (Scotland, 2012:16).

4.2.1 Ontology

Ontology is described by Bryman and Bell (2011:1) as "the perception or opinion about the existence of man, society, and the world in general on the one hand, and their

interaction on the other." In other words, ontology is concerned with the nature of the world's entities and the reality assumptions made about them (Bryman & Bell, 2011:1). It has to do with the character of what is to be known's reality. Reality is one and numerous realities coexisting in a social world are two basic ontological conceptions of social world reality (Bryman & Bell, 2011:1). Knowledge, for example, exists as a natural rule waiting to be discovered. Some, on the other hand, may regard knowledge as a societal fact that can only be grasped through an individual's interpretation. This study's ontology is that there are numerous realities for learners to learn existing practical experience variables and observe real-life difficulties in order to improve their mathematics accomplishment.

4.2.2 Epistemology

The method by which a researcher establishes or determines reality is known as epistemology (Makamure, 2016:75). It looks at the origins, nature, and boundaries of human knowledge, as well as how the researcher interacts with it. According to Creswell (2013:23), the epistemological perspective can be determined by asking, "What is the relationship between the researcher and the researched?" According to Makamure (2016:75), researchers' perspectives on whether they are part of that knowledge shape and create their interactions with the subjects of their studies. In this study, the researcher's epistemology is that knowledge gained from Mathematics students is subjective in terms of how it is formed and understood.

4.2.3. Methodology

One of the most crucial aspects of research is methodology. Denzin & Lincoln (2011) define methodology as "the process employed in the research to obtain, analyze, and make sense of data." Silverman (2016:1) describes methodology as the researchers' whole approach to their research, which encompasses everything from data collection to data analysis. Qualitative and quantitative methodologies are common approaches

to research methodology. In what is known as a multi-methods approach or for triangulation, both approaches may be applied in a single study.

This study was based on a pragmatist paradigm investigation of elements impacting learners' Mathematics ability in order to uncover feasible answers to the issues. Pragmatism is a conviction that reality is realized through experience and observation, based on its epistemology and ontology (Terrell, 2012:254). This paradigm appealed to me since it is an educational philosophy that believes education should be practical, i.e., acquired by experience (Creswell et al. 2013:48).

The mission of science, according to a pragmatist, is not to discover the truth or reality, whose existence is continually contested, but to help people solve problems (Terry, 2013:49). Pragmatism fosters a desire for practical results and increases practice, hence increasing practical relevance (Terry, 2013:49). Valid arguments to position pragmatist design, according to Terry (2013:49), are:

- To address real-world problems
- Attempts to generate artefacts with practical utility
- Contributes to practice improvement
- Participates in academic-practice interaction

The pragmatism paradigm is a deconstructive paradigm that promotes the use of diverse research methods, avoids contentious problems of truth and reality, and instead focuses on what works as the truth in relation to the research question at hand (Feilzer, 2010:8). While the positivist paradigm informs the quantitative approach and the constructivist or interpretative perspective informs the qualitative approach, the multi-method approach that informs this study is a result of the pragmatic paradigm (Cameron, 2011:96).

4.3. RESEARCH DESIGN AND METHODOLOGY

This section discusses the research strategy and technique that are appropriate for this investigation.

4.3.1. Research Design

The research design, according to Creswell (2010:123), is a set of rules and tools to be used in solving the research challenge. The model that will be employed in the investigation is summarized in the research design. It is crucial in defining how this research will be carried out. The study's research design determines how data will be collected and analyzed. According to Alam (2020:4), the research design aids the researcher in selecting relevant data collection methods and applying appropriate analysis methodologies. This study aimed to learn more about the elements that influence mathematics learning and the possibilities available; it also aimed to describe what is going on in the mathematics classrooms at Nzhelele Central Schools and therefore to show the mathematics learning situation in the classroom.

As previously stated, this study used a multi-method research design that included both qualitative and quantitative methodologies. Multi-method research is a design that incorporates both quantitative and qualitative approaches, as well as philosophical assumptions and methods of inquiry, all of which are grounded in the pragmatic paradigm. A quantitative approach, according to Creswell (2010:123), is one in which the investigator uses methods such as I cause-and-effect thinking, (ii) measurement and study, and (iii) theory testing to build knowledge. Experiments, surveys, and data collected on pre-set instruments are examples of quantitative strategies. A qualitative approach, on the other hand, is when the researcher makes knowledge claims based on constructivist perspectives, such as I the meanings of individual experiences; (ii) meanings that are socially and historically constructed to develop a theory or pattern, according to Creswell (2010:123). A multiple-method design's basic concept is that combining quantitative and qualitative approaches yields a greater grasp of research

problems than either strategy alone (Creswell, 2010:123). A quantitative study approach was utilized to collect data from the learners since the goal of this study is to investigate factors impacting Grade 10 learners' achievement in Mathematics in order to find factors that may serve as opportunities for learning Mathematics. Teachers, directors of departments, and Mathematics curriculum advisers provided qualitative data on variables and techniques that enable accomplishment in Grade 10 Mathematics.

4.3.2. Multi-Method Research

The paradigm choice, according to Denzin and Lincoln (2011:20), guides and shapes a study. Because this study was guided by a pragmatic paradigm, it was necessary to use a data collection strategy that included both interaction with participants as a source of information and quantification of some replies. This research entails looking into a subject using a variety of data sources and offering diverse viewpoints on the issue. This approach, according to Lincoln and Denzin (2011:20), was designed to collect and analyze quantitative and qualitative data in a single study to better understand a research subject.

This section outlined the methodology for gathering data for this investigation. As previously stated, the study employed both qualitative and quantitative methods. The next sections detail the data collection methods employed in these two approaches.

• **Qualitative approach**

Interviews were used to gather qualitative data. An interview is a technique for acquiring data, information, or opinions that involves asking a series of questions (Creswell et al., 2013:56). Face-to-face interviews are the most prevalent, and they can take a variety of formats. They can range from unstructured, naturalistic, in-depth discussions to more structured formats such as questionnaires or scheduled interview schedules where answers are provided from a preset list (Jupp, 2006:157; Creswell,

2013:181). Educators, department heads, and curriculum consultants were interviewed to learn about their perspectives on mathematics teaching and learning. The interviews were semi-structured.

• Quantitative approach

Questionnaires were used to collect quantitative data on learners' perspectives on mathematics learning (Creswell et al., 2013: 54). A questionnaire is a set of well-crafted questions delivered to a group of people in the same format in order to collect data on a topic of interest to the researcher (Slootweg & Jupp, 2020:252). The students who took part in the study were given questionnaires by the researcher.

4.3.3. Population

A population is the entire group of people about whom the researcher seeks to draw certain conclusions (Welman, Kruger & Mitchell, 2012: 52). Subject advisors for Mathematics curriculum in the circuit, heads of departments housing Mathematics in schools, all teachers and Mathematics learners in all thirteen secondary schools in the Nzhelele Central Circuit where Mathematics is an area of study were included in this study.

4.3.4 Sampling Procedures

To determine the sample, two sampling approaches were used. Participants who contributed to qualitative data were chosen using purposeful sampling, while learners who engaged in quantitative data were chosen using stratified sampling. The nine secondary schools were chosen for the study based on the researcher's assessment of their worth (Creswell et al., 2013: 54). The selection was based on the level of mastery in the subject. In this study, high performers, middle performers, and low performers in Mathematics were selected using stratified random sampling. Each

school had an equal number of students, with 10 high, 10 middle, and 10 low performances from all nine secondary schools, totalling 270 students. The learners were classified based on their test scores. The mechanism used to select these students was that their test results in Mathematics were listed in ascending order, with the first ten students at the bottom representing poor performers, the middle ten students representing medium performers, and the top ten students representing high performers. The Mathematics curriculum topic advisor, educators, and heads of departments in each of the three secondary schools were purposefully chosen based on their experience and appropriate knowledge of the subject. It was assumed that those with the most expertise and understanding on the issue would give the needed information and participate in the interviews.

4.3.5. Sample

A sample is a group of people chosen from the general population and from whom data is collected (Tavakoli, 2012:561). Two subject advisors, three heads of departments chosen at random from all HODs in the schools, and nine educators, one from each school, participated in the interviews from each of the three secondary schools chosen. 270 students were chosen for the quantitative method in this study, thirty (30) from each of the nine institutions. Questionnaires were employed to collect data in this method.

4.4 PILOT OF STUDY

A pilot study is a smaller version of the proposed study that is intended to improve the approach (Hallway & Jefferson, 2007:94). A pilot test allows the researcher to identify potential flaws in the proposed project and to examine the procedure and instrument before conducting the actual analysis (De Vos, Strydom, Fouche & Deport, 2005:54). To improve the study's validity, questionnaires and interview questions were initially tested to see if they produced the desired replies (Hallway & Jefferson, 2007:94).

Research piloting is the process of exposing research instruments to a specific circumstance that is similar to the one in which data will be collected. There are usually only a few people participating. This was done to determine the feasibility of the desired study as well as the participants' trustworthiness in delivering the required data, as well as to test the instruments' reliability and validity in terms of being the best for the intended purpose. This practice involves giving sixty Grade 10 Mathematics students an imitation research questionnaire and conducting interviews with three teachers, one departmental head, and one curriculum advisor. This method benefited in the strengthening of research methodologies by identifying and removing unforeseen research problems that were likely to arise, as well as giving the researcher the opportunity to remedy all discovered flaws before to the real data gathering expedition. The researcher engaged the assistance of a statistician during this stage, who assisted with the creation of dummy research findings.

4.5 DATA COLLECTION PROCEDURE

Data collection, according to Creswell (2013:181), is the process of locating and choosing study participants, receiving their agreement to engage in the study, and collecting information using varied but relevant instruments. Data collection is a methodical process of acquiring and analyzing research data in order to respond to a research question by providing answers and validating hypotheses (Kabir, 2016:168). Data collecting is not optional, despite the fact that different research fields require different approaches.

According to Creswell (2013:181), the type of information sought should define the instrument utilized to gather data. Because the collected data is analyzed and interpreted to inform the study's findings, this assignment is crucial to the overall effectiveness of the research endeavor. To obtain reliable study findings, Kabir (2016:168) emphasizes the need of employing adequate data collection instruments.

The researcher requested and received permission from the Department of Education to conduct research in the chosen circuit. The next step was to obtain authorization from the relevant schools to collect data. A permission form was sent to the schools on the Department of Education's list, and the principals of the schools signed the permission document. After this step was done, the study was announced to Mathematics teachers, and their cooperation was requested. The interview guide was supplied to the teachers and HODs, and they were free to ask questions about the research instrument. A date was selected for each school after the teachers agreed to participate. The parents were given an informed consent form to sign, and the pupils were given an assent prompt form to sign. The Mathematics teachers who were interviewed were given a comparable informed consent form. The study could begin once all of the consent forms were gathered and copies were distributed to each learner, the instructors, and the HODs.

Different instruments appropriate for certain approaches must be used in a mixed methods study like this one, and an explicit explanation must be provided, as outlined in the following subsections.

4.5.1 Quantitative Data Collection

A quantitative study collected numerical data and statistically analyzed it to explain events (Rasinger, 2013:1). It is a method of data collection in which the researcher uses investigative techniques such as experiments and surveys, as well as pre-set tools such as questionnaires, to collect data (Creswell, 2013:181). It is an endeavor to study problems and provide answers to questions such as how many, how much, and to what extent the problems under consideration are investigated (Rasinger, 2013:1). Quantitative research's most major strength is that its methodologies create trustworthy and quantifiable data that can be generalized to a large population (Rasinger, 2013:1). It's also useful for putting previously formulated beliefs about how and why things happen to the test.

The study used a quantitative approach to determine the elements that influence grade 10 learners' mathematics achievement. The researcher employed a closed-ended questionnaire with tick boxes and responses that best matched the proposed possibilities. During the questionnaire data collection step, the researcher visited all of the indicated schools and delivered questionnaires to all of the Mathematics Grade 10 students. In the classrooms, learners completed questionnaires in under an hour. Learners were invited to share their knowledge on how they study Mathematics in terms of techniques and activities via surveys. In the questionnaire, participants were also requested to provide biographical information. The purpose of including the later piece was to investigate if the factors that influenced the learners' classroom behavior might be linked to their educational experiences. The questionnaires were gathered and analyzed by a statistician.

4.5.2 Qualitative Data Collection

The research focused on gathering qualitative data. The qualitative technique in mixed-methods research fills in the information gaps by providing helpful information that strengthens and enriches the understanding of the quantitative data. Separate interviews with department directors, teachers, and a curriculum advisor were scheduled. Only semi-structured interviews were employed to acquire qualitative data in this study.

4.6 RESEARCH INSTRUMENTS

4.6.1. Semi-Structured Interview

An interview is a two–way dialogue in which the interviewer asks the participants questions in order to gather data and learn about their ideas, beliefs, perspectives, opinions, and behaviors (Creswell 2010:87). Face-to-face meetings with study respondents were used to collect relevant research data through interviews. The

interview methodology will provide participants with information on the target group, interview time, and study data use (Creswell et al., 2013: 54). Individual semi-structured interviews with nine teachers, three department heads, and two subject advisors were undertaken to obtain their perspectives on grade 10 learners' mathematics achievement. The focus was on current chances for learning Mathematics in schools and classrooms in order to study factors impacting learners' achievement in Mathematics, as well as how learners use such opportunities to develop viable solutions to learning obstacles. Semi-structured interviews were used in this study to learn how educators, HODs, and curriculum advisers prepare for teaching and whether the opportunities faced by students are related to the school's learning environment. Educators, HODs, and curriculum advisers frequently employ semi-structured interviews to convey their experiences and opinions regarding Mathematics education in greater depth.

The interviews took place at a convenient time for the participants, during school hours, and lasted about twenty to thirty minutes. The questions posed to these three groups differed because Mathematics teachers were in charge of designing and delivering lessons to their students in order for them to learn mathematical skills and concepts covered in the curriculum, while HODs were in charge of curriculum management. They are confronted with obstacles that prohibit them from making an informed decision. The curriculum advisor meets with the HODs at school to assess this effectiveness. He or she may be asked to review and recommend books, educational software, or other products.

4.6.2 Questionnaires

Quantitative data was gathered using the questionnaires. According to Creswell (2011:46), a questionnaire is a method of eliciting the feelings, beliefs, experiences, perceptions, and attitudes of the people being investigated. It's also a succinct set of questions to collect information that addresses the research topic, according to

Creswell. 270 grade 10 Mathematics students from ten schools were given questionnaires by the researcher. The purpose of this study's questionnaire was to gather data on the elements that influence how grade 10 students learn Mathematics. The open-ended questions for learners were about learners' experiences in studying Mathematics and techniques that can be used to take advantage of chances that may increase learners' progress in Mathematics grade 10.

4.6.3. Construction of Factors in the Theoretical Framework in the Instruments

The O-P model used surveys and interviews to collect data.

- **Questionnaires**

Propensity factors measured the variables that capture learners' prosperity for learning in terms of motivation, intelligence, and prerequisite knowledge through questionnaires. Distal factors measured the learners' family socio-economic status, while opportunity factors measured learner opportunities to learn Mathematics content at home and school (Zhao, 2011:9).

- **Interviews**

Teachers, heads of departments, and curriculum advisors were asked about their objectives for the classroom's mathematical ability to measure distal factors, opportunities, and inclination (Zhao, 2011:9). They had to think about the interviews in terms of what they wanted students to achieve by the conclusion of the school year. The combination of distal factors, which are variables that operate early in the learner's life and explain the emergence of opportunities and propensities, was used to predict mathematical achievement.

The framework in this study suggested that high achievement is the result of three types of factors: distal factors, opportunities, and propensity, and it also promoted the

process of integrative theory building in the field of academic achievement by combining these three factors.

4.7. MEASURES OF QUALITY CONTROL

4.7.1 Validity and Reliability of the study

The foundations of research are reliability and validity (Mery & Newby, 2011:1). Both qualitative and quantitative research are equally significant. Purposive sampling for qualitative methodology and stratified sample for quantitative methodologies were both options for increasing the study's validity. This was done in order to obtain the intended outcomes, which would address the research objectives and questions.

In this study, triangulation was utilized as another method of determining reliability and validity. There were three types of triangulation in the study: methodological, where qualitative and quantitative approaches were used, and theoretical, where the Opportunity-Propensity model was used. Data triangulation was also used, which included several types of data sources such as questionnaires and interviews, as well as a literature review. This section discusses the study's validity and reliability.

4.7.1.1 Validity of the study

Validity is defined as a research instrument that tests only what it is designed to test (Creswell, 2010:91). According to Creswell (2010:91), the accuracy of the outcomes reflects the concept of validity. The researcher's treatment of the instrument has an effect on its results. For reliable outcomes throughout the data-handling stage of the study, Haider, Chowdhury, and Holbrook (2020:1) believe that the researcher should treat the research gathering stage with the care it deserves. As a result, it is reasonable to say that validity is not a one-time occurrence that occurs as an afterthought, but rather pervades the entire study project until the finish.

Several research bodies, including the promotion team, the School and University Higher Degrees Committee, and the Limpopo Provincial Research Monitoring Unit, examined the research instruments. All of these organizations assessed and certified the instruments after determining that they were accurate and specific for their intended purposes, among other things.

4.7.1.2 Reliability of the study

In research, reliability is crucial; else, the entire effort would be deemed ineffectual. (Creswell, 2010:91) defines dependability as the capacity of research instruments to generate the same or substantially identical results when used on the same candidates at different times and under varied situations. Haider, Chowdhury, and Holbrook (2020:1) define dependability as one of the core features of a research instrument, then escalate it to the level of delicacy that the researcher should demonstrate throughout its implementation, from data collection to analysis. As a result, the researcher must avoid any undue influences that he or she is aware could affect the outcomes analysis. The researcher should stay out of the game during the study procedure.

To verify the instruments' reliability and identify the acceptable criteria for the researcher's objectivity, a pilot testing project was conducted with learners, teachers, departmental heads, and curriculum advisors in Mathematics who were not involved in the research. Whatever acts had the potential to influence the research were reduced or removed.

4.8 TRIANGULATION DATA

The purpose of this study was to look into major elements that influence grade 10 learners' achievement and to discover factors that serve as chances for learning Mathematics and how students use those opportunities to find answers to the obstacles of studying Mathematics. The different approaches of the parallel-

convergent mixed-methods study design, as well as the various modes of data collection and analysis, were utilized by the researcher (Cohen et al., 2013:24). This study used three types of triangulation: methodological, theoretical, and data triangulation. The data collection and analysis phases were limited to a specified approach for independent interpretations and explanations, and the results from the four secondary schools were discussed.

The goal of this design was to confirm the findings of diverse approaches by bringing different perspectives together. The studies' themes and/or categories were grouped together in order to embrace the most common and remove the others.

The advantages of triangulation, which include arresting the bias and weaknesses of one instrument, complementing the instruments, providing more comprehensive data results, and so on, led to the use of various instruments representing qualitative and quantitative methodologies such as interviews and questionnaires. Two techniques, qualitative and quantitative, were also used, as mentioned in the previous portions of the study. In the quantitative data collection, 270 grade 10 Mathematics students from nine secondary schools in the Vhembe West District's Nzhelele Central Circuit filled questionnaires, while the qualitative data collection included nine instructors, three heads of departments, and two curriculum advisers. During this stage, the researcher checked these students while they completed their questionnaires, allowing them to build mathematical concepts. She also met with instructors, department heads, and curriculum advisers for one-on-one interviews. The results of the two data sources were analyzed and interpreted individually before being combined for a comprehensive analysis and interpretation.

