GRADE 10 LEARNERS' EXPERIENCES OF THE TEACHING STRATEGIES IN ALGEBRA USED BY THEIR MATHEMATICS TEACHERS: A CASE STUDY OF TWO SCHOOLS IN THE PINETOWN DISTRICT

BY

REMIGIUS N. AMAEFULE

(Student Number: 212558040)

This dissertation is submitted in partial fulfillment of the academic requirements for the degree of Masters in Mathematics Education of the

College of Humanities

Faculty of Education,

University of KwaZulu-Natal

SUPERVISOR: Ms Busisiwe Goba

DATE OF SUBMISSION: August, 2022

ABSTRACT

This study makes use of social constructivism theory as the lens to explore Grade 10 learners' experiences of learning algebra in two selected High Schools in one township in Pinetown Education District, KwaZulu-Natal Province. The purpose was to examine learners' perceptions of strategies that their teachers use in teaching Grade 10 algebra and the way it supports or inhibits their learning of the topic. algebra is considered to be an important topic in mathematics. In High School mathematics curriculum, algebra is particularly important at Grade 10 because, it is at this time the Grade 10 learner moves to higher concepts and advance in their learning of algebra. However, observations indicated that among other areas that posed challenges to High School learning of mathematics in the district, learners' perception of algebra as difficult topic was a major factor. This prompted interest in the present study that used qualitative research approach and a case study design to explore in-depth, the learners' experiences in order to better understand the issues in teaching and learning Grade 10 algebra in the township schools. Questionnaires were developed for purposes of individual interviews given the limitations the COVID-19 pandemic restrictions imposed on conducting physical contact interview and focus group methods originally designed.

Hence the remote use of qualitative questionnaire instruments