4.9 TRUSTWORTHINESS OF A RESEARCH STUDY

The goal of trustworthiness was to establish the validity of qualitative research. In this study, the qualitative method was used to conduct interviews. Data was collected from

various people involved in secondary school education, including heads of departments, instructors, and curriculum consultants, at various times and at various schools (Slootweg & Jupp, 2020:1). Credibility, transferability, dependability, and conformability are all aspects of trustworthiness, according to Pregoner, Opalla, and Palacio (2020:1).

4.9.1 Credibility

The research findings' credibility is brought into question (Carcary, 2020:56). The major role of the researcher is to convey the findings convincingly, which may involve making all raw collected data public as real evidence of the study. The findings of different instruments should be consistent, and any differences should be within a reasonable range; otherwise, the results will be called into question.

The extent to which the results approximate reality and are deemed to be accurate, trustworthy, and reasonable is defined by McMillan and Schumacher (2010:20). They clarify that when a researcher analyzes sources of errors that could compromise the quality of the research, findings, and conclusions, credibility is strengthened or enhanced. In other words, credibility determines if the results reflect reality and can be trusted. The use of peer debriefing will be used to make this study credible. Peer debriefing, according to Anney (2014:25), entails the researcher seeking advice from other experts, including members of the academic staff. According to Anney (2014), peer input will assist the researcher in improving the quality of their research. To get more information, the researcher will interview some of the participants. The researcher will next undertake follow-up visits to the participants to get clarification on the interview transcripts.

4.9.2 Transferability

Only if the research findings fit into other situations outside of the original study environment are they transferrable or generalisable. External validity, or the extent to which findings can be generalised, is related to transferability (Carcary, 2020:56). To

ensure transferability, rich data was acquired through interviews. This should allow other researchers to replicate the procedure used in this study.

Transferability, according to Anney (2014:278), relates to the extent to which qualitative research findings can be implemented in multiple situations with different respondents. According to (Anney 2014:278), the researcher facilitates transferability by providing a clear description of how the investigation and participants were purposefully selected. Because it described why it had to be done and how the participants were recruited, this study fostered transferability. The researcher produced a report that included everything from data collecting to the study's background and final report writing.

A detailed description aids other researchers in replicating (repeating) the study in different settings under similar conditions (Anney 2014:278). Transferability can also be substantially helped when participants are carefully picked, as previously stated in this section. Purposive sampling is the process of selecting units (e.g., individuals) for specific purposes related to a researcher's research questions (Carcary, 2020:56). Transferability was aided by the use of purposive sampling in this study.

4.9.3 Dependability

Dependability is comparable to reliability in that it refers to the consistency with which the same discovery is observed under similar conditions. It refers to the amount to which research findings were duplicated with similar people in a similar situation, according to Carcary (2020:56). It emphasizes the significance of the researcher accounting for or articulating the shifting contexts and conditions that are critical to the research's consistency. To ensure research dependability, field study evidence in the form of research instruments was used to establish results, conclusions, and recommendations. This study's dependability was ensured by describing any altering contexts and circumstances during the study's duration. Dependability, according to Anney (2014:278), relates to a finding's constancy across time. Participants assess

the study's findings, interpretations, and recommendations for dependability to ensure that they are all supported by data obtained from the study's informants. The findings and recommendations were shared with the selected schools' teachers, HODs, and curriculum advisors. They had to look over the report to see if it was based on the data they had provided.

4.9.4 Confirmability

Confirmability, the final construct, captures the classical concept of objectivity. Denzin and Lincoln (2011:20) emphasize the importance of asking participants if they could confirm the study's findings. By doing so, they shift evaluation away from the researcher's natural trait of objectivity and focus it directly on the facts. Participants were given the documented data to check and recheck if the data represented their views throughout the study to ensure confirmability.

Confirmability, according to Anney (2014:278), is the degree to which an investigation's conclusions can be verified by other researchers. Confirmability is focused with establishing whether the data and interpretation of the findings are obtained from the data rather than the researcher's imagination. In qualitative research, confirmability is obtained by a reflective journal and triangulation (Denzin & Lincoln, 2011:20). A reflexive journal, according to Anney (2014:278), is a collection of records kept by a researcher to reflect on tentatively interpreting and planning data collecting. Data, investigator, theoretical, and methodological triangulation are the four types of triangulation identified by Denzin and Lincoln (2011:20). Data triangulation is defined as the collecting of data utilizing several sampling procedures at various times and in social circumstances, as well as on a broad group of people. Data was collected at multiple periods and with different questionnaires in this study, resulting in data triangulation. In conclusion, confirmability ensures that the study's findings are based on participant responses rather than the researcher's preferences and opinions. The inclusion of certain learners' remarks in the conclusions boosted the study's credibility. Because data was collected over time and through questionnaires, the study's findings were reliable and trustworthy.

4.10. ETHICAL CONSIDERATIONS

Ethical considerations, according to Saunders and Thornhill (2012:1), are moral principles that guide researchers in conducting and reporting research without dishonesty or the intention of harming study participants or society, whether intentionally or unintentionally. To ensure the validity of your findings, it is critical to follow ethical principles when conducting and reporting research (Thakhathi, 2018:1). Before beginning the study, the researcher double-checked that it followed the University's research protocols. Permission to conduct the research was also sought from the Limpopo Provincial Education Department's Head, which was granted. The Vhembe West district's District Director, the Nzhelele Central circuit's Circuit Manager, and the principals and heads of departments were also sought for permission, as well as informed consent from the educators and responses. They were told that whatever information they gave to the researcher would be kept absolutely private, and they tried to stick to the deadlines set for the study's findings to be used as soon as possible. All of the data collection processes were given to them so that they would know ahead of time that this would not interfere with their routine teaching and learning activities.

According to Kumar (2015:212), collecting information without the knowledge of participants and their expressed willingness and informed consent is unethical in every discipline. Consent must also be given voluntarily and without undue pressure. To ensure anonymity, I assured the participants that their identities would not be shared with anyone, not even the Department of Education. By providing a written form to sign and authorize informed consent, the principle of confidentiality was strictly followed. I told them that participation in the study was completely optional, and that they could leave at any time. Those who agreed to participate in this study did so voluntarily. To protect the participants' identities, the study did not mention the location or their names.

4.11. DATA ANALYSIS

This section covers both quantitative and qualitative data analysis.

Data analysis is the process of condensing a large amount of information into a manageable story and then interpreting it to draw conclusions by creating summaries, looking for patterns, and running statistical analyses (Tavakoli, 2012:144). This is understandable because data analysis aids in the reduction of enormous amounts of data into smaller components.

4.11.1. Quantitative Data Analysis

The Statistical Package for Social Sciences was used to analyze the data from the questionnaires (SPSS). Descriptive statistics were used to analyze the data. The mean, percentage, and standard deviation were determined in descriptive analytical statistics to determine the difference in learners' mathematics achievement. The data was presented using frequency distribution tables, and statistical measurements such as percentages were used to understand it. The services of a statistician were requested for the quantitative data analysis in this investigation. The Statistical Package for Social Sciences (SPSS) version 21 was used to code, count, and analyze the data collected. The statistician found it straightforward to convert the data into numerous cases because the researcher identified and categorize variables. Descriptive statistics were produced and presented in the form of tables and graphs to simplify the data. The statistical data included information such as frequencies and percentages, which aided in the comparison and differentiation of the obtained data.

4.11.2. Qualitative Data Analysis

The interviews' raw data was digitally recorded and transcribed for analysis. Then, utilizing content analysis by item or comparable set of items, the data was analyzed thematically (Morse, 2012:199). Qualitative content analysis is a research method for subjective interpretation of text data that involves a systematic classification process of coding and identifying themes or patterns (Shah, Abdeljawad, Mahariq & Jarad,

2020:1). A data code is a label that represents a theme or pattern in the data. Category names might be derived from the researchers' existing conceptual pool or from technical literature from their disciplinary and professional reading (Morse, 2012:199). When pre-determined codes were used in interview content analysis, this is referred to as guided content analysis (Morse, 2012:199)

The analysis technique in this study was based on the research question: What possibilities exist for learners in Nzhelele Central Circuit to improve their mathematics achievement?

In the surveys and interviews, the following areas of learner achievement in Mathematics were identified:

- The factors that influence learners' mathematics achievement.
- The opportunities that exist in schools to enhance mathematics learning.
- The strategies that can be used to enable learners to take advantage of opportunities to improve their mathematics achievement.

4.12. CONCLUSION

The study took place in the Nzhelele Central Circuit, with a focus on grade 10 mathematics in nine secondary schools.

The research paradigm that underpins the study is introduced in the first section of the chapter. This study focuses on pragmatism, which is the belief that reality can only be grasped by experience and observation (Terrell, 2012:254). I also covered the study's research technique and data collection procedures in this chapter. Because it is a method that requires discussion with participants as a source of knowledge, the mixed methods approach was appropriate for this study (Guba & Lincoln, 2011:20)

Questionnaires and semi-structured interviews were used to gather information. Data was gathered using quantitative and qualitative methods. To ensure reliability,

quantitative results could be reorganized or replenished using qualitative methods (Terrell, 2012:254).

The population, sample, and sampling procedures are described in the remainder of the chapter. The convenience sampling method was appropriate for this study since it supplied the needed information on learner knowledge achievement. To collect data from various sources, various data collection instruments were used, and various analytical tools were used to analyze different sets of data. Finally, I discussed the methods for ensuring the findings' validity and reliability, as well as the use of the pilot study, trustworthiness, and ethical considerations in this study.

The data from the surveys and interviews are analyzed in the following chapter.

CHAPTER 5

5.1 INTRODUCTION

The findings of the study are presented in this chapter, which were gathered from a variety of participants, including grade 10 students, curriculum advisors, department heads, and teachers. The goal of this study is to look into the important elements that influence grade 10 learners' achievement, as well as to discover factors that serve as opportunities for learning Mathematics and how students use those opportunities to find answers to the obstacles of learning Mathematics.

The findings of this investigation are presented, followed by a discussion. In a multiple method approach, the study used both qualitative and quantitative approaches, and the data was presented based on the methods used in data collecting and analysis. The statistical package for social sciences (SPSS) Version 22 was used to analyze quantitative data, which reflects the responses as summarized by the statistician based on the participants' responses to the questionnaire. Figures and tables were used to present the findings. The qualitative data, on the other hand, was presented as it was recorded during the participants' interviews. The latter is analyzed thematically based on the patterns shown by the participants' responses.

The findings will be presented in the following order, driven by the study questions listed below.

The study was guided by three research questions:

- What factors influence grade 10 mathematics learning in Nzhelele Central Circuit?

• What elements contribute to students learning grade 10 mathematics at Nzhelele Central Circuit schools?

• What tactics can be employed to help students take advantage of Mathematics learning opportunities?

5.2. PRESENTATION OF QUANTITATIVE DATA

Questionnaires were used to acquire quantitative data. According to the three study questions outlined above, the findings were presented and discussed.

Quantitative

The questionnaire, which was given to 270 grade 10 Mathematics students in nine schools in the Nzhelele Central Circuit, was analyzed using quantitative methods. The questionnaire was created to answer three research questions and provide insight into the learners' achievement and preferred learning style. There were three sections to the questionnaire. The first section dealt with biographical data. Section B looked at the elements that influence learners' mathematics performance in grade 10. Section C focused on tactics that could be employed to take advantage of chances that could help students improve their mathematics skills. A Likert scale was used to create sections A, B, and C. "An individual must react to a series of assertions by stating whether he or she strongly agrees, agrees, disagrees, or strongly disagrees," according to a Likert-type scale. The questionnaire's five-point Likert scale was divided into five columns with the headings "Strongly agree," "agree," "disagree," "strongly disagree," and "nonresponse," and it asked about accomplishment preferences, study techniques, and how learners felt they could enhance their comprehension of Mathematics *(See Appendix A)*

SECTION A: BIOGRAPHICAL INFORMATION

DEMOGRAPHIC PROFILE OF LEARNERS

The demographic profile of the learner participants is presented in this section. Gender, age, number of years in each grade, number of periods per week, and instructor expectations for learner achievement in each period are all part of the demographic profile. The learners' data display is as follows:

5.2.1 Gender

This portion revealed that 148 (54.8 %) of the 270 learners that answered to the questionnaire were females, whereas 122 (45.2 %) were males. The data also shows that girls completed the questionnaires in greater numbers than males. This indicates that women appear to be more interested in mathematics than men.

5.2.2 Age Group

The statistics revealed that (211) 78.1 % of the respondents were between the ages of 15 and 17, with 52 (19.3%) of the respondents being between the ages of 18 and 20. Only 1 (0.4%) of the respondents were between the ages of 24 and 26, while 05 (1.9%) were between the ages of 21 and 23. The majority of the respondents began elementary school at a normal age, as seen by their age distribution. This indicates that this is the standard age for secondary school students (Department of Education, 2007:8).

5.2.3 Textbook and other teaching materials

This part revealed that 172 (63.7%) of respondents said they obtained instructional materials from the government, while 92 (34.1%) said they got them from parents, and 14% said they got them from the community. This means that the government provided textbooks and other teaching materials to the majority of the students.

5.2.4 Number of years per grade

According to the data, 257 (95.5%) of the respondents were in grade 10 for the first time, while 11 (4.1%) were repeating the grade. Only two people (0.7 percent) said

they repeated grade 10 three times. This shows that the majority of students were in grade 9 the year before.

5.2.5 Number of Periods per week

There are nine periods per week, according to all students. This means that students in grades 10 through 12 have nine mathematics classes per week.

5.2.6 Teacher expectation for learner achievement in each period

The findings revealed that 167 (61.9%) of respondents had high instructor expectations for learner achievement in each period, whereas 89 (33.3%) had moderate expectations and 6 (2.2%) had termly expectations; 8 (3.0%) did not respond to the surveys. The majority of the professors had high expectations for each time.

SECTION B: FACTORS INFLUENCING LEARNER'S ACHIEVEMENT IN GRADE 10 MATHEMATICS

DISTAL FACTORS

5.2.7 Lack of Parental Involvement in the Education of their Learners.

Table 5.1 reveals that 67 (24.8%) of respondents highly agreed that learners' lack of parental participation creates difficulty in Mathematics, while 111 (41.1%) agreed; the table also shows that 62 (23.3%) disagreed and 30 (11.1%) strongly disagreed. This suggests that having parents assist students with homework difficulties improves their mathematics performance. Parents can help their children succeed by taking an interest in their schooling and encouraging them to succeed. Parents can assist their children by ensuring that they complete their homework, offering appropriate books, complimenting good teachers and challenging poor ones, and ensuring that their children do not disturb school lessons. These findings corroborated Enu's (2015:68)

conclusions that families with socially, educationally, and economically advantaged parents nurture high levels of achievement in their children's learning.

Table 5.7 Parental involvement

	Frequency	Percent
Strongly Agree	67	24.8
Agree	111	41.1
Disagree	62	23.0
Strongly Disagree	30	11.1
Total	270	100.0

Source: Questionnaires

5.2.8. Home environment and resources contribute to learner achievement.

Table 5.8 shows that 95 (35.2 %) of respondents strongly agreed that access to the internet and other resources from home should help students do better in mathematics, while 120 (44.4 %) of respondents agreed. According to the table, 32 (11.9 %) of respondents disagreed, while 19 (7.0 %) strongly disagreed and 4 (1.5 %) did not respond. The results show that the majority of respondents believe that having internet access and other resources at home is beneficial. Students' limited access to computers limits their learning ability in mathematics. Learners' mathematics grades in all schools are influenced by their home environment, and they learn everything from their family members and social behaviours. The learner's background in terms of the availability of educational materials at home, such as books, electronic resources such as a television, computer, study desk, and table for their use, and general academic support at home, is critical to their success in Mathematics (Machaba, 2013:38).

Table 5.8: Access to Internet and other resources at Home Environment

	Frequency	Percent
Strongly Agree	95	35.2
Agree	120	44.4
Disagree	32	11.9
Strongly Disagree	19	7.0
Non-response	4	1.5
Total	270	100.0

Source: Questionnaires

5.2.9. Learners' Performance and Parents' Employment

Table 5.9 reveals that 34 (12.6 %) of respondents strongly agreed that unemployed parents' children perform better than employed parents' children; 67 (24.8 %) agreed; 98 (36.3 %) disagreed; 69 (25.6 %) strongly disagreed; and 2 (7%) did not respond. According to the comments, students who live with unemployed parents do not perform well in mathematics, making it impossible for them to pass because their parents do not support teaching and learning. Most of their children's education is good for those parents who have a high economic standing because there are many elements in their homes as much as possible. However, similar circumstances do not exist in a poor family.

Table 5.9: Level of Learners performance of Unemployed Parent and Learners of Employed parent

	Frequency	Percent
Strongly Agree	34	12.6
Agree	67	24.8
Disagree	98	36.3
Strongly Disagree	69	25.6
Non-response	2	.7
Total	270	100.0

Source: Questionnaires

5.2.10 Home Background Experiences Affects Learner's Achievement.

Table 5.10 shows that 70 (25.9%) of respondents strongly agreed with the assertion that home background experiences had an impact on learners' mathematics achievement, while 104 (38.5%) agreed. Furthermore, the table shows that 63 (23.3%) of respondents disagreed, with 30 (11.1%) strongly disagreeing. The results suggest that the home background environment, which includes infrastructures, furniture, resources, and physical structures, was unsuitable for learning and that there was no acceptable study location. Learners who have access to resources have an edge over those from low-income homes since they will be better educated about current events. As a result, they help them improve their mathematics grades at school, whereas students from low-income households who lack resources must still take the same test (Acharya, 2017:13).

Table 5.10: Home Background Experiences

	Frequency	Percent
Strongly Agree	70	25.9
Agree	104	38.5
Disagree	63	23.3
Strongly Disagree	30	11.1
Non-response	3	1.1
Total	270	100.0

Source: Questionnaires

5.2.11 Prior Knowledge of Mathematics Influences Good Performance.

According to Table 5.11, 141 (52.2 %) of respondents strongly agreed that prior knowledge of Mathematics is the most important factor in determining high performance, whereas 93 (34.4 %) agreed and 22 (8.1 %) strongly disagreed. In addition, 6 (2.2 %) disagreed, while just 8 (3.0 %) did not respond. This indicates that some students will grasp more if teachers begin with prior knowledge, allowing them to excel in mathematics. The degree of information that students have on the first day of school is the best predictor of knowledge increase throughout the course of an academic year (Byrnes, 2011:9). Existing knowledge in the mind of a student acts as a foundation for future learning.

Table 5.11: Prior knowledge is the key

		Frequency	Percent
Valid	Strongly Agree	141	52.2
	Agree	93	34.4
	Disagree	22	8.1
	Strongly Disagree	6	2.2
	Non-response	8	3.0
	Total	270	100.0

Source: Questionnaires

5.2.12 Learners who solve Mathematics problems at home achieve better.

Table 5.12 shows that 90 (33.3%) of respondents strongly agreed that students who tackle Mathematics problems at home receive higher results because their parents' guide them, whereas 130 (48.1%) agreed. In addition, the table shows that 36 (13.3%) strongly disagreed and (4.1%) 11) disagreed. According to the findings, the majority of respondents agreed that parental advice enhances learners' mathematics achievement.

Table 5.12: Parental Guidance to Solve Mathematics Problems

		Frequency	Percent
Valid	Strongly Agree	90	33.3
	Agree	130	48.1
	Disagree	36	13.3
	Strongly Disagree	11	4.1
	Non-response	3	1.1
	Total	270	100.0

Source: Questionnaires

5.2.13 Lack of Parental Support Contributes to Learners' Achievement.

According to Table 5.13, 40 (14.8 %) of respondents strongly agreed that a parent's lack of regular support of learners in Mathematics contributes to the learner's accomplishment, whereas 115 (42.6 %) agreed and 85 (31.5 %) disagreed. In addition, the table shows that 24 people (8.2%) strongly disagreed. Communication between the school and the parents is critical to student progress and achievement. Parents are more interested in school achievement because they are aware that their children's achievement in mathematics is determined by the school's development (Mosibudi, 2012:18)

Table 5.13: Lack of frequently support by parent

		Frequency	Percent
	Strongly Agree	40	14.8
	Agree	115	42.6
	Disagree	85	31.5

	Strongly Disagree	24	8.9
	Non response	6	2.2
	Total	270	100.0

Source: Questionnaires

5.2.14 Educated Parent Motivate their Learners to Perform Better Mathematics.

Table 5.14 shows that 116 (43.2%) of respondents highly agreed that parents encourage or inspire their children to do better in mathematics, while 111 (41.1%) agreed and 27 (10.0%) disagreed; just 14 (5.2%) severely disagreed. This response indicates that the majority of students feel that parents should support or drive their children to improve their mathematics skills.

Table 5.14: Educated Parent Motivation

		Frequency	Percent
Valid	Strongly Agree	116	43.0
	Agree	111	41.1
	Disagree	27	10.0
	Strongly Disagree	14	5.2
	Non-response	2	.7
	Total	270	100.0

Source: Questionnaires

5.2.15 Schools in Rural Areas Perform Better than Schools in the City.

Table 5.15 demonstrates that 22 (8.1%) of respondents strongly agreed that urban schools perform better in Mathematics than schools in the surrounding cities, whereas 60 (22.2%) agreed and 129 (47.8%) disagreed. Furthermore, according to the table,

57 (21.1%) of the respondents strongly disagreed. Several studies on student achievement have demonstrated that the level of academic performance in urban and rural locations differs in several circumstances. Learner success is an international issue that has been connected to the learners' low socioeconomic backgrounds. It has also been discovered that urban students outperform rural students (Rammala, 2009:1; Adell, 2002:91). Many participants disagree, contradicting the conclusions of the professors indicated before. The popularity of this question is shown in the number of people who participated in this study.

Table 5.15: Level of performance of schools in the city and schools in the rural area

		Frequency	Percent
Valid	Strongly Agree	22	8.1
	Agree	60	22.2
	Disagree	129	47.8
	Strongly Disagree	57	21.1
	Non-response	2	.7
	Total	270	100.0

Source: Questionnaires

SECTION C: PROPENSITY FACTORS

5.2.16 Learners' Attitudes Toward Mathematics Contribute to Achievement

Table 4.16 demonstrates that 77 (26.7%) strongly agreed that learners' attitude toward mathematics influences their achievement, whereas 91 (33.7%) agreed and 54 (20.0%) disagreed. In addition, the table shows that 47 (17.4%) strongly disagreed and 6 (2.2%) did not respond. The replies indicate that students have a negative attitude toward mathematics. Students' views about mathematics can have a positive

or negative impact on their confidence in the subject. An important and integral purpose of mathematics education is to foster a favorable attitude toward mathematics (Dhurumraj, 2013:18). Many students ignore Mathematics because they are afraid of it and lack self-confidence (Dhurumraj, 2013:18). This pessimistic attitude might lead to student underachievement and, as a result, inability to obtain the necessary marks for university admission.

Table 5.16: Attitude of Learners

	Frequency	Percent
Strongly Agree	72	26.7
Agree	91	33.7
Disagree	54	20.0
Strongly Disagree	47	17.4
No response	6	2.2
Total	270	100.0

Source: Questionnaires

5.2.17 Learners' Interests Contribute to their Achievement in Mathematics

Table 5.17 shows that 59 (58.9%) of the students strongly agreed that students learn more efficiently when they are engaged in what they are learning and achieve more when they appreciate what they have learned in Mathematics, while 81 (30.0%) agreed and 22 (8.1%) disagreed. The chart also shows that 5 (1.9 %) strongly disagreed with the question, while 3 (1.1 %) did not respond. The results suggest that learners' enthusiasm in mathematics can help them obtain better results. The assumption is that learners' enthusiasm for mathematics adds to their academic success. In general, students see mathematics as an important and valuable topic to acquire because it gives them with certain skills and backgrounds that are directly relevant to their future occupations. Learners learn more successfully when they are engaged in what they are learning, and they are more likely to achieve more if they

enjoy it. When students are motivated to learn mathematics, they devote more time to the subject and are more tenacious in their efforts to solve problems (Posamantier, 2017:1).

Table 5.17: Interest of Learners in Mathematics

	Frequency	Percent
Strongly Agree	159	58.9
Agree	81	30.0
Disagree	22	8.1
Strongly Disagree	5	1.9
No response	3	1.1
Total	270	100.0

Source: Questionnaires

5.2.18 Developing Positive Attitude, Motivation as Well as Proper Guidance Towards Mathematics Can Improve Achievement among Learners.

Table 5.18 shows that 130 (48.1%) strongly agreed that adopting a good attitude, motivation, and adequate direction toward Mathematics can help students attain higher levels of accomplishment, whereas 110 (40.7%) agreed and 16 (5.9%) disagreed. In addition, 7 (2.6 %) strongly disagreed and 7 (2.6 %) did not react, according to the table. According to the research, the majority of respondents felt that establishing an attitude and motivation can help students achieve better results. Higher scores are achieved by students who have greater ability in Mathematics. The effort students put into acquiring and practicing mathematical concepts and abilities is influenced by their attitude toward mathematics. Their levels of involvement, as well as emotional states that encourage or hinder their potential to be academically successful, have been closely connected to their competency and expectations for success in school (Wekesa, 2013:43).

Table 5.18: Developing Attitude and Motivation can improve achievement

		Frequency	Percent
	Strongly Agree	130	48.1
	Agree	110	40.7
	Disagree	16	5.9
	Strongly Disagree	7	2.6
	No response	7	2.6
	Total	270	100.0

Source: Questionnaires

5.2.19 Learners Should be Willing to Learn on their Own

According to Table 5.19, 92 (34.1%) of learners strongly agreed that learners should be willing to learn independently, whereas 108 (40%) agreed and 39 (14.4%) disagreed. In addition, the chart shows that 24 (8.9%) strongly disagreed and 7 (2.6%) did not respond. This result indicates that the majority of students believe that learning on their own enhances mathematics proficiency. The school should encourage them to learn on their own. This willingness on the side of the students aids in the magnification of numbers and their significance in one's Mathematics accomplishment. Because of numbers, Wekesa (2013:43) claims that numbers cannot be viewed as separate things in a mathematical function. Mathematics instruction, when done correctly, needs students to pay particular attention to each issue, attempting to amplify them each time a new topic is addressed, as well as their meanings and applicability in that context.

Table 5.19 Learners Willing to Learn on their Own

		Frequency	Percent
Valid	Strongly Agree	92	34.1
	Agree	108	40.0
	Disagree	39	14.4
	Strongly Disagree	24	8.9
	No response	7	2.6
	Total	270	100.0

Source: Questionnaires

5.2.20. Interest of Learners in Mathematics Improve Learner Achievement

Table 5.20 shows that 124 (45.9%) of the students strongly agreed that interest in Mathematics enhances student progress, with 113 (41.9%) agreeing and 14 (5.2%) disagreeing. In addition, the data shows that 9 (33.3%) strongly disagreed, while 10 (3.7%) did not respond. The responses suggest that learners' motivation increases their performance. The implication is that learners' enthusiasm for mathematics adds to their success in the subject. In general, students see mathematics as an important and valuable topic to acquire because it gives them with certain skills and backgrounds that are directly relevant to their future occupations (Fagnant, 2005:355).

Table 5.20 Interest in Mathematics

		Frequency	Percent
Valid	Strongly Agree	124	45.9
	Agree	113	41.9
	Disagree	14	5.2
	Strongly Disagree	9	3.3
	No response	10	3.7
	Total	270	100.0

Source: Questionnaires

5.2.21 Positive Expectation in Mathematics is to Influence Achievement.

Positive expectancy in Mathematics is an important component that influences accomplishment, according to Table 5.21, with 86 (31.9%) of learners strongly agreeing and 140 (51.9%) agreeing. In addition, 23 (8.5 percent) disagreed, 9 (3.3 percent) strongly disagreed, and 12 (4.4 percent) did not react, according to the table. If students have high expectations in mathematics, the problem of low student accomplishment will become obsolete because student achievement will improve. This means that teachers should provide assistance to students in solving problems in certain areas of mathematics.

Table 5.21 Positive Expectation in Mathematics

		Frequency	Percent
	Strongly Agree	86	31.9
	Agree	140	51.9
	Disagree	23	8.5
	Strongly Disagree	9	3.3
	No response	12	4.4
	Total	270	100.0

Source: Questionnaires

5.2.22 Enjoyment During Mathematics Periods Improves Achievement.

Table 5.22 shows that 144 (53.3%) of the learners strongly agreed that teaching and learning Mathematics is enjoyable, whereas 99 (36.1%) agreed. Furthermore, 15 (5.6 percent) disagreed, 5 (1.9 %) strongly disagreed, and 7 (2.6%) did not respond, according to the table. According to the findings, the majority of respondent's love teaching and learning mathematics. Learners who appreciate and are proficient in the topic outperform those who despise it. Learners who enjoy themselves while studying Mathematics receive better results.

Table 5.22: Enjoyment of Teaching and learning Mathematics

		Frequency	Percent
	Strongly Agree	144	53.3
	Agree	99	36.7
	Disagree	15	5.6
	Strongly Disagree	5	1.9
	No response	7	2.6
	Total	270	100.0

Source: Questionnaires

5.2.23 Spending More Time on Section Assists Learners Master it

Table 5.23 shows that 100 (37.0%) of learners strongly agreed that spending additional time on the work will help them grasp some portions of mathematics, while 124 (45.9%) agreed. In addition, 32 (11.9 %) disagreed, while 7 (2.6 %) strongly disagreed and 7 (2.6 5) did not react, according to the table. According to the findings, the majority of students believed that spending more time on projects would help them

obtain better results. Learners recommended that devoting more time to activities and investing enough time in relevant education can help them grasp academic skills. Teachers should schedule adequate time to teach challenging areas early in the year so that students can grasp the material and practice problem-solving skills. This means that when students practice tough topics, they will be able to acquire information quickly (Anderson, 2013:13).

Table 5.23 Spending more time to Master Sections

	Frequency	Percent
Strongly Agree	100	37.0
Agree	124	45.9
Disagree	32	11.9
Strongly Disagree	7	2.6
No response	7	2.6
Total	270	100.0

Source: Questionnaires

OPPORTUNITY FACTORS

5.2.23 Teacher Attitude towards Mathematics and Learners' Achievement.

Table 5.3 demonstrates that 97 (35.9%) of the students strongly agreed that instructor attitude toward Mathematics influences student accomplishment, whereas 123 (45.6%) agreed and 31 (11.5%) disagreed. In addition, the table shows that 14 (5.2%) strongly disagreed and 5% (1.9%) did not respond. This suggests that teachers have a positive attitude toward mathematics. The teachers' conceptual content and schemes, as well as their system of ideas about Mathematics and its teaching and learning, all influence their approach to teaching mathematics. Teachers' level of reflection is determined by the social context of their teaching position, notably the limits and opportunities (Wekesa, 2013:43).

Table 5.23 Attitude of teachers towards Mathematics

	Frequency	Percent
Strongly Agree	97	35.9
Agree	123	45.6
Disagree	31	11.5
Strongly Disagree	14	5.2
No response	5	1.9
Total	270	100.0

Source: Questionnaires

5.2.24 Inadequately Qualified Mathematics Teachers and Subject Difficulty

Table 5.24 shows that 63 (23.3 %) of learners strongly agreed that insufficiently qualified Mathematics teachers cause students to struggle in the subject; 121 (44.8 %) agreed, 65 (24.1 %) disagreed, 14 (5.2%) strongly disagreed, and 7 (2.6 %) did not respond. This result implies that the most relevant determinants in learners' achievement are insufficiently qualified teachers. Miles (2011:643) found that in developing nations, unqualified teachers increase the chance of learner dropout. Underqualified instructors in developing nations are unable to unlock learners' talents and support academic accomplishment in a range of knowledge domains, particularly teachers' topic knowledge, pedagogical content knowledge, and instructional experiences, according to Miles (2011:643).

Table 2.24: Inadequate qualified teachers

	Frequency	Percent
Strongly Agree	63	23.3
Agree	121	44.8
Disagree	65	24.1

	Strongly Disagree	14	5.2
	No response	7	2.6
	Total	270	100.0

Source: Questionnaires

5.2.25 Inappropriate Teaching Methods and Learners' Performance

Table 5.25 shows that 100 (37.0 %) of learners strongly agreed that teachers using inappropriate or poor methods in teaching Mathematics results in poor student performance, while 38.1 (103 %) of learners agreed and 43 (15.9%) disagreed; the table also shows 22 (8.1 %) strongly disagreed and 2 (0.7 %) not responding. This remark implies that if the proper approaches were not employed in the classroom, learners' performance would suffer. This has an impact on how well students perform in their exams. In Mathematics, students must be able to calculate, simplify, and solve geometrical ideas. Similar findings were made by Alidino (2015:13), who performed a survey in 2011 and discovered that the majority of Mathematics teachers (72 percent) still used expository teaching approaches. Only 28% of the lessons could be classed as learner-cantered.

Table 5.25 Use of Inappropriate or poor methods of teaching

		Frequency	**Percent**
	Strongly Agree	100	37.0
	Agree	103	38.1
	Disagree	43	15.9
	Strongly Disagree	22	8.1
	No response	2	0.7
	Total	270	100.0

Source: Questionnaires

5.2.26 Extra Support by Teachers Affects Learner Achievement

Table 5:26 reveals that 126 (46.7%) of the students strongly agreed that extra teacher support affects student progress in Mathematics, with 89 (33.3%) agreeing and 23 (8.5%) disagreeing. In addition, the chart shows that 26 (9.6%) strongly disagreed, while 6 (2.2 %) did not respond. According to the findings, the majority of students agree that more teacher assistance improves their performance. Extra help protects and offers learners with the opportunity to review and change their preconceptions about how certain portions should be taught, as well as how they attempted various techniques to solve problems (Khan, 2012:109).

Table 5.26: Extra Support from the teacher

		Frequency	Percent
	Strongly Agree	126	46.7
	Agree	89	33.0
	Disagree	23	8.5
	Strongly Disagree	26	9.6
	No response	6	2.2
	Total	270	100.0

Source: Questionnaires

5.2.27 Teacher Behaviour and Learners' Achievement

Table 5. 27 shows that 38.9 (105%) of learners strongly agreed that teacher behaviour has a major impact on student accomplishment, with 109 (40.4%) agreeing and 35 (14.0%) disagreeing. In addition, 17 (6.3 %) strongly disagreed and 4 (1.5 %) did not react, according to the table. This shows that the teacher's attitude toward mathematics is excellent. Teachers are in charge of the types of learning and experiences that students can have on a daily basis, as well as the establishment of educational goals and overall personality development. According to Anderson (2013:13), the teacher's mathematics knowledge had a very significant link with

learner achievement. On the Mathematics achievement test, teachers who were frequently absent or did not teach obtained some of the lowest marks. Thus, strengthening teachers' mathematical expertise, commitment to the profession, and continuous engagement in professional development might improve mathematics achievement (Anderson, 2013:13).

Table 5.27 Teacher Behaviour Plays a Significance Role

	Frequency	Percent
Strongly Agree	105	38.9
Agree	109	40.4
Disagree	35	13.0
Strongly Disagree	17	6.3
No response	4	1.5
Total	270	100.0

Source: Questionnaires

5.2.28 Primary School Foundation of Learners in Mathematics

According to Table 5.28, 57 (21.1%) of learners strongly agreed that the foundation of learners in Mathematics in elementary schools had an impact on learner accomplishment, whereas 114 (42.2%) agreed and 72 (26.7%) disagreed. The data also shows that 20 people (7.4%) strongly disagreed, while 7 people (2.6%) disagreed. The replies suggest that the students had a weak foundation in mathematics in primary school and so were unable to solve issues even when given identical examples. Learners struggle with the deductive approach in the FET phase due to a lack of basis in lower classes. Wang's (2013: 259) observation that a very young learner begins with fundamental Mathematics competency and evolves to more complicated mathematical skills through time is similar to learners' replies. This is especially true in primary school, when learners' mathematical abilities advance from recognizing

small groups of items to counting the number of objects in the wrong order and eventually developing early arithmetic skills.

Table 5.28 Mathematics Foundation in Primary Affects Learners Achievement

	Frequency	Percent
Strongly Agree	57	21.1
Agree	114	42.2
Disagree	72	26.7
Strongly Disagree	20	7.4
No response	7	2.6
Total	270	100.0

Source: Questionnaires

5.2.29 Learning and Teaching Media in Mathematics and Achievement

According to Table 5.29, 95 (35.2%) of learners strongly agreed that learning and teaching media make teaching and learning of Mathematics simple, while 115 (42.6%) agreed and 40 (14.8%) disagreed. In addition, the chart shows that 15 (5.6%) strongly disagreed, while 5 (1.9%) did not respond. This reaction implies that learners' mathematics performance will improve if learning and teaching are done through media. Teaching and learning cannot take place through learning channels or the internet if school infrastructure is insufficient to the point where certain classrooms are without electricity.

Table 5.29 Learning and Teaching Media Make Teaching and Learning Mathematics easy

	Frequency	Percent

Valid	Strongly Agree	95	35.2
	Agree	115	42.6
	Disagree	40	14.8
	Strongly Disagree	15	5.6
	No response	5	1.9
	Total	270	100.0

Source: Questionnaires

5.2.30 Language in Learning Mathematics and Learners' Achievement

According to Table 5.30, 56 (20.7%) of the learners highly agreed that language problems in studying Mathematics contribute to learners' accomplishment; 120 (44.4%) agreed, 64 (23.7%) disagreed, 27 (10.0%) severely disagreed, and 3 (1.1%) did not respond. The results suggest that language is a hindrance to learners' success in mathematics. Language is a primary learning medium used in Mathematics classrooms for communicative and epistemic goals, so it's critical that language become a learning goal as well (Prediger, 2019:11).

Table 5.30 Language Problem in Learning Mathematics

		Frequency	Percent
	Strongly Agree	56	20.7
	Agree	120	44.4
	Disagree	64	23.7
	Strongly Disagree	27	10.0
	No response	3	1.1
	Total	270	100.0

Source: Questionnaires

5.2.31 Overcrowded Classes Causes Difficulties in Mathematics

Table 5.31 shows that 76 (28.1%) strongly agreed that overcrowding hinders learners' progress in Mathematics, whereas 86 (31.9%) agreed and 77 (28.5%) disagreed. In addition, 29 (10.7 %) strongly disagreed and 2 (7 %) did not react, according to the table. The implication is that overcrowding in Mathematics classes lowers student achievement. In secondary schools, larger classes have a negative impact on learners' academic ability in mathematics. Teaching in overcrowded classrooms poses a significant challenge in terms of generating productive learning settings in which excellent teaching and evaluation strategies are critical (Imtiaz, 2014:251).

Table 5.31 Overcrowded classes

	Frequency	Percent
Strongly Agree	76	28.1
Agree	86	31.9
Disagree	77	28.5
Strongly Disagree	29	10.7
No response	2	.7
Total	270	100.0

Source: Questionnaires

SECTION C: STRATEGIES THAT COULD BE ADOPTED TO UTILISE OPPORTUNITIES THAT MAY IMPROVE LEARNERS' ACHIEVEMENT IN MATHEMATICS

5.2.32 Appropriate Teaching Methods Improves Achievement

Table 5.32 reveals that 107 (36.6%) of learners strongly agreed that utilizing proper ways of teaching Mathematics (learner-centered approaches) can improve learners'

accomplishment, whereas 141 (52.2%) agreed and 17 (6.3%) disagreed. In addition, the table shows that 2 (0.7%) strongly disagreed and 3 (1.1%) did not respond. The replies suggest that proper strategies, such as a learner-cantered approach, can increase mathematics achievement. Effective Mathematics approaches in the classroom are required to improve all kids' mathematics achievement. Effective teaching and learning occurs when students actively participate in classroom activities (Machaba, 2013:38).

Table 5.32: Using appropriate methods of teaching Mathematics

	Frequency	Percent
Strongly Agree	**107**	**39.6**
Agree	**141**	**52.2**
Disagree	**17**	**6.3**
Strongly Disagree	**2**	**0.7**
No response	**3**	**1.1**
Total	**270**	**100.0**

Source: Questionnaires

5.2.33 Proper Supervision by Departmental Officials

According to Table 5.34, 97 (35.9%) of the learners strongly agreed that effective supervision and inspection by departmental authorities can help improve the performance of both teachers and learners in Mathematics, while 136 (50.4%) agreed and 29 (10.7%) disagreed. In addition, the chart shows that 5 (1.9 percent) strongly disagreed, while 3 (1.1%) did not respond. Learners contends that if effective monitoring and inspection by departmental authorities are implemented, the problem

of low learner achievement would be obsolete because student mathematics achievement will improve. This means that teachers should help students in addressing mathematical difficulties. Killer's (2000:206) findings reinforce the learners' response by stating that schools cannot function without the assistance of District Offices and professionals. Some folks should be able to aid you with references. When general educators and support teams are unable to assist learners, who are having difficulty learning, they should send them to experts who will use their experience to offer the learners with the help they require.

Table 5.34: Proper supervision and inspection by departmental officials

	Frequency	Percent
Strongly Agree	**97**	**35.9**
Agree	**136**	**50.4**
Disagree	**29**	**10.7**
Strongly Disagree	**5**	**1.9**
No response	**3**	**1.1**
Total	**270**	**100.0**

Source: Questionnaires

5.2.35 Frequent Helpful Feedback can Improve Learner Achievement

Table 5.35 shows that 109 (40.4%) of the students strongly agreed with the assertion that frequent feedback can boost student progress, while 133 (49.3%) agreed and 20 (7.4%) disagreed. In addition, 5 (1.9 percent) of the students strongly disagreed, while 3 (1.1 percent) did not respond. The findings suggest that receiving comments from a teacher after analyzing their work enhances mathematics achievement. Effective assessment procedures are critical for improving Mathematics instruction and achieving higher academic success. The best way to prepare students for the

demands of mathematics performance is to provide them with feedback (Khan, 2012:109). Teaching has evolved into a more comprehensive, diverse, and complex phenomena in which the roles of educators and students have shifted. In the new teaching-learning paradigm, teaching entails preparing students for a future in which they will be confronted with a more complex scenario that will force them to think differently in order to keep up with change.

Table 5.35 Helpful Feedback should be Provided

	Frequency	Percent
Strongly Agree	**109**	**40.4**
Agree	**133**	**49.3**
Disagree	**20**	**7.4**
Strongly Disagree	**5**	**1.9**
No response	**3**	**1.1**
Total	**270**	**100.0**

Source: Questionnaires

5.2.36 Adequate and Relevant Mathematics Materials (LTSM)

According to Table 5.36, 79 (29.3%) of learners strongly agreed that providing suitable and relevant Mathematics materials can increase learners' achievement in the subject, whereas 137 (50.7%) agreed. In addition, the chart shows that 32 (11.9 %) disagreed, 14 (5.2 %) strongly disagreed, and 8 (3%) did not respond. This response implies that if the department offers learners with enough materials, they will be able to grasp mathematical ideas and improve their performance. The availability, provision, and usage of teaching and learning materials all contribute to higher academic achievement by improving teaching quality. Academic attainment is enhanced by the availability, provision, and usage of teaching and learning materials. Enu (2015:68) finds a correlation between using suggested textbooks and academic success. In a

comprehensive assessment of activity-based learning in Mathematics in secondary schools through grade eight, Enu (2015:68) indicates that using manipulative materials promotes more accomplishment than not using them.

Table 5.36: Provision of adequate and relevant Mathematics materials

	Frequency	Percent
Strongly Agree	**79**	**29.3**
Agree	**137**	**50.7**
Disagree	**32**	**11.9**
Strongly Disagree	**14**	**5.2**
No response	**8**	**3.0**
Total	**270**	**100.0**

Source: Questionnaires

5.2.37 Conducive Learning Environment for Effective Learning

According to Table 5.37, 72 (26.7 %) of learners strongly agreed that the learning environment should be made favourable to successful teaching/learning, whereas 132 (48.9%) agreed and 56 (20.7 %) disagreed. In addition, the chart shows that 6 (2,2%) strongly disagreed and 4 (1,5%) did not respond. The findings suggest that a positive learning environment motivates students to flourish in mathematics. By creating a safe and consistent school environment, the detrimental impacts of a disorganized school environment can be mitigated. The alienation of the students can be alleviated by expressing genuine concern for them, involving them, and making the school their own.

Table 5.37 Teaching and Learning Environment should be conducive

	Frequency	Percent
Strongly Agree	**72**	**26.7**
Agree	**132**	**48.9**
Disagree	**56**	**20.7**
Strongly Disagree	**6**	**2.2**
No response	**4**	**1.5**
Total	**270**	**100.0**

Source: Questionnaires

5.2.38 Learners should be More Involved in Practical Work than Theory

Table 5.38 shows that 85 (31.5%) of the learners strongly agreed that practical work should be prioritized over theoretical work, whereas 120 (44.4 %) concurred. In addition, 50 (18.5 %) disagreed, 7 (2.6 %) strongly disagreed, and 8 (3.0 %) did not react, according to the table. According to the findings, the majority of students believed that practical work was more valuable than theoretical study. This indicates that doing actual work makes students more comfortable tackling mathematics difficulties. This comes from solving difficulties and applying them in everyday circumstances. This can help learners gain confidence in their ability to learn and apply practical work in a variety of situations.

Table 5.38 Involvement of learners in Practical Work

	Frequency	Percent
Strongly Agree	**85**	**31.5**
Agree	**120**	**44.4**
Disagree	**50**	**18.5**

	Strongly Disagree	**7**	**2.6**
	No response	**8**	**3.0**
	Total	**270**	**100.0**

Source: Questionnaires

5.2.39 The Necessary Learning Instructional Materials

Table 5.39 shows that 83 (30.7%) of learners strongly agreed that providing their students with the essential learning instructional materials improves their learners' Mathematics achievement, whereas 138 (51.1%) agreed and 30 (11.1%) disagreed. In addition, the table shows that 11 (4.1%) strongly disagreed, while 80 (3.0%) did not respond. According to the comments, the department should give the required materials to help students improve their mathematics skills. Parents should provide their children with complete support by purchasing the things they require to succeed. The outcomes of this study back up Enu's (2015:68) conclusion that long-term usage of instructional materials by teachers who are familiar with them increases student accomplishment and attitudes. Enu (2015:68) also claims that providing the necessary human and material resources goes a long way toward improving academic achievement, and that effective teaching and learning is heavily reliant on the competencies of its human resources as well as the material resources required for knowledge transmission.

5.39 Necessary Learning Instructional Material

		Frequency	**Percent**
	Strongly Agree	**83**	**30.7**
	Agree	**138**	**51.1**
	Disagree	**30**	**11.1**
	Strongly Disagree	**11**	**4.1**
	No response	**8**	**3.0**

Total	**270**	**100.0**

Source: Questionnaires

5.2.40 Group Work can Improve Learner's Achievement in Mathematics

Table 5.40 shows that 138 (51.1%) of learners strongly agreed that working in groups could help them get better results in Mathematics, whereas 107 (39.6%) agreed and 19 (7.0%) disagreed. In addition, the chart shows that 5 (1,9%) strongly disagreed and 1 (0.4%) did not respond. The findings suggest that when students work in groups, they understand more and achieve better results. Working in a group at school helps students build effective teamwork skills and improves their communication talents, which are important in cooperative learning environments. Many students said they preferred working in groups since group learning is one of the most essential and effective ways to improve student proficiency in mathematics. Learners can also improve their personal, social, and psychological skills. Mustafa et al. (2014:178) found that the learning environment should encourage learners' motivation to participate in group or individual learning activities, which is similar to the findings of this study. Classmates become more engaged and academic achievement improves when they are placed in classrooms with a limited number of students

Table 5.40 Working in groups can improve learner's achievement

		Frequency	Percent
	Strongly Agree	**138**	**51.1**
	Agree	**107**	**39.6**
	Disagree	**19**	**7.0**
	Strongly Disagree	**5**	**1.9**
	No response	**1**	**0.4**

Total	**270**	**100.0**

Source: Questionnaires

5.2.41 Good School-community Participation and Parental Involvement

Table 5.41 reveals that 128 (47.3%) of the students strongly agreed that effective school-community participation and active parental involvement in their children's education can help them improve their grades, whereas 108 (40.0%) agreed and 28 (10.4%) disagreed. 6 people (2.2 %) strongly disagreed, according to the data. According to the comments, good community participation and parental involvement can help students achieve better results. Tan and Laswad's (2006:23) findings, which identified the amount of duties to be done by the community through school governing bodies, are consistent with these findings. However, governing bodies influence a number of elements that influence student achievement in schools. The parents' financial origins, reading level, and distance traveled to school are all factors that influence parental participation in school governance, especially in rural areas. It has been established that overseas students, in particular, value the opinions of their parents and community when deciding on their preferred field of study.

Table 5.41 Community Participation

	Frequency	Percent
Strongly Agree	**128**	**47.4**
Agree	**108**	**40.0**
Disagree	**28**	**10.4**
Strongly Disagree	**6**	**2.2**
Total	**270**	**100.0**

Source: Questionnaires

5.2.41 Developing Positive Attitude, Motivation and Proper Guidance

Table 5.41 shows that 137 (50.7 %) of the students strongly agreed that establishing a positive attitude, enthusiasm, and correct direction toward Mathematics will increase public secondary school learners' achievement, whereas 99 (36.7%) agreed and 23

(8.5%) disagreed. In addition, the table shows that 10 (3.7%) strongly disagreed and 1 (0.4%) did not agree. This shows that the learners' attitude, enthusiasm, and guidance in mathematics are excellent. The teachers' mental content and schemes, particularly their system of beliefs about 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 process of reflection all influence their attitude toward teaching Mathematics (Tsanwani, 2009:21).

Table 5.41

	Frequency	Percent
Strongly Agree	**137**	**50.7**
Agree	**99**	**36.7**
Disagree	**23**	**8.5**
Strongly Disagree	**10**	**3.7**
Non-response	**1**	**0.4**
Total	**270**	**100.0**

Source: Questionnaires

5.2.42 Provision of Adequately Trained Mathematics Teachers

Table 5.42 reveals that 125 (46.3%) strongly agreed that providing skilled and appropriately trained Mathematics teachers can help students attain higher levels of accomplishment, whereas 110 (40.7%) agreed and 25 (9.3%) disagreed. In addition, the table shows that 7 (2.6%) strongly disagreed, while 3 (1.1%) did not respond. The data showed that the majority of people agreed with the statement. The replies suggest that teachers' knowledge, abilities, and competences have a direct impact on learners' understanding. Because the function of the teacher is not clearly defined, professional development courses for teachers are not adequately learned, and teachers are not properly equipped to support. Tsanwani's (2009:21) long debate on the problem of learners' attitudes toward mathematics is supported by the findings. The learners' attitude toward mathematics is one of the most essential variables in

growing their mathematical competence, according to Tsanwani (2009:21), who also argues that teachers' attitudes about Mathematics and its utility influence how they teach and how learners learn.

Table 5.42

	Frequency	Percent
Strongly Agree	**125**	**46.3**
Agree	**110**	**40.7**
Disagree	**25**	**9.3**
Strongly Disagree	**7**	**2.6**
Non-response	**3**	**1.1**
Total	**270**	**100.0**

Source: Questionnaires

5.2.43 Provision of Additional to Public Secondary School

Table 5.43 reveals that 151 (55.9%) of the students strongly agreed that providing additional facilities such as libraries and mathematics laboratories can help improve public secondary school learners' achievement in the subject, while 93 (34.4%) agreed and 19 (7.0%) disagreed. Six people (2.2 percent) strongly disagreed, according to the data. When students use additional resources such as libraries to learn Mathematics, they develop critical thinking abilities that help them solve difficulties. Learners must develop their skills while the teacher guides them. This suggests that learners' restricted access to new facilities limits their mathematical learning ability. The most important factor influencing learner learning is a qualified teacher. It appears to reduce the impact of other risk factors such as parental educational attainment, student gender, sociocultural and socioeconomic backgrounds, according to evidence (Anderson, 2013:13).

Table 5.43 Provision of Additional Facilities

	Frequency	Percent
Strongly Agree	**151**	**55.9**
Agree	**93**	**34.4**
Disagree	**19**	**7.0**
Strongly Disagree	**6**	**2.2**
Non-response	**1**	**0.4**
Total	**270**	**100.0**

Source: Questionnaires

5.3 PRESENTATION OF QUANTITATIVE DATA

Qualitative

The interview questionnaire given to six educators, three department heads, and two curriculum advisers was analyzed using qualitative methodologies. According to the three research questions, the findings were presented and discussed. The interview for the educator's schedule included 9 questions, 7 questions for heads of departments, and 6 questions for curriculum advisers. Six instructors, three department heads, and two curriculum advisors participated in the study, which took place during a thirty-minute period during breaks. The goal was to find out why instructors, department heads, and curriculum advisors employed different opportunities and techniques when teaching Mathematics by answering the three research questions. The researcher was the interviewer in this study, and the interviewees included six Mathematics teachers, three department heads, and two curriculum advisors.

Respondents 1, 2, and so on were assigned to teachers, department heads, and curriculum advisors at schools (See Appendix, B, C, D, E). The data for interviews is presented in the following format.

5.3.1 Interview Schedule for Grade 10 Mathematics Teachers

The following are the opinions of grade 10 Mathematics teachers on the learners' performance in the Nzhelele Central Circuit.

DEMOGRAPHIC PROFILE OF TEACHERS

The demographic profile of instructor participants is presented in this section. Gender, age, teaching experience, and highest professional qualifications are all part of the demographic profile.

There were four guys and two females among the contestants. Only one instructor (16.7 percent) was between the ages of 20 and 30, while two (33.3 percent) were between the ages of 30-39, and three (50 percent) were between the ages of 40 and 49, according to the statistics. This means that the majority of Mathematics teachers in this circuit are between the ages of 40 and 49.

According to the findings, the biggest percentage of instructors (66.7 percent) did not divulge their number of years as educators, while the lowest percentage of teachers (23.3 percent) had 1-3 years of experience.

The respondents were asked to list their top educational achievements. These credentials included a master's, bachelor's, and education diploma. The statistics revealed that 5 (83.3 percent) of teachers had a diploma, while only 1 (16.7 percent) had a bachelor's degree.

CONTEXUAL RESEARCH QUESTIONS

These contextual research questions will include findings from the questionnaires conducted on Teachers.

Question 1: Learners experience problems in understanding mathematical concepts and in some topics. How can you change the situation around that?

Some teachers stated that engaging and encouraging students might go a long way toward ensuring that they comprehend various mathematical ideas. The utilization of graphics and visuals was also identified as a key method for aiding student comprehension. "Teachers should guarantee that pupils comprehend basic ideas and expose them to varied problem-solving strategies to assist them increase their comprehension," one teacher added (see Appendix E line 9). ’’

It is successful teaching that equips students to absorb new information, connect it to past information, and form a chain of knowledge in order to work in a changing environment.

Question 2: One major problem with mathematics learners is the weakness in the language of Mathematics. What can you do to improve the situation?

The teachers reacted by stating that their kids should receive vocabulary training. In addition, teachers should define key words that are important in helping students grasp what is required of them in terms of mathematics. Edmonds (2017:63) agrees with the teachers, stating that thorough grammar reading is crucial in helping pupils improve their grammar. "Encourage learners to read novels and newspapers extensively," they suggested, as one example. To improve their vocabulary, they should jot down new terms and look up their definitions. Explain the meaning of mathematical terminology (see Appendix E lines 14 and 15).

Language is a primary learning medium used in Mathematics classrooms for communicative and epistemic goals, hence it is critical that language become a learning goal as well. The teacher should be able to properly communicate knowledge through language. Failure to do so will simply compound the learners’ mathematics

issues. The knowledge of the teacher is an important aspect in mathematics education.

Question3: Mathematics topics are the progression of sections from lower grades upwards. Which methods can a teacher use to assist learners to see the progression of the topics?

Extra hours in Mathematics, according to the teachers, produce excellent results. The interviews also suggested that it is critical to provide these kids with an introduction or background in order for them to grasp the concept of mathematics. "Basic concepts in all topics should be emphasized," stated an engaging teacher. As a basis, sufficient background knowledge of mathematics should be established." (See line 26 of Appendix E).

Existing knowledge in the mind of a student acts as a foundation for future learning (Byrnes 2011:9). Basic mathematical knowledge at the lower secondary level is the most important aspect in determining student achievement. It also determines the learner's future academic achievement.

Teachers are the acme of a great mathematical comprehension. The researcher might conclude from the findings that teachers are a key element in student achievement. Teachers that combine a variety of instructional tactics can help students improve their mathematics knowledge while also improving their grades.

QUESTION 4: Educators are expected to screen, identify, assess and support learners in their classrooms. What are the challenges you experience in encouraging Mathematics learners and also the approaches you use when teaching Mathematics?

Some professors stated that the most difficult obstacle is learners' bad attitudes about mathematics. It is widely assumed that mathematics is a difficult topic. Mathematics

teachers also face difficulties in comprehending mathematical jargon. All of these issues raise the question of what tactics a teacher can employ when teaching Mathematics.

"Attitude toward Mathematics depends on learners who think and believe that Mathematics is difficult (see appendix 30)," one teacher was cited as stating.
"Learners have a negative attitude about mathematics. Learners find mathematical terminology and concepts challenging to grasp. As many informal activities as possible (see appendix 31)."

The effort students put into acquiring and practicing mathematical concepts and abilities is influenced by their attitude toward mathematics. Their academic skills and aspirations have been closely related to their levels of involvement as well as emotional states that support or hinder their ability to succeed academically. As a result, for successful performance in the upper grades, Mathematics educators must maintain favorable attitudes about mathematics (Tsanwani 2009:21).

The researcher argues that extensive Mathematics practice is critical. This atmosphere should reduce emotional frustrations, resulting in increased student involvement and motivation in mathematics.

Question 5: Hands-on activities will provide learners with opportunities to investigate, build, take part, create and make drawings and observe shapes in the world around them. How do you motivate learners in a Mathematics classroom so that they can learn better in an easy and interesting way?

The studies demonstrated that using ICT gadgets can make studying more appealing and fascinating, as well as improve learners' mathematics proficiency. Machaba (2013:38) agrees that using the gargets to study Mathematics is a good concept. Setting a strong and clear expectation for your pupils may help them perform better.

Students should also be informed about their responsibilities. This means that teachers should be explicit about the mathematics learning objectives. Finally, these kids should feel in charge of the classroom.

"Encouraging pupils to work in groups and assist each other is vital in increasing student marks," a teacher was quoted as stating (see Appendix E line 40).
A positive interaction between teachers and students, according to the researcher, has a positive impact on student achievement.

Question 6: To manage a big class can be difficult. What do you think is the best way to manage a big class?

In the interviews, the easiest strategy to manage a class was to divide it into smaller portions or groups. Getting students to collaborate increases peer-to-peer teaching, which has been shown to dramatically improve student performance. Increased student responsibility leads to students becoming more responsible and determining their professional trajectories, according to the data.

"Deal with pupils in groups, smaller groups," one teacher was quoted as saying. Also, identify students who are falling behind and provide them with extra classes (see Appendix E line 44)."

Teaching in overcrowded classrooms is a huge problem when it comes to creating productive learning environments where excellent teaching and evaluation strategies are critical. Teachers are unable to use a number of techniques such as higher-order questioning and active learning strategies. Teachers are effectively limited to the 'chalk and talk' technique of instruction (Wekesa, 2013:18).

A small class can result in one-on-one attention from the educator, depending on the teacher's response. This implies that teachers can get to know their pupils on a

personal level and recognize their strengths and limitations, allowing them to provide solutions.

Question 7: Educational programmes and different teaching strategies for learners with problems in Mathematics are constantly reviewed to improve their achievement. How best do you think the implementation of intervention programmes and different teaching strategies may improve achievement? What is your opinion about different teaching strategies?

Extra lessons and other intervention programs can greatly improve a student's grade. Teachers must profile kids based on their intellectual talents, according to one interesting research. Extra classes improve learners' understanding in general. *"Intervention programs help in isolating difficult learners and give them the assistance they need to pass," a researcher was quoted as saying. (See line 53 of Appendix E).*

Learners who engaged in Mathematics development programs outperformed those whose teachers did not participate (Anderson, 2013:13).

However, the researcher argues that I left an important question unaddressed about the opportunity costs of extra lessons.

Question 8: What is your preferred teaching style? Why do you prefer this style of teaching Mathematics?

Three basic teaching styles emerged from the interviews, including demonstration and story instruction. One teacher said that:

"The demonstrating styles, I'm the one who leads the class and shows them the way. I make inquiries. I urge students to participate in discussions and support slow

learners. Encourage students to demonstrate their understanding (see Appendix E, line 58)."

Learners would benefit from interactive Mathematics classes with the goal of learning because they would practice Mathematics in more inventive and successful ways.

Question 9: Prior achievement of learners is another aspect of learner related factor that influences learner achievement. How do you incorporate the learner's prior knowledge in your lesson?

The interviews suggested that it is critical for teachers to review what has already been taught in order to assess the necessity to re-teach some of the previous chapters and to assist learners in remembering earlier knowledge.

"Every class should start from the known to the unknown," one teacher said. Moving from the known to the unknown is accomplished by asking a question about previously discussed topics. "Build on existing knowledge with new knowledge." (See line 66 of Appendix E).

Another part of the learner-related factor is prior achievement, which refers to the learners' prior mastery of mathematical information.

This, according to the study, is significant since it gives learners confidence and incentive to understand what they don't know.

5.3.2 Interview Schedule for Mathematics Departmental Heads

DEMOGRAPHIC PROFILE OF THE DEPARTMENTAL HEAD

The demographic profile of departmental heads is presented in this section. Gender, age, experience, and highest professional qualification are all part of the demographic profile.

The findings revealed that there was 1 male and 2 female participants.
When it came to age, two HODs (66.7 percent) were between the ages of 40 and 49, while only one (33.3 percent) was between the ages of 50 and 59.

In terms of departmental head experience, the research revealed that 33.3 percent of HODs had 1-3 years of experience, while 66.7 percent did not specify the number of years they had been HODs.

Respondents were asked to select their greatest degree of academic and professional qualifications when it came to academic and professional qualifications. A master's degree and a diploma in education were among the qualifications. HODs with a diploma made up 33.3 percent of the total, while HODs with an Honours degree made up 33.3 percent. Finally, 33.3 percent did not respond when asked what their highest qualification was.

2. CONTEXUAL RESEARCH QUESTIONS

These contextual research questions will include findings from the questionnaires conducted on Head of Departments.

Question 1: Work schedule in Mathematics gives direction to the administration of various topics in the subject. Tell me about the challenges you experience in managing educators who teach Mathematics.

The fact that some instructors are untrained and unqualified to teach Mathematics is acknowledged by all department heads in the Nzhelele Central Circuit.

"Some teachers just focus on things that they are familiar with," according to the comments. Support and observe educators as they develop techniques to improve student achievement." (See line 82 in Appendix E).

To run, schools require the assistance of district offices and professionals. When it comes to referrals, certain people should pitch in. When general educators and support teams are having difficulty assisting learners who are experiencing learning hurdles, they should refer them to experts who will use their expertise to provide the learners with the assistance they require (Killer 2000:206).

Furthermore, some educators have a difficult time being supervised and encouraged since they have not met the required level of performance.

Question 2: Mathematics educators have a mandate to create a conducive teaching and learning environment in the classroom. Tell me how you motivate educators and learners in Mathematics to achieve better?

The key takeaway from the HOD's feedback was the need of providing a favorable teaching and learning environment for teachers. One of the most important things that influences learning is the environment. This setting can give current and relevant knowledge, establish clear goals, and assist students in developing social skills that will help them succeed.

"Content offered must be connected to everyday life situations (examples given) be related to what learners come across," one of the HODs remarked. Paste mathematics-related charts to create a positive learning environment. A mathematics class must be able to communicate independently." (See line 86 of Appendix E).

Teachers of mathematics cannot effectively teach the subject unless they understand the relationship between motivation and its impact on mathematical learning. Passion, which refers to a person's inherent aims and wants, lies at the heart of motivation.

Question 3: Having an individual meeting with the parents of the learners may determine the improvement in Mathematics. Do you involve parents in the education of learners, especially those with difficulties in Mathematics?

The involvement of parents in school matters is of highest importance in helping and assisting pupils who are having difficulty with Mathematics, according to all Heads of Department at various schools. The more parents participate in their children's academic pursuits, the better their motivation and behavior in class will be. The value of parental involvement cannot be overstated.

"Yes, we encourage them to recruit others to support their children," one of the HOD said. Encourage them to organize study groups for their children (see Appendix E line 90)."

Communication between the school and the parents is critical to student progress and achievement. Parents are more interested in school achievement because they are aware that their learner's achievement in Mathematics is determined by the school's development (Mosibudi 2012:18).

This, according to the study, is one of the most crucial tactics for creating a happy learning environment. The topic of teaching beyond the classroom will be supported by parental involvement. As a result, it will provide students with a pleasurable experience while also supporting them in improving their academic performance.

Question 4: The attitude of learners towards Mathematics influences the efforts they put in understanding and practicing mathematical concepts and skills. Can you describe the most important challenges that affect learner achievement in Mathematics?

Learners have a negative opinion toward Mathematics, describing it as a challenging subject, according to the research. One aspect that has contributed to the poor success rate in Mathematics is the negative effect of the general community, which is based on the premise that Mathematics is difficult. Another aspect that has been identified as contributing to the failure of Mathematics as a subject is socioeconomic status. Because their parents and guardians cannot afford them, these students lack learning aids such as practice guides and textbooks. Finally, copying things such as homework and assignments from other students contributes to the student's lack of understanding. One HoD said that:

"Learners consider Mathematics as a challenging subject," Parents are typically poor and have a low level of education. Most parents do not work; hence their children are not developed. Lack of learning aids and skilled educators for students (see Appendix E line 92)."

When compared to peers from wealthier households, learners from poor families were 1.5 times more likely to have a learning disability (Enu, 2015:68).

Question 5: Departmental policies give guidance on the various programmes of the subject. How often do you have departmental meetings about the achievement of learners in Mathematics?

The average number of meetings held by the Heads of Departments is one per month, according to all department heads. "Once a month or once a quarter," was the response *(see Appendix E line 96).*

Question 6: Head of department efforts may determine the success of the strategies adopted. Tell me the strategies that you use to remedy the difficulties faced by learners in Mathematics.

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The findings revealed that in order for students to be interested in learning Mathematics, it must be made fascinating, enjoyable, and practical. Teachers can give pupils more work to practice after mathematics becomes appealing to them. Finally, the findings revealed an important technique for rewarding learners who demonstrate progress. One of the HoD had this to say:

"Making Mathematics entertaining to boost learners' enthusiasm in learning Mathematics (see Appendix E line 101),"

The researcher discovered that when pupils realize that they will be rewarded for good performance, their attitudes toward mathematics shift.

Question 7: Motivating learners by introducing a practical application of genuine interest to the class at the beginning of a lesson. Are there any ways in which learners can learn and have an interest in mathematical concepts with ease?

Almost all department heads agreed that the teacher should demonstrate the topic's utility and make Mathematics a real thing by ensuring that students understand how their learning relates to something beyond the classroom. Learners will be more interested if they are given numerous opportunities to practice solving mathematics problems and are given practical examples in everyday activities. One had this to say: *"Teacher demonstrating the value of a topic, To pique learners' interest, the teacher tells an engaging tale about the topic. Teachers should make Mathematics a reality by ensuring that students realize how what they are learning relates to something outside of the classroom. Teachers should be aware that students learn in different ways. Learners have preferences for how they approach things (see Appendix E line 103)*.

Teachers must guarantee that the application of real-world context in the classroom keeps the focus on mathematical concepts and motivates students to practice Mathematics in an intelligible manner.

5.3.3. Interview Schedule for Mathematics Curriculum Advisors

The demographic profile of curriculum advisor participants is presented in this section. Gender, age, experience, and highest professional qualification are all part of the demographic profile.

The findings revealed that there is one male and one female participant. All of the curriculum advisors were in their forties or fifties. The curriculum advisors have a combined experience of seven and eight years. They possessed a master's degree and a postgraduate diploma in education.

CONTEXTUAL RESEARCH QUESTIONS

These contextual research questions will include findings from the questionnaires conducted on curriculum advisors.

Question 1: Tell me about the challenges you experience in managing curriculum in Mathematics?

During moderation, one of the curriculum advisers discovered that educators do not provide learners with feedback. This is due to a lack of informal work assigned to students. This was what he said:

"When regulating educators' work at school, I discovered that educators do not provide learners with feedback when learners have gaps in their classwork and also informal assignments (see Appendix E line 116),"

Question 2: Mathematics educators have a mandate to create a conducive teaching and learning environment in the classroom. Tell me how you motivate educators and heads of departments in Mathematics to achieve better grades?

These curriculum advisors, according to the data, urge educators to give students extra work. The goal is to motivate the learner and enable them to comprehend and master diverse tricks. One of them said:

"I encourage educators to encourage learners to use calculators and to ensure that they finish the syllabus on time so that they can give learners more tests (see Appendix E line 120),"

Question 3: Can you describe the most important challenges that affect educators and heads of departments in teaching Mathematics?

One of the most significant obstacles that educators and HODs have when teaching mathematics is the unfavourable attitude of students toward the subject. Another major issue was a lack of understanding of the fundamentals of mathematics. One of the curriculum advisors said:

"I noticed that learners have bad views toward Mathematics, which causes them not to be serious about it (see Appendix E line 122),"

Question 4: Departmental policies give guidance on the various programmes of the subject. How often do you have workshops about policies in Mathematics?

All of the curriculum advisors stated that workshops are held once a term.

Question 5: Tell me the strategies that you use to remedy the challenges faced by the head of department in Mathematics?

The most important method has been to teach students about the importance of mathematics in their future careers. Second, parental involvement has been identified as a critical component of finding solutions. One of the curriculum advisors indicated that:

"Encourage educators to attend meetings with parents and advise them to buy Calculators and also remind them to teach essentials even when learners are in grade 10 (see Appendix E line 129),"

Question 6: Motivating learners by introducing a practical application of genuine interest to the class at the beginning of a lesson. Are there any ways in which learners can learn and have an interest in mathematical concepts with ease?

Almost all curriculum advisors agreed that there are ways to help students learn and understand mathematical concepts more easily, such as giving them frequent practice solving mathematical problems and referencing practical examples that make mathematics more interesting while also rewarding those who succeed. This is what one of them said:

"Yes, paying those who accomplish well gets learners interested in Mathematics, so they may also get a reward and undertake practical examples that make grow interest in Mathematics." Mathematics, in fact, must be amusing (see Appendix E line 132)."

The data revealed that students who improve their mathematics grades should be awarded often. In a classroom, rewards play a crucial role in encouraging acceptable and constructive behaviour.

5.4. SUMMARY AND GENERAL IMPRESSION

The data analysis was presented in this chapter. The goal of the study was to look at the important elements that influence grade 10 learners' achievement, as well as to discover factors that serve as opportunities for learning Mathematics and how students use those opportunities to solve problems. The research was conducted using a mixed methods approach. The results indicated responses from learners' questionnaires as well as responses from interviews with instructors, heads of departments, and curriculum advisors about grade 10 learners' mathematics achievement. The learners' replies in the survey also revealed that activities such as group work and practical work in the classroom, frequent feedback, and the provision of additional facilities will help learners achieve better results in the Mathematics classroom. ICT use, extra lessons, the use of learner incentives, and profiling learners are the most common activities in the grade 10 Mathematics classroom. These activities will help learners get higher results in the grade 10 Mathematics classroom. It indicated that those students preferred a little guided instruction on a concept before working on their own with Mathematics problems. The following chapter, which is also the study's final chapter, summarizes the research overview as well as the researcher's major findings, recommendations, study limits, research opportunities, and conclusions.

CHAPTER 6

MAJOR FINDINGS, CONCLUSION AND RECOMMENDATIONS

6.1 INTRODUCTION

This chapter provides and summarizes the research's major results, draws conclusions based on the findings, and gives recommendations for change and additional research on the issues examined. The goal of the study was to look at the important elements that influence grade 10 learners' mathematics ability, as well as to discover factors that serve as opportunities for learning Mathematics and how students use those opportunities to solve problems. It also discusses the study's weaknesses and recommendations for further research.

6.2. MAJOR FINDINGS

The major findings were organized into categories based on the secondary research questions. The following are the three secondary research questions:

- Which factors influence the learning of grade 10 Mathematics in Nzhelele Central Circuit?
- Which factors serve as opportunities for learning grade 10 Mathematics in schools in Nzhelele Central Circuit?
- What strategies can be used to enable learners to utilise opportunities to learn Mathematics?

The following table summarises the data on factors as observed from chapter 5.

O-P MODEL	FACTORS OF THE STUDY	NEGATIVES	POSITIVES
DISTAL FACTORS	Parental Involvement,	Unemployed parent	Employed parent
	Home environment	Lack of resources	Availability of resources
	Attitude of learners	Negative attitude	Positive attitude
	Prior Knowledge		
OPPORTUNITY FACTORS	School Environment	Overcrowded classes	Normal classes
	Teacher variables	Inadequate qualified teachers	Qualified and experienced teachers
	Educational resources at school		
PROPENSITY FACTORS	Motivation		
	Prerequisite Knowledge		
	Intelligent		
	Aptitude		

6.2.1. Factors Influencing Learning of grade 10 Mathematics

The first research question in mathematics was to find out what factors influence learning. These characteristics were divided into three categories: distal, opportunity,

and propensity factors that predict grade 10 achievement. The three will be explored further down.

- **Distal Factors**

Parental participation is a problem for grade 10 students, according to the data. The data on parental involvement in their children's education revealed that more than 70% of children lack parental supervision and encouragement, which can help them achieve better results. When asked about the home environment and resources such as internet access, 79 percent of learners believed that a lack of resources, internet, infrastructure, and computer contribute to learner achievement. When asked about their family backgrounds, 62 percent of students said that prior knowledge is important for obtaining better levels of accomplishment in Mathematics. The data support the assumption that pupils will perform better in Mathematics if parents become involved, inspire, and lead their children, and educators provide prior knowledge.

All Distal characteristics were important in predicting Mathematics achievement, according to the O-P Model (Byrnes & Miller, 2016:34). Mosibudi's (2012:18) remarks that parents can make a difference by showing interest in their children's academics and encouraging them to achieve are supported by the data. Parents can help their children by making sure they finish their homework, offering appropriate resources such as books, complimenting good teachers and challenging poor ones, and ensuring that their children do not interrupt class. The aforementioned findings show how important secondary school mathematics achievement is in today's achievement.

A large communication gap between parents and instructors was also discovered in this study. Parents rarely contacted teachers to inquire about their children's grades. This was not ideal because it masked weaknesses in both the teacher and the student. If a student's parent is continuously in contact with the school regarding his or her performance, the learner will always seek to do his or her best to avoid being reprimanded by the parents.

Parental involvement, such as providing resources to learners, such as internet access and the purchase of calculators and other study aids, contributes to their learning success. Machaba's research (2013:38) suggests that parents can make a difference by demonstrating an interest in their children's schooling and encouraging them to succeed. The learner's background in terms of the availability of educational materials at home, such as books, electronic resources such as a TV, computer, study desk and table, and general academic support at home, is critical to their success in Mathematics.

Learners who have access to resources have an edge over those from low-income homes because they will be more informed about current events, which will help them enhance their school performance in Mathematics.

The results show that learners' views toward mathematics have a favorable or negative impact on their confidence in the subject (Wekesa, 2013:43). The findings are consistent with those of Tsanwani (2009:21), who discovered a lack of willingness and readiness to learn among students who had a negative attitude toward mathematics. Mathematical interest among students is beneficial, especially if it is directly tied to their future careers. Learners who are interested in mathematics and have the ability to do so perform better than those who are not (Wekesa, 2013:43). Many students ignore Mathematics because they are afraid of it and lack confidence in themselves. This pessimistic attitude can lead to underperformance among students and, as a result, failure to achieve the required marks for university admission.

- **Opportunities**

Because more experienced teachers, the school atmosphere, and school resources have a beneficial impact on a learner's arithmetic accomplishment, opportunities increased mathematical abilities in this study. The amount of weekly hours of Mathematics lesson had a substantial impact. This could indicate that both quantity

(number of hours) and quality (teacher experience) are essential variables in Mathematics proficiency.

Furthermore, the current study discovered that through educated parents, parental involvement impacts learner achievement, showing that distal variables might be mediated by opportunities factors. This could be explained by the current study's unique choice of opportunity variables, as opposed to prior research on the O-P Model (Byrnes and Wasik, 2009), which included a broader range of opportunity measurements.

According to the results of the survey, over 70% of learners said that extra help from the teacher allows them to analyze and change their beliefs about how certain portions should be taught, and that an experienced teacher uses learners to try new techniques to find solutions.

"Mathematics educators have a mandate to establish a favourable teaching and learning environment in the classroom," departmental heads responded to question 2 of the interview. "Could you tell me how you inspire Mathematics educators and students to attain greater success?" demonstrated that professional educators provide a positive learning environment, as well as relevant, up-to-date content, clear goals, and assistance in developing social skills, which will help learners succeed. The findings show that a positive school climate helps students perform better in mathematics.

- **Propensity**

Learner motivation, intellect, aptitude, and necessary knowledge are key variables that will grow learners and teach them to rely on themselves rather than teachers and parents. "Motivating pupils by providing a practical application of genuine interest to the class at the beginning of a course," the question continues. Is there a simple way for students to understand and be interested in mathematical concepts?"

According to the findings, the options they have at school help them develop motivation, aptitude, and intelligence, all of which help them achieve higher results. This could imply that teachers should employ motivation and positive consequences to help students improve their mathematics skills.

6.2.2 Factors Serving as an Opportunity for Learning Grade 10 Mathematics in Nzhelele Central Circuit

The following is a summary of the study's data and findings on factors that serve as learning opportunities.

In this study, prospects for success in Mathematics are explained as a combination of parental involvement, learner attitude, and prior knowledge as distal predictors. Parental participation in mathematics achievement is a strong distal predictor, according to Byrnes and Miller (2016:34). Because they encouraged and led their children, educated parents want their children to achieve better at the end of the year. The formation of a good attitude toward mathematics is an important and integrated goal of mathematics education. When it comes to creating an attitude, motivation, and adequate supervision, the majority of learners' attitudes are influenced by their expectations as children.

Opportunities for learning mathematics

When learners are provided numerous opportunities to gain knowledge and abilities in a topic, such as Mathematics, and when learners are able and motivated to take advantage of these opportunities, high achievement is more likely to occur (Byrnes & Miller, 2016:34). Chances to learn are culturally defined situations in which a person is supplied with new knowledge to learn or given practice opportunities. Both exposure to knowledge (course work or homework) and instructional quality (the application of proven methodologies or communication skills) are opportunities (McElya, 2016:22). The following paragraphs will go over the O-P Model factors. The O-P Model was

influenced by only two of the study's opportunity factors: school atmosphere (classroom and environment variables) and teacher variables.

In line with the foregoing facts, Imtiaz (2014:251) reports that classroom atmosphere influences student achievement in mathematics and has an impact on student success. Most schools, based on observations of grade 10 classes, are overcrowded. In one of the schools, I discovered a class with over 70 Mathematics students, although in other schools, students are few. Larger classes have a negative impact on learners' mathematics achievement. Teaching in overcrowded classrooms is a huge problem when it comes to creating productive learning environments where excellent teaching and evaluation strategies are critical (Imtiaz, 2014:251). Some classrooms are in disarray, making teaching and learning difficult. All students benefit from smaller classes. Learners who struggle in a variety of topics gain the most. When a class is too large, students lose concentration on the task since the instruction is geared toward the entire group rather than individual students (Wekesa, 2013:18). When students enter high school, smaller class sizes benefit them, especially in areas where they are focusing on mathematics.

More experienced teachers, according to McElya (2016:22), have a beneficial impact on pupils' mathematics achievement. Teachers are in charge of the types of learning and experiences that students can have on a daily basis, as well as the development of educational goals and general personality. "Managing a large class can be tough," teachers said in response to question 6 of the interview. What do you believe is the most efficient method of managing a huge class?" The interviews suggested that breaking up a class into smaller groups was the most effective approach to handle it. According to the findings of this study, the majority of teachers are well qualified, with 83.3 percent having a diploma in education, indicating that they are capable of managing a large class. The teacher's additional assistance aids the learners' achievement. The most influential causes in learners' underachievement are insufficiently qualified teachers. Unqualified teachers, according to Miles (2011:643),

increase the likelihood of learner dropout in developing nations. Teachers are revered in some South African cultures. However, teachers' qualifications, topic understanding, and even commitment have been criticized. The finding backs up Anderson's (2013:13) claim that topic content knowledge is important for teaching, but subject content knowledge is not the same as teaching. This indicates that in order to teach Mathematics effectively in grade 10, teachers must demonstrate adequate content understanding. Having topic understanding in Mathematics does not, however, guarantee the competence to teach that content. Miles (2011:643) agrees with Anderson (2013:13) on the relationship between Mathematics content and pedagogy, arguing that pedagogical procedures may be hampered without Mathematics subject knowledge. Based on the findings of this study, I contend that if teachers are familiar with the curriculum they will teach and with the abilities necessary to effectively teach learners, they have a better probability of doing so.

Other elements that act as opportunities include educational resources, computer use and internet access, departmental teaching and learning resources, and intervention programs, which will be described further below:

- **Educational Resources**

The findings show that in four schools, resources such as the interactive whiteboard, internet, and computers are adequate, but in five schools, they are insufficient. The achievement of learners in Mathematics improves when learning and teaching is done through the media. Some schools also have poor infrastructure, with some classrooms lacking electricity. As a result, teaching and learning are no longer possible via learning channels or computers. A bad learning environment might also make students dislike mathematics. The results of the questionnaire on the provision of additional facilities revealed that 89 percent of learners agreed that additional facilities such as libraries, ICT, and various types of mathematics can help students succeed in the subject while also equipping them with critical thinking skills to solve problems. The findings of this study back up Saun's (2014:13) claim that a teacher who uses ICTs in the classroom

is more likely to be a team leader rather than a single source of knowledge for pupils. She says that using ICTs enhances learners' learning expectations and makes lessons more student-centered, increasing learners' motivation to try and learn new things. As previously stated, computers and interactive whiteboards are not available in five secondary schools. As a result, classes typically used chalk and talk and manila sheets to show concepts being taught.

The studies revealed that Mathematics language is another important component in learners' ability to succeed in mathematics, which has resulted in a difficulty for students in grasping mathematical concepts. The responses in this language question revealed that 64% of learners consider language as a primary learning medium utilized for communicative and epistemic reasons in Mathematics classrooms, emphasizing the importance of making language a learning goal in Mathematics classrooms as well (Prediger et al., 2019:11). Naude et al. (2002:294) agreed, stating that a learner needs be proficient in both expressive and receptive languages in order to understand and perform academic tasks such as mathematics. Learners should memorize what they've learned and be able to recall it when needed. It is understood that learners in the GET band would be hampered by a lack of language proficiency. As a result, when teaching concepts like integers, factorizations, exponents, geometry, and trigonometry, teachers must be patient.

If mathematical language is taught adequately in grade 10 classes, students will have an easier time grasping terminology in mathematics. With the correct resources, instructors can show ideas and actions like angle measurement, which can help these students, as well as those who are learning in their mother language, obtain a visual experience of the events going place and so increase their understanding.

- **Usage of computer and access of internet in the classrooms**

Most students regard computers and internet access as instructional tools that make it easier for them to grasp mathematical ideas. The usage of computers in mathematics classes gives students the critical thinking abilities they need to solve issues (Widana, 2018:24). While the teacher provides assistance, the students must develop their talents. This suggests that learners' limited access to computers limits their mathematical learning ability. Parents should fully support their children's motivation by purchasing the required materials and ensuring that they have access to the internet. One of the department directors stated that requiring students to learn Mathematics using devices such as cell phones will inspire them to appreciate the subject. The outcomes of this study back up Machaba's (2013:38) claim that computers connected to the internet can help students with school assignments and projects in Mathematics by providing a source of information.

- **Teaching and learning resources from the department**

According to the statistics, the Department of Education appears to provide textbooks and other study aides to 80% of students. The adequacy and usage of teaching and learning materials such as key textbooks and reference books, among other things, determine the success of a teacher's lesson. Learners should be exposed to these important texts in this regard, which they can consult as they gain knowledge. Learners will get a better understanding of mathematical topics as a result of the resources provided by the Department of Education. The availability, provision, and usage of teaching and learning materials all contribute to higher-quality instruction and higher academic accomplishment.

- **Intervention programmed**

"Educational programs and alternative teaching tactics for learners with challenges in Mathematics are regularly reviewed to improve their accomplishment," according to the findings from the educator interview. How do you think alternative teaching

techniques and implementation intervention programs can best promote achievement? What are your thoughts on various teaching methods?" reveal that intervention programs such as winter enrichment and Saturday classes help learners identify their strengths, which helps them improve their learning confidence, increase their motivation to learn, allow them to work independently of the larger group, and encourage them to take responsibility for themselves.

Propensity as an opportunity to learn mathematics

Ability or readiness to learn content after exposure or offered situations are examples of propensity factors. Intelligence and aptitude are examples of cognitive factors. Motivational variables, such as interest, self-efficacy, values, and competence judgements, are also representative of propensity factors (Byrnes & Miller, 2016:34). Proximal causes of achievement are factors that, when met, lead to increased achievement. Propensity factors were the most numerous and had the biggest magnitude of all the factors in the O-P Model. These findings are consistent with earlier research that has found that arithmetic performance can influence achievement in other subjects (Byrnes & Miller, 2016:34; Zhao, 2011:9; McElya, 2016:22; Wang, 2013:259).

In terms of the number of significant predictors, the propensity factors appeared to have the greatest impact on academic achievement in the O-P model. As previously said, propensity factors are linked to motivation, knowledge growth, and achievement when students have strong domain-specific aptitude for learning the subject and can process diverse types of material rapidly and intelligently.

The other factors that act as propensity will be discussed below

- **Motivations**

The findings of the study on building attitude and motivation showed that motivation can help students achieve more. According to the results of the survey, 88 percent of students agreed. The directors of school departments urged their teachers to motivate

their students. It was discovered that 100 percent of head teachers believe that motivating teachers in some way is related to student achievement. Teachers who are satisfied are more likely to concentrate, improving their learners' academic success. The findings revealed that teachers' attitudes, motivation, and effective guidance to students in mathematics are excellent. Teachers' teaching attitudes are influenced by a number of factors, including their mental content and schemes, particularly their system of beliefs about Mathematics and its teaching and learning, the social context of the teaching situation, particularly the constraints and opportunities it presents, and their level of reflection thought. The data also revealed that instructor motivation stimulates extra help, which preserves and allows learners to analyze and change their ideas about how certain portions should be taught, as well as how learners used various strategies to solve problems.

- **Hands-on activities as an opportunity in Mathematics**

The results of the questionnaire suggest that learners preferred hands-on activities such as practical work over theoretical study, which allows them to investigate, build and disassemble, develop and produce drawings, and examine shapes in their environment. This means that mathematical concepts are easily grasped and understood when learners are actively involved. Practical activity helps pupils improve their ability to solve mathematical problems and develop their learning aptitude. This is the product of real-world problem-solving experience and application. This can help learners gain confidence in their ability to study and apply for practical work in a variety of scenarios. This research also demonstrated that parents should fully assist their children by purchasing the materials they require for practical work in order for them to succeed. Hands-on activities give the classroom a fresh lease on life. It motivates students to get up and walk around. It speeds up their hearts and minds. It encourages children to pay attention to instructions in order to figure out what they should do next or how to solve an issue.

- **Working in groups build pre-requisite knowledge**

According to the findings, when students work in groups, they obtain a better understanding and create pre-requisite information, which has a favorable impact on both knowledge acquisition and the ability to use higher-order cognitive problem-solving skills. As a result, group work enhances their performance. According to survey results, 81 percent of students believe that working in a group at school helps them develop efficient team skills and increases their communication abilities, both of which are important in cooperative learning environments. The group approach is one of the most successful learning strategies for enhancing learners' achievement in Mathematics, according to all of the teachers interviewed (100%). Learners can also increase their personal, social, and psychological abilities.

- **Parent influence**

The findings showed that when parents influence their children, they get smarter and gain the ability to understand and deal with new situations. The department heads reported that when parents and teachers collaborate, their children understand more. As a result, the researchers wanted to know how often parents talk to instructors about their children's education.

Progress and learner accomplishment are dependent on communication between the school and the parents. Parents are more active in school achievement and involvement because they understand that their child's mathematics achievement is determined by school development (Mosibudi, 2012:18). This, according to the study, is one of the most crucial tactics for fostering a happy learning environment. Parents' engagement will aid in the advancement of the subject of teaching outside of the classroom. As a result, it will provide students with a pleasurable experience while also supporting them in improving their academic performance.

6.2.3. Strategies to Enable Learners Utilise Opportunities to Learn Mathematics

The current study's findings on distal factors support previous studies on parental involvement and prior accomplishment. As previously indicated, data shows that parent and child expectations in mathematics are catching up and closing the accomplishment gap. According to the statistics, 83 percent of students have a favorable expectation in Mathematics as a crucial factor influencing accomplishment. Distal learners should benefit from opportunities that lead to the formation of a natural proclivity for later achievement.

The results showed that the school environment and teacher variables focusing on numerical cues are opportunity factors, prerequisite knowledge, motivation intelligence, and aptitude are propensity factors, and general parent involvement, home background, parent expectation, and aptitude are distal factors in the prediction of Mathematics achievement among grade 10 students. To predict later accomplishment, the opportunity-propensity model integrates these three kinds of criteria. Furthermore, the findings revealed a predictive contribution of opportunity-predictors in learners to school-based mathematics achievement.

The strategies revealed that the opportunity-propensity model combines these three categories of factors to predict later achievement, according to the findings. The study found a positive relationship between Mathematics achievement and the environmental numeracy opportunities available for learning Mathematics, as well as how learners use those opportunities to find possible solutions to the problem. Furthermore, the findings revealed that opportunity-predictors in learners have a predictive impact to Mathematics achievement.

According to the Opportunity–Tendency (O-P) model, learners are more likely to realize their learning potential if they are given opportunities to study at school and in other settings and have the capability or propensity (P) to profit from those

opportunities (Wang et al. 2013). Learners are presented with content to learn or given opportunities to practice Mathematics abilities in culturally determined environments called opportunity indicators.

6.3. CONCLUSIONS

The following conclusions were formed based on the primary facts mentioned above:

6.3.1 Factors Influencing Grade 10 Mathematics Learning in Nzhelele Central Circuit

Some of the findings related to this study question are as follows:

- A huge communication gap exists between parents and instructors. Parents have rarely confronted teachers about their children's academic performance. This was not ideal because it masked the inadequacies of the teacher or the student. If a parent is continually in contact with the school regarding his or her child's performance, the student will always seek to do his or her best to avoid the parents' censure. Similarly, the findings of the survey revealed that there was little evidence of parents assisting their children with homework tasks assigned by their teachers.

- Mathematics has a poor reputation among students.

- The teaching and learning environment in Mathematics classrooms is unconducive to learning since Mathematics students share classrooms with students studying other disciplines, causing them to struggle with Mathematics language. Learners' achievement is influenced by class size and classroom settings. Students suffer from overcrowding because they spend the majority of their time not learning. Overcrowding in the classroom makes it difficult for

instructors to achieve their full potential as educators. In the circuit's selected secondary schools, there were insufficiently qualified teachers. Because the majority of teachers were attempting to improve their credentials, they spent more time preparing assignments than teaching, leaving their kids unattended. They would occasionally act as if they were lecturing in their various classes while doing something else. It was also determined that teacher dedication was exceedingly low in the schools under investigation. In the selected day secondary schools, there was a considerable gap in the availability of educational resources. It was discouraging to learn that ten years after democracy, secondary schools in South Africa still can't afford to supply a textbook for teachers' lesson preparations. Some teachers in the selected secondary schools shared a textbook when preparing their classes, according to the findings. Even in such schools, students do not have access to textbooks to aid their study.

6.3.2 Factors Serving as Opportunities for Learning Grade 10 Mathematics in Schools in Nzhelele Central Circuit

Some of the findings related to this study question are as follows:

• Learners do not have access to computers or the internet as learning aids that could help them comprehend mathematical concepts. Computers are used in Mathematics lessons to assist students develop the critical thinking skills they need to solve problems. While the teacher just provides direction, students must develop their abilities. Another key issue was the Department of Education's insufficient teaching and learning resources. As a result, students were unable to obtain necessary textbooks for study purposes, and were forced to rely on what they learned in class from the teacher, who became their sole source of information and knowledge. Learning came to a halt in the absence of the teacher. Mathematical language is also a barrier for these students in understanding concepts and achieving success in the subject. • Intervention programs like the department's winter enrichment, Saturday

sessions, and supplementary classes like morning and afternoon studies help these students enhance their Mathematics skills.

6.3.3 Strategies to Enable Learners to Utilise Available Opportunities to Learn Mathematics

Some of the findings related to this study question are as follows:

- The majority of department heads and professors fail to motivate their students. Only a small number of department heads and teachers said they were motivating their students in some way. Learner satisfaction is connected to success, according to other study. Satisfied students are more inclined to concentrate, resulting in improved mathematics performance. Teachers' incentive encourages extra help, which maintains and allows learners to analyze and amend their thoughts about how certain sections should be taught, as well as how they solved problems using various ways.

- Learners can investigate, build, participate in, create, mark drawings, and observe shapes in the world around them through hands-on activities. When students use ICT, they can quickly learn and discover new mathematical concepts. When students work in groups, they have a greater understanding. As a result, group work improves their mathematics performance. Working in a group at school allows students to develop effective cooperation abilities and improve their communication skills, which are both important in cooperative learning situations. The group method is one of the most effective learning approaches for improving learners' mathematics proficiency. It also allows students to develop their personal, social, and psychological skills. The majority of parents consult instructors regarding their children's education, with only a small fraction saying they never do (teachers). This shows that the majority of parents are worried about their children's education. It would also raise learners'

awareness and push them to study because they would be aware that their parents might criticize their school performance. When parents are unaware of what is going on at school, they may be unable to provide much direction and assistance in helping their children improve their grades. According to previous study, as parents become more involved in their children's education at school and in the community, their children's achievement rises.

Finally, the O-P model added proximal characteristics that explained why some learners are more likely than others to profit from opportunities and develop stronger learning proclivities. Even after correcting for the O and P variables in the model, several distal variables were revealed to be relatively relevant predictors of Mathematics achievement. The effect of SES as a distal variable was generally indirect and mediated by other variables, according to the researchers. Learners from higher socioeconomic backgrounds have parents who had higher educational aspirations for their children at home.

6.4 RECOMMENDATIONS PERTAINING TO THE STUDY

6.4.1. Factors Influencing Learning of Grade 10 Mathematics in Nzhelele Central Circuit

6.4.1. Factors Affecting Grade 10 Mathematics Learning in the Nzhelele Central Circuit
The following are some of the recommendations related to research question #1, which questioned learners, instructors, department heads, and curriculum advisers what factors they regard to be influential in the learning of Mathematics to Grade 10 students.

- **Parental involvement and home environment**

Through community gatherings and Parents-Teachers Association meetings, parents and the general public should be aware of the necessity of supporting the teaching/learning process and providing moral support to teachers and the school

administration. At the start of each term, academic clinics with parents of students who perform poorly should be held to evaluate possible remedies.

- **Attitude of learners**

This study revealed that students have a negative attitude toward mathematics. District managers, circuit managers, and principals should collaborate to promote mathematical learning and encourage interest in teaching mathematics. When it comes to careers in mathematics at higher education institutions, parents, friends, teachers, and guidance teachers must provide more convincing evidence of the economic benefit. Schools can devise packages that reward hardworking students to motivate them. Special programs for learners to support them after conventional class courses should be designed as early as grades 8 and 9.

- **Overcrowded classes**

The government should invest in infrastructure and facilities to encourage teachers and students to teach and learn mathematics in schools. Students should be encouraged to learn in a classroom setting. Some schools lack sufficient classrooms, and students lack sufficient desks and chairs. This makes it difficult for the teacher to provide each pupil the individual attention that they deserve. It is difficult for the teacher to provide individual attention to each student, and it would be much easier for the teacher to recognize the students if class numbers were not so large.

- **Inadequate qualified teachers**

As soon as possible, the government should send more qualified teachers to all of the affected secondary schools. The government should send enough qualified teachers to secondary schools where the staffing is not only insufficient but also inexperienced.

- **Educational resources and language problem**

Department heads are in charge of making sure that all teaching and learning materials in their departments are secure and properly accounted for. Anyone who

loses a book, whether a teacher or a pupil, should be forced to replace it as soon as possible.

6.4.2. Factors Serving as Opportunities for Learning Grade 10 Mathematics in Schools in Nzhelele Central Circuit

The following are some of the recommendations related to study question number 2, which asked learners, teachers, department heads, and curriculum advisers about the elements that serve as opportunities for learning grade 10 mathematics in schools in the Nzhelele Circuit.

- **Usage of computer and access of internet**

The Department of Education should provide each student with a computer so that they can download programs that will aid them in mathematics. Students should be able to grasp mathematical concepts more easily if effective ICT training models are used in teaching and learning. Technology plays a key part in the teaching and learning of mathematics, and it improves student performance when used efficiently.

- **Teaching and learning resources from the department**

Educational policymakers at the Department of Education should ensure that schools have all of the physical and material resources they require. The Department of Education should ensure that school administrators and teachers receive in-service training on topics that affect school effectiveness, as well as establish monitoring mechanisms to measure it.

If classwork and homework are of poor quality, candidates will not be prepared to answer questions assigned for formal tasks (SBA) and tests. As a result, I propose that the Department of Basic Education only approve textbooks that promote conceptual thinking, i.e., practice questions that help students understand why something is done.

- **Intervention programs**

The government should develop intervention programs such as extra classes, winter and spring enrichment, and deploy specialized educators in the circuit to teach the learners to enhance Mathematics achievement.

6.4.3. Strategies to Utilise Available Opportunities to Learn Mathematics

The following are some of the recommendations made in response to research question 3, which questioned students, teachers, department heads, and curriculum advisers about ways that can be used to help students take advantage of opportunities to learn Mathematics.

- **Motivation**

Learners should be kept motivated at all times. The Department of Education should increase follow-up seminars on student achievement in Mathematics to avoid a collapse at the conclusion of the year. Workshops should be held to foster a feedback-friendly environment. Teachers should aim to attach their lectures to real-life events as much as possible to reduce the abstract nature of mathematical topics.

- **Hands-on activities as an opportunity in Mathematics**

Parents should provide total assistance to their children by getting the materials they need for practical work. Every school should have a Mathematics laboratory where pupils can practice their skills and put their knowledge to the test, according to the education department. Most importantly, they are actively creating knowledge rather than passively consuming it. To create and do something with their education, students must be actively involved. For years, increased academic accomplishment has been linked to involvement, such as higher test scores and academic achievements.

- **Working in groups**

Teachers should use profile and grouping to guarantee that students are adequately handled in order to increase educational quality. Students share ideas and help one another as they work in groups. Working with others encourages students to integrate their ideas and examine problems from other perspectives. Learners can try things that would be impossible for an individual to perform in a group context, combining a variety of skills and experiences to take on more difficult and larger-scale difficulties.

- **Parent influence**

Parents are also influential in their children's education. Enrolling a student in school is merely the first step. Parental involvement in education is critical and beneficial. Parents should participate and encourage their children to complete homework assignments. Even if they are unable to provide directions on how to do the assignment, discussing what the child has learned in class will motivate the youngster to do more in class.

6.5 RECOMMENDATIONS FOR FURTHER STUDY

The study met its goal of identifying significant elements that influence grade 10 learners' achievement and identifying factors that serve as chances for learning Mathematics and how learners use those opportunities to develop possible solutions to learning Mathematics issues. However, it has paved the way for future research in the following areas:

• The research was limited to secondary schools in the Nzhelele Central Circuit of the Vhembe District. Because the Vhembe District did not include all circuits, it is recommended that similar research be conducted in other circuits to see if the findings on learner achievement in mathematics in secondary schools are comparable and to determine the factors that influence learners' achievement in mathematics on school certificate exams.

- Because this study focused on learners' achievement in secondary schools in grade 10, more research into learner achievement in mathematics in grade 12 is needed. This study will make a significant contribution to improving Mathematics performance in secondary school because it will involve grade 12 students who are about to leave the school system, and similar research should be done in other regions of the province to see if the effective schools' model is applicable to all Secondary schools.

- Lack of motivation, a lack of resources, teacher effectiveness and learner discipline, teacher supervision, learner assessment, teacher-to-learner ratio, and parental involvement are all factors that affect Mathematics teaching and learning in the Nzhelele central circuit, according to the findings of this study. This research lays the groundwork for future research. As a result, more research can be conducted with a larger sample of schools and participants.

6.6. LIMITATIONS OF THE STUDY

The following are some of the study's limitations:

- Due to budget constraints, the study was limited to nine secondary schools in the Nzhelele Central Circuit. Different results could have been discovered in the same circuit if more schools had participated in the study.
- The study was limited to the Nzhelele Central Circuit in the Vhembe District of Limpopo Province. It's likely that different outcomes would have been obtained at the provincial level if the study had been expanded to more districts in Limpopo province. As a result, the findings of the study are not applicable to a larger, provincially based population. The findings are limited to impressions of rural places because the Nzhelele Central Circuit represents a rural site.

6.7. CONCLUDING REMARKS

Three main research questions were investigated in the exploratory study. The main research question focused on the factors that influence learners' mathematics achievement in grade 10. For students in grade 10, a combination of distal, opportunity, and propensity factors can be used to predict academic achievement. The model revealed that distal factors cause learners to benefit from opportunity and develop through propensity, resulting in mathematical achievement. It suggests that educators should design the learning environment such that individual students may make meaning of their mathematical knowledge and progress in mathematics. Educators can reach a wide range of students, including those who have given up hope of passing Mathematics, by introducing them to a variety of tactics rather than only those provided in the necessary textbooks. To ensure that learners receive high-quality education, all stakeholders in the educational system should collaborate. Educators must shift from teacher-centered to cognitive constructivist teaching methods. As the South African government and the Department of Education conduct improvements and reforms in Mathematics education to increase learners' accomplishment, the current study supports the need to develop educators and quality teaching quality as significant factors of learners' Mathematics achievement.

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APPENDICES

APPENDIX A: RESEARCH INSTRUMENTS
Questionnaire schedule for learners' grade 10

Factors Influencing Learners' Achievement in grade 10 Mathematics: The Case of Nzhelele Central Circuit in Vhembe West District in Limpopo Province

Aim: The aim of this questionnaire is to gather information about the factors influencing learners' achievement in grade 10 Mathematics to find possible solutions to the challenges.

Instructions:

1. Please answer all questions.
2. Your name is not required.
3. Please give your true response to all questions.

   Strong Agree ----------SA

   Agree----------A

   Disagree----------DA

   Strongly----------SD

SECTION A: GENERAL INFORMATION

A. Biographical Data

1.1 Gender

M F

1.2 Age group

15-17 18-20 21-23 24-

1.3 Textbook and other teaching materials provider

Parents Sponsor Government Community

1.4. Number of years per grade

1.5 Number of periods per week

1.6 Commitment level of your teacher during each period

High Moderate Termly

2. SECTION B: FACTORS INFLUENCING LEARNERS' ACHIEVEMENT IN GRADE MATHEMATICS

2.1 DISTAL FACTORS

		Strong Agree	Agree	Disagree	Strong Disagree
2.1.1	Lack of parental involvement in the education of their learners causes difficulties in Mathematics among learners				
2.1.2	Home environment and resources like access to internet contribute to learner achievement				
2.1.3	Learners of unemployed parents perform better than a learner of an employed parent				
2.1.4	Home background experiences affect learners' achievement				
2.1.5	Prior knowledge of Mathematics is the key to determining good performance				
2.1.6	Learners who solve Mathematics problems at home achieve better because their parents' guide them				
2.1.7	Lack of frequent support of learners by the parent in Mathematics contributes to learner's achievement				

2.1.8 Educated parents encourage or motivate their learners to perform better in Mathematics

2.1.9 Schools in rural areas perform better in Mathematics than schools in the city

2.2 PROPENSITY FACTORS

2.2.1 Learners' negative attitudes toward Mathematics contribute to learner achievement

2.2.2 Learners learn more effectively when they are interested in what they learn and achieve more if they enjoy what they have learnt in Mathematics

2.2.3 Developing a positive attitude, motivation as well as proper guidance towards Mathematics can improve the performance among learners

2.2.4 Learners should be willing to learn on their own

2.2.5 Interest of learners in Mathematics improves learner performance

2.2.6 Positive expectation in Mathematics is the key component that influences achievement

2.2.7 Enjoyment of teaching and learning during Mathematics periods improves achievement.

2.2.8 Spending more time on the section should assist the learner to master that section

2.3 OPPORTUNITY FACTORS

2.3.1 Teacher's attitude towards Mathematics contributes to learner performance

2.3.2 Inadequate qualified teachers of Mathematics cause difficulties in the subject among learners

2.3.3 Using inappropriate or poor methods of teaching Mathematics by teachers cause poor performance in the subject among learners

2.3.4 Extra support from the teacher affects learner performance in Mathematics

2.3.5 Teacher behaviour plays a significant role in the performance of learners

2.3.6 Schools that are located in poor regions have a higher risk to fall into learning difficulties in Mathematics

2.3.7 The foundation of learners in Mathematics in primary school affects learners' achievement

2.3.8 Learning and teaching media make teaching and learning of Mathematics easy

2.3.9 Language problem in learning Mathematics contributes to the achievement of learners

2.3.13 Overcrowded classes cause difficulties in the achievement of Mathematics

2.4 STRATEGIES THAT COULD BE ADOPTED TO UTILISE OPPORTUNITIES THAT MAY IMPROVE THE LEARNERS' ACHIEVEMENT IN GRADE 10 MATHEMATICS

3.1

3.2 Using appropriate methods of teaching Mathematics (learner-centred approaches) can improve the achievement of learners

3.3 Proper supervision and inspection by departmental officials can assist in improving the achievement in Mathematics of both the teachers and learners

3.4 Frequent helpful feedback can improve learner achievement

3.5 Provision of adequate and relevant Mathematics materials can improve the achievement of learners in the subject

3.6 The learning environment should be made conducive for effective teaching/learning to take place

3.7 Learners should be more involved in practical work than theoretical work

3.8 The necessary learning instructional materials for their learners improve achievement in Mathematics

3.10 Working in groups can improve learners' achievement in Mathematics

3.12 Good school-community participation as well as active parental involvement in the education of learners can help in improving the achievement of learners

3.13 Developing a positive attitude, motivation as well as proper guidance towards Mathematics can improve the achievement of public secondary school learners.

3.14 Provision of qualified and adequately trained Mathematics teachers can improve the achievement of learners.

3.15 Provision of additional facilities like libraries and Mathematics laboratories can assist in improving the achievement of public secondary school learners in the subject,

THANK YOU FOR RESPONDING TO THIS QUESTIONNAIRE

APPENDIX B: HOD's INTERVIEW SCHEDULE

INTERVIEW SCHEDULE FOR HEADS DEPARTMENT ON THE INFLUENCING LEARNERS' ACHIEVEMENT IN MATHEMATICS

Hello

My name is Reaneth Mamali and I am conducting a study on factors influencing learner's achievement in Mathematics

I am pleased to meet you. I would like to ask you a few questions on the influencing learners' achievement in Mathematics.

1. **BIOGRAPHICAL INFORMATION**

1.1. Gender  Male  Female

1.2. Age (in years) ……..

1.3. Period of time as a head of a department……..

1.4. Academic Qualification…….

1.5. Highest Professional Qualification ……

2. CONTEXTUAL RESEARCH QUESTIONS

2.1. Work schedule in Mathematics gives direction to the administration of various topics in the subject. Tell me about the challenges you experience in managing educators who teach Mathematics?----------
---

2.2. Mathematics educators have a mandate to create a conducive teaching and learning environment in the classroom. Tell me how you motivate educators and learners in Mathematics to achieve better? ----------
---

2.3. Having an individual meeting with the parent of the learners may determine the improvement in Mathematics. Do you involve parents in the education of learners, especially those who have difficulties in Mathematics?--
---

2.4. The attitude of learners towards Mathematics influences the efforts they put in understanding and practising mathematical concepts and skills. Can you describe the most important challenges that affect learner achievement in Mathematics?----------
---

2.5. Departmental policies give guidance on the various programmes of the subject. How often do you have departmental meetings about the achievement of learners in Mathematics?----------
---

2.6**. Heads of department efforts may determine the success of the strategies adopted.** Tell me the strategies that you use to remedy the difficulties faced by learners in Mathematics ?----------
---

2.7. **Motivating learners by introducing a practical application of genuine interest to the class at the beginning of a lesson**. Are there any ways in which learners can learn and have an interest in mathematical concepts with ease?----------
---

2.8. Is there anything else you would like to tell me about learners' achievement in Mathematics?

THANK YOU FOR YOUR TIME

APPENDIX C: MATHEMATICS TEACHERS' INTERVIEW SCHEDULE

INTERVIEW SCHEDULE FOR MATHEMATICS TEACHERS ON THE INFLUENCING LEARNERS' ACHIEVEMENT IN MATHEMATICS

Hello

My name is Reaneth Mamali and I am conducting a study on factors influencing learner's achievement in Mathematics

I am pleased to meet you. I would like to ask you a few questions on factors influencing learner's achievement in Mathematics

1. **BIOGRAPHICAL INFORMATION**

1.1. Gender ☐ Male ☐ Female

1.2. Age (in years) ……..

1.3. Period of time as a head of a department……..

1.4. Academic Qualification…….

1.5. Highest Professional Qualification ……

2. CONTEXTUAL RESEARCH QUESTIONS

2.1. Learners experience problems in understanding mathematical concepts and some topics. How can you change the situation?.....
.....
.....

2.2. **One major problem with Mathematics learners is the weakness in the language of Mathematics.** What can you do to improve the

situation?.....
.....
.....

2.3. Mathematics topics is the progression of sections from all grades from grade 8.

Which methods can a teacher use to assist learners to see the progression of the topics?.....
.....
.....

2.4. **Educators are expected to screen, identify, assess and support learners in their classrooms.** What are the challenges you experience in encouraging Mathematics learners and also the approaches you use when teaching Mathematics?-
---

2.5. **Hands-on activities will provide learners with opportunities to investigate, to build, take part, create and make drawings and to observe shapes in the world around them.** How do you motivate learners in the Mathematics classroom so that they can learn better, easily and interestingly?----------
---

2.6. To manage a big class can be difficult. What do you think is the best way to manage a big class?----------
---

2.7. **Educational programmes and different teaching strategies for learners with problems in Mathematics are constantly reviewed to improve their achievement**. How best do you think the implementation of intervention programmes and different teaching strategies may improve achievement? What is your opinion about different teaching strategies?----------

---

2.8. What is your preferred teaching style? Why do you prefer this style of teaching Mathematics?----------

---

2.9. **Prior achievement of learners is another aspect of learner related factor that influence learner achievement**. How do you incorporate learners' prior knowledge in your lesson?----------

---

THANK YOU FOR YOUR TIME

APPENDIX D: CURRICULUM ADVISORS' INTERVIEW SCHEDULE

INTERVIEW SCHEDULE FOR CURRICULUM ADVISORS ON THE INFLUENCING LEARNERS' ACHIEVEMENT IN MATHEMATICS

Hello

My name is Reaneth Mamali and I am conducting a study on factors influencing learner's achievement in Mathematics

I am pleased to meet you. I would like to ask you a few questions on the factors influencing learner's achievement in Mathematics.

1. **BIOGRAPHICAL INFORMATION**

1.1. Gender ☐ Male ☐ Female

1.2. Age (in years) ……..

1.3. Period as a curriculum advisor……..

1.4. Academic Qualification…….

1.5. Highest Professional Qualification ……

2. CONTEXTUAL RESEARCH QUESTIONS

2.1. Tell me about the challenges you experience in managing curriculum in Mathematics?----------
---

2.2. **Mathematics educators have a mandate to create a conducive teaching and learning environment in the classroom.** Tell me how you motivate educators and heads of departments in Mathematics to achieve better? --------
---

2.3. Can you describe the most important challenges that affect educators and heads of departments in teaching Mathematics?----------
---

2.4. **Departmental policies give guidance on the various programmes of the subject**. How often do you have workshops about policies in Mathematics?----
---

2.7**.** Tell me the strategies that you use to remedy the challenges faced by the head of the department in Mathematics ?----------
---

2.9. **Motivating learners by introducing a practical application of genuine interest to the class at the beginning of a lesson**. Are there any ways in which learners can learn and have an interest in mathematical concepts with ease?----------
---

THANK YOU

APPENDIX E: TEACHERS' VERBATIM INFORMATION

VERBATIM INFORMATION ON INTERVIEWS

INTERVIEWS WITH GRADE10 MATHEMATICS TEACHERS

The interview was conducted with 6 teachers from different schools in the Nzhelele Central circuit.

Researcher: Good morning? 1

Respondent: Good morning 2

Researcher: How are you? 3

Respondent: Very fine and how are you? 4

Researcher: Fine too. 5

Question 1.

Researcher: Learners tend to experience problems in understanding Mathematical concepts and in some topics. How can you change the situation around? 6

Respondent 1: By understanding first through discussion what they know about the topics

7

Respondent 2: When introducing topic every time provide basic knowledge of the new matter which can lead them to have a better motivation in subject 8

Respondent 3: Ensure that learners understand the basic concepts and expose them to various problems solving more problems can help improve their understanding 9

Respondent 4: Motivate learners before introducing a topic and tell them that the topic that we are moving to next is the simplest of them all. 10

Respondent 5: The topics that give learners challenges need actualization of concepts, the mathematical reality be exposed when teaching this topic including gestures. 11

Respondent 6: By making mathematics interesting. Making it more practical and something to play around with. Start with concrete examples. Ask learners to explain their ideas.

12

Question 2.

Researcher: One major problem with mathematics learners is the weakness in the language of Mathematics. What can you do to improve the situation?

13

Respondent 1: Encourage learners to do extensive reading of novels and newspapers. They should also note down new words and find their meanings to improve their vocabulary.

14

Respondent 2: Explain the meaning of terms used in mathematics 15

Respondent 3: By making mathematical look like play. By making learners start to use mathematical language from early age 16

Respondent 4: Mathematics vocabulary plays vital role in the understanding of concepts and its topic

17

Respondent 5: Teach learners using a medium of instruction (English), allow them to answer using English whenever answering questions 18

Respondent 6: Code-switching should be used and teachers should also tell them the words in the languages so that they can relate the terms 19

Question 3

Researcher: Mathematics topics is the progression of sections from all grades from grade 8. What methods can a teacher use to assist learners to see the progression of the topics? 20

Respondent 1: Discussing a topic before explaining it to understand and see how far they understand it. Also doing question and answer method to help them get involved. 21

Respondent 2: Teach extra hours. Do one on one with learners 22

Respondent 3: Frequently test the learners on questions linking various topics 23

Respondent 4: To start from the known to unknown. Start with simple topics. 24

Respondent 5: This is also real with topics, when addressing a concept in Mathematics approach should differ from grade to the other example patterns in grade 8 and 9, learners may be requested to establish a relationship between numbers while FET learners are able to develop a general term 25

Respondent 6: Basic concert in all topics should be emphasised. Enough background knowledge of mathematics should be laid down as a foundation. 26

Question 4

Researcher: Educators are expected to screen, identify, assess and support learners in their classrooms. What are the challenges you experience in encouraging Mathematics learners and also the approaches do you use when teaching Mathematics? 27

Respondent 1: Learners do not write work, they don't give themselves enough time to practice and to discover new knowledge by themselves. It is better to refer them to textbook every time 28

Respondent 2: Learner's needs and want to play the biggest challenge in this regard, this guide the ability of a teacher to choose a subject but through daily performance one can translate performance with the needs(career) they associate them. 29

Respondent 3: Attitude towards mathematics learners seen to think and believe mathematics is difficult. 30

Respondent 4: Learners attitude towards mathematics is negative. Mathematical language and concepts are difficult for learners to grasp. Giving learners as many informal activities as possible

31

Respondent 5: Learners struggle with understanding the questions so I encourage them to read the questions carefully and also explain to them how to analyse a question. 32

Respondent 6: Learners have got negative attitude towards mathematics I will give them more work to practice at home.

33

Question 5

Researcher: Hands-on activities will provide learners with opportunities to investigate, to build, take part, create and making drawings, and to observe about shapes in the world around them. How do you motivate learners in the Mathematics classroom so that the learners can learn better easily and interestingly?

34

Respondent 1: By stating how mathematics is an important subject that will make it easier for them to get admitted to the best universities.

35

Respondent 2: I show them triangles and compare them to real life concepts e.g. a rectangle to a classroom or a table. A triangle to a road sign- yield sign. i.e. relating mathematics concepts to real life objects. 36

Respondent 3: Conduct outdoor activities especially on assignments and projects. Use technology to project colourful and interesting mathematical visuals to draw the attention of learners.

37

Respondent 4: I ask them to use mathematical formulas in an everyday lifetime 38

Respondent 5: Encourage them to work in groups. Assisting each other, they must not belong to a group meaning that groups must rotate 40

Respondent 6: Learners should share knowledge in the classroom, especially when writing classwork and homework. Learners should be encouraged to work by themselves without the teacher's assistance.

41

Question 6

Researcher: To manage a big class can be difficult. What do you think is the best way to manage a big class?

42

Respondent 1: There must be classroom rules to monitor; all learners should adhere to those rules without any negotiations. There should have a class captain to attend to all problems before reporting to class teacher

42

Respondent 2: The vital aspect of teaching and managing a big class is good content delivery, showing the expertise in the content and making sure the way you teach evoke learners understanding

43

Respondent 3: Deal with learners in groups (smaller groups). Also, to identify learners that are behind and give them extra classes.

44

Respondent 4: Divide a class into groups. working with learners into groups helps to be able to identify learners that are struggling much quicker and assist them in time. Divide papers such that there will be a teacher for paper 1 and a teacher for paper 2 helps in managing the bigger class.

45

Respondent 5: By dividing the class into smaller groups, each group having a leader and assistance leader.

46

Respondent 6: By grouping learners into two or more, and focusing at one group at a time.

47

Question 7

Researcher: Educational programmes and different teaching strategies for learners with problems in Mathematics are constantly reviewed to improve their achievement. How best do you think the implementation intervention programmes and different teaching strategies may improve achievement? What is your opinion about different teaching strategies?

48

Respondent 1: Different strategies should be implemented e.g. Develop extra classes to assist learners with needs. Learners should be assisted according to their needs in such programs

50

Respondent 2: Profiling learners from their performance, creating extra activities for such learners, being there for their support, which includes extra lessons giving progress feedback to them.

51

Respondent 3: Variety is very good; it is essential when teaching learners (Learners are different) so when we vary the way of teaching this aid in understanding.

52

Respondent 4: Intervention programmes help in isolating struggling learners and offering them the assistance they need for them to pass. Different teaching strategies help in accommodating different learners' understanding. If this strategy does not work for learner A the other strategy might work.

53

Respondent 5: Learners learn or understand concepts differently. Strategies have to be varied for different learners to follow. When a concept is taught using different methods, learners get to know that there are several ways to tackle any concept.

54

Respondent 6: It motivate learners to want to do more and do better without hesitations

55

Question 9

Researcher: What is your preferred teaching style? Why do you prefer this style of teaching Mathematics?

56

Respondent 1: Practical teaching methods. It gives learners a chance to see their mistakes and they will have to rectify them in time. 57

Respondent 2: The demonstration style. I lead the class, I show the way, I ask questions, I encourage participation through discussions, and I assist learners who are slow to learn. Encourage learners to demonstrate also.
58

Respondent 3: Narrative discussion, question and answer. These styles help in improving learner understanding. 59

Respondent 4: Narrative and discussion. Explaining a new concept then we discuss it helps me to understand and see how many of my students understand the concept and those who need assistance. 60

Respondent 5: Varying access teaching methods help me to identify learners' shortcoming progress they are making in the content covering. 61

Respondent 6: Demonstration and discovery methods where learners are learning some time discovering using the textbook as their main resource.
62

Question 9

Researcher: Prior achievement of learners is another aspect of learner related factors that influence learner achievement. How do you incorporate the learner's prior knowledge in your lesson? **63**

Respondent 1: All learners are encouraged to participate and develop self-confidence, they must always practice and write classwork, homework and test to achieve their goals
64

Respondent 2: I give related activities which will connect learners with their priors' class or topics so that it will help us to see what key concept must be addressed each time a topic resumed.

65

Respondent 3: Every lesson starts from the unknown to the known, what learners know is important to help them understand the new knowledge

66

Respondent 4: By first doing a quick re-cap of prior knowledge in a class discussion manner to help learners to remember the prior knowledge. 67

Respondent 5: By asking a question of the topics already dealt with. Moving from the known to the unknown. Use known knowledge to build onto new knowledge

68

Respondent 6: In each lesson, they should write an activity based on the previous lesson.

69

APPENDIX F: HOD'S VERBATIM INFORMATION

INTERVIEW WITH THE MATHEMATICS DEPARTMENTAL HEADS

Interview was conducted with 3 Mathematics heads of departments from different schools in the Nzhelele Central Circuit.

Researcher: Good afternoon? 70

Respondent: Good afternoon 71

Researcher: How was your day? 72

Respondent: Fine and good, what about you? 73

Researcher: I am fine. 78

QUESTION1

Researcher: Work schedule in Mathematics gives direction to the administration of various topics in the subject. Tell me about the challenges you experience in managing educators who teach Mathematics?

79

Respondent 1: Failure to give more written work, failure to control all written work give

80

Respondent 2: Support and Monitor Educators work to come up with strategies to improve learner performance

81

Respondent 3: Some teachers dwell much on topics they like to detriment of other topics

82

QUESTION 2

Researcher: Mathematics educators have a mandate to create a conducive teaching and learning environment in the classroom. Tell me how you motivate educators and learners in Mathematics to achieve better? 83

Respondent1: By encouraging them to grow their thinking all the time. To use guidance for them to proceed on their own. By making mathematics fun, something to play around with. Make learners use gadgets like cell phones to learn maths. Encourage them to appreciate mathematics.

84

Respondent 2: Introduce appraisal for the best performing educator in mathematics. 85

Respondent 3: Content given must be related to everyday life situations (examples given must be related to what learners come across. Create a good atmosphere for learning by pasting charts related to maths. A maths class must communicate by itself.

86

Question 3

Researcher: Having an individual meeting with the parent of the learners may determine the improvement in Mathematics. Do you involve parents in the education of learners, especially those who have difficulties in Mathematics? 87

Respondent1: Yes, but few parents attend subject meetings, those who attend give support 88

Respondent 2: Yes, for only those who do not comply in class. 89

Respondent 3: Yes, and we encourage them to get people to assist their children. Advise them to encourage their children to form a study group.

90

Question 4

Researcher: The attitude of learners towards Mathematics influences the efforts they put in understanding and practising mathematical concepts and skills. Can you describe the most important challenges that affect learner achievement in Mathematics? 91

Respondent 1: Learners regard mathematics as a difficult subject. Generally, parents are poor and their education is low. Generally, most parents do not work and therefore not developed. Learners lack learning aids and well-qualified educators. 92

Respondent 2: Negative influence from the general perspective of people saying mathematics is difficult. 93

Respondent 3: Failure to write informal task, copying answers based on informal task from other learners 94

Question 5

Researcher: Departmental policies give guidance on the various programmes of the subject. How often do you have departmental meetings about the achievement of learners in Mathematics?

95

Respondent 1: Once a month 96

Respondent 2: Once per quarter 97

Respondent 3: Fourth night 98

Question 6

Researcher: Head of department's efforts may determine the success of the strategies adopted. Tell me the strategies that you use to remedy the difficulties faced by learners in Mathematics? 99

Respondent 1: Make sure that are given more written work to do

100

Respondent 2: making mathematics fun to stimulate the interest of learners to mathematics

101

Respondent 3: Repeating challenging topics very often. Connecting local objects to mathematical concepts. Grouping learners to tackle a topic and later report in class.
101

Question 7

Researcher: Motivating learners by introducing a practical application of genuine interest to the class at the beginning of a lesson. Are there any ways in which learners can learn and have an interest in Mathematics concepts with ease?
102

Respondent 1: Teacher showing the usefulness of a topic. Teacher telling an interesting story about the topic to sharpen learners to get interested. Teachers to make mathematics a real thing. i.e. by making learners understand that their learning is related to something outside the classroom. Teachers to know that learners learn differently. Learners have a preference in the way they solve problems.
103

Respondent 2: lower grades or GET learners.
104

Respondent 3: Yes, the topic to be taught must be related to day-to-day activities.
105

Question 8

Is there anything else you would like to tell me about learners' achievement in Mathematics?
106

Respondent 1: It seems to be a national problem.
107

APPENDIX G: CURRICULUM ADVISORS'VERBATIM INFORMATION

INTERVIEW WITH THE CURRICULUM ADVISORS

The interview was conducted with 2 curriculum advisors from the Nzhelele Central Circuit. Curriculum advisors are responsible for monitoring the work done by teachers and heads of departments.

Researcher: Good afternoon Sir? 108

Respondent: Good afternoon. 109

Researcher: How are you? 110

Respondent: Very fine and, how are you? 111

Researcher: I am very much fine. 112

Researcher: I just want to ask you a few questions, are you ready? 113

Respondent: Yes, I am ready. 114

Question 1

Researcher: Tell me about the challenges you experience in managing curriculum in Mathematics? 115

Respondent 1: When moderating educators' work at school, I found that educators do not give learners feedback when learners have gaps in the classwork and also informal tasks. 116

Respondent 2: Decline in the performance of learners and most learners have insufficient informal tasks. 117

Question2

Researcher: Mathematics educators have a mandate to create a conducive teaching and learning environment in the classroom. Tell me how you motivate educators and heads of departments in Mathematics to achieve better? 118

Respondent 1: I will encourage educators to give learners more work to do at home. Use previous question paper for revision. 119

Respondent 2: I encourage educators to encourage learners to have calculators and to make sure they finish the syllabus before time so that they can have time to give learners more tests. 120

Question 3

Researcher: Can you describe the most important challenges that affect educators and heads of departments in teaching Mathematics? 121

Respondent 1: I found that learners have negative attitudes towards Mathematics which makes them not to be serious. 122

Respondent 2: Learners do not have calculators and lack basics in Mathematics 123

Question 4:

Researcher: Departmental policies give guidance on the various programmes of the subject. How often do you have workshops about policies in Mathematics? 124

Respondent 1: We do have a workshop once per term 125

Respondent 2: Once per term 126

Question 5

Researcher: Tell me the strategies that you use to remedy the challenges faced by the head of department in Mathematics? 127

Respondent 1: To motivate learners and encourage them by telling them the importance of doing mathematics 128

Respondent 2: Encourage educators to have parent meetings and tell parents to buy Calculators and also tell them to teach basics though learners are in grade 10. 129

Question 6

Researcher: Motivating learners by introducing a practical application of genuine interest to the class at the beginning of a lesson. Are there any ways in which learners can learn and have an interest in mathematical concepts with ease? 130

Respondent 1: Yes, by making them learn the practical things in Mathematics like, in the geometric topic e.g. use signboard, drawings, etc. 131

Respondent 2: Yes, rewarding those who achieve well makes learners have an interest in Mathematics, so they can also get a reward and also doing practical examples that make to be interested in Mathematics. In fact, Mathematics must be funny. 132

APPENDIX H: REQUEST FOR PERMISSION LETTERS

Enquiries: NR Mamali

TEL: 0712417084

Email: mamalitr@gmail.com

P.O BOX 3012

Dzanani

0955

01 February 2021

The District Senior Manager

Vhembe West

Dear District Senior Manager,

REQUEST FOR PERMISSION TO CONDUCT RESEARCH

My name is Ntshengedzeni Reaneth Mamali and I am a PhD student at the University of Venda. I am carrying out a research on the factors influencing learners' achievement in mathematics: the case of Nzhelele Central Circuit in Vhembe West District. The main purpose of the research is to investigate factors which serve as opportunities available for learning Mathematics and how learners utilise those opportunities with the aim of finding possible solutions to the challenges of learning mathematics. I have been granted permission to conduct this research

I am requesting your permission to conduct this research in your schools in Grade 10 classes in the schools in Vhembe District Education Department. The research will involve Grade 10 teachers, learners and head of department. Data will be collected in the following manner:

- Questionnaires for learners in the grade 10 mathematics class. Responding to the questionnaire should take about 30-40 minutes.
- Individual interviews with educator teaching grade 10 mathematics learners and head of Department for mathematics from the school. Each interview will take about 20-30 minutes. Interviews will be audio taped.

Participation in this research is entirely voluntary. This means that everyone is free to accept or refuse to take part. If one agrees to participate, but later changes his/her

mind, he/she will be allowed to withdraw from the research at any stage without any questions being asked.

Participation of your schools in this research will not harm the school or the participants in any way. The researcher will not interfere with normal activities in the classrooms, and there are no foreseeable physical injuries that could result to anyone from her/his participation. The interviews will be conducted privately between the researcher and the individual teacher and head of department in a private area. This will provide a safe and comfortable environment where the participant will be free to express his/her views. Any views expressed will be used for the purpose of this research only.

In addition, the identity of the school and the participants, as well as their responses will be regarded as extremely confidential at all times and will not be made available to any unauthorized user. To ensure the confidentiality, learners responding to questionnaires will be asked not to write their names or any information that will give their identity linking them to the questionnaire.

If you still have any questions regarding the purpose, procedures and activities of this research, please do not hesitate to contact me at any of the above-mentioned telephone numbers or email addresses. Should you wish your schools to participate in this research, please sign in the form in the next page as a declaration that you give permission for the research to be conducted in your school.

Yours sincerely,

_____ _____

……. Date

CONFIDENTIAL

Ref: 2/2/2 Enq: Makola MC Tel No: 015 290 9448 E-mail:MabogoMG@edu.limpopo.gov.za

Mamali NR
P O Box 3012
Dzanani
0955

RE: REQUEST FOR PERMISSION TO CONDUCT RESEARCH

1. The above bears reference.

2. The Department wishes to inform you that your request to conduct research has been approved. Topic of the research proposal: **"FACTORS INFLUENCING LEARNERS ACHIEVEMENT IN GRADE 10 MATHEMATICS:THE CASE STUDY OF NZHELELE CENTRAL CIRCUIT IN VHEMBE WEST DISTRICT IN LIMPOPO PROVINCE "**

3. The following conditions should be considered:

3.1 The research should not have any financial implications for Limpopo Department of Education.

3.2 Arrangements should be made with the Circuit Office and the School concerned.

3.3 The conduct of research should not in anyhow disrupt the academic programs at the schools.

3.4 The research should not be conducted during the time of Examinations especially the fourth term.

3.5 During the study, applicable research ethics should be adhered to; in particular the principle of voluntary participation (the people involved should be respected).

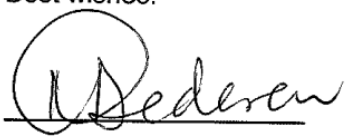
Cnr. 113 Biccard & 24 Excelsior Street, POLOKWANE, 0700, Private Bag X9489, POLOKWANE, 0700
Tel: 015 290 7600, Fax: 015 297 6920/4220/4494

3.6 Upon completion of research study, the researcher shall share the final product of the research with the Department.

4 Furthermore, you are expected to produce this letter at Schools/ Offices where you intend conducting your research as an evidence that you are permitted to conduct the research.

5 The department appreciates the contribution that you wish to make and wishes you success in your investigation.

Best wishes.



Dederen KO

Head of Department

05/05/2021

Date

APPENDIX I: INFORMED CONSENT DECLARATION

In terms of the ethical requirements of the University of Venda, I now request you to complete the following section as an indication or your voluntary acceptance to take part in this research:

I, _____ have read this letter and fully understood what the study is about. I understand that

- my participation in this research is voluntary, meaning that I can choose to take part or not to take part from the beginning; and that if I take part, I am free to withdraw from the research at any stage without being asked any questions or having to explain anything.
- in line with the regulations of the University of Venda regarding the code of conduct for proper research practices for safety in participation, I will not be placed at risk or harmed in any way by this research.
- my privacy with regard to confidentiality and anonymity as a human respondent will be protected at all times, meaning that my identity will not be made known to any unofficial user and whatever I say will remain confidential.
- as a research participant, I will at all times be fully informed about the research process and purposes.
- research information, including the information I give during the research, will be used only for the purposes of this research
- my trust will not be betrayed in the research process and in dissemination of its published outcomes, and I will not be deceived in any way.

hereby declare that I **(Mark what IS applicable**)

☐ **give** my *informed consent* for participation in this research.

☐ **do NOT** give *informed consent* for participation in this research.

Signature: _____ Date: _____

Researcher's signature: _____Date: _____

Thank you for your time

APPENDIX J: RESSC ETHICS CERTIFICATE

ETHICS APPROVAL CERTIFICATE

RESEARCH AND INNOVATION
OFFICE OF THE DIRECTOR

NAME OF RESEARCHER/INVESTIGATOR:
Mrs NR Mamali

STUDENT NO:
11637846

PROJECT TITLE: **Factors influencing Grade 10 learners' achievement in Mathematics: The case of Nzhelele Central Circuit in Vhembe West District in Limpopo Province.**

ETHICAL CLEARENCE NO: SEDU/21/CSEM/03/2903

SUPERVISORS/ CO-RESEARCHERS/ CO-INVESTIGATORS

NAME	INSTITUTION & DEPARTMENT	ROLE
Dr M Mpeta	University of Venda	Promoter
Dr LP Ramabulana	University of Venda	Co - Promoter
Mrs NR Mamali	University of Venda	Investigator – Student

Type: Doctoral Research
Risk: Minimal risk to humans, animals or environment (Category 2)
Approval Period: March 2021 – March 2024

The Research Ethics Social Sciences Committee (RESSC) hereby approves your project as indicated above.

General Conditions
While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, please note the following.

- The project leader (principal investigator) must report in the prescribed format to the REC:
  - Annually (or as otherwise requested) on the progress of the project, and upon completion of the project
  - Within 48hrs in case of any adverse event (or any matter that interrupts sound ethical principles) during the course of the project.
  - Annually a number of projects may be randomly selected for an external audit.
- The approval applies strictly to the protocol as stipulated in the application form. Would any changes to the protocol be deemed necessary during the course of the project, the project leader must apply for approval of these changes at the REC. Would there be deviated from the project protocol without the necessary approval of such changes, the ethics approval is immediately and automatically forfeited.
- The date of approval indicates the first date that the project may be started. Would the project have to continue after the expiry date; a new application must be made to the REC and new approval received before or on the expiry date.
- In the interest of ethical responsibility, the REC retains the right to:
  - Request access to any information or data at any time during the course or after completion of the project,
  - To ask further questions; Seek additional information; Require further modification or monitor the conduct of your research or the informed consent process.
  - withdraw or postpone approval if:
  - Any unethical principles or practices of the project are revealed or suspected.
  - It becomes apparent that any relevant information was withheld from the REC or that information has been false or misrepresented.
  - The required annual report and reporting of adverse events was not done timely and accurately.
  - New institutional rules, national legislation or international conventions deem it necessary

ISSUED BY:
UNIVERSITY OF VENDA, RESEARCH ETHICS COMMITTEE
Date Considered: March 2021

Name of the RESSC Chairperson of the Committee: Prof Takalani Mashau

Signature:

UNIVERSITY OF VENDA
OFFICE OF THE DIRECTOR OF RESEARCH & INNOVATION
2021 -03- 29
PRIVATE BAG X5050
THOHOYANDOU
REPUBLIC OF SOUTH AFRICA

APPENDIX K: LANGUAGE EDITOR'S CERTIFICATE

LANGUAGE EDITING CERTIFICATE

Registered with the South African Translators' Institutes (SATI)
Reference number 1000363

SACE REGISTERED

8 March 2022

TITLE: ***FACTORS INFLUENCING LEARNERS' ACHIEVEMENT IN GRADE 10 MATHEMATICS: THE CASE OF NZHELELE CENTRAL CIRCUIT IN VHEMBE WEST DISTRICT IN LIMPOPO PROVINCE***

This serves to confirm that I edited substantively the above document including a Reference list. The document was returned to the author with various tracked changes intended to correct errors and to clarify meaning. It was the author's responsibility to attend to these changes.

Yours faithfully

Dr. K. Zano

Ph.D. in English
kufazano@gmail.com/kufazano@yahoo.com
0631434276

APPENDIX L: SIMILARITY INDEX REPORT

FACTORS INFLUENCING LEARNERS' ACHIEVEMENT IN GRADE 10 MATHEMATICS: THE CASE OF NZHELELE CENTRAL CIRCUIT IN VHEMBE WEST DISTRICT IN LIMPOPO PROVINCE

ORIGINALITY REPORT

13%	9%	3%	5%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

MATCHED SOURCE

3	scholar.ufs.ac.za:8080 Internet Source	1%

< 1%
★ repository.up.ac.za
Internet Source

Exclude quotes	On	Exclude matches	< 3 words
Exclude bibliography	On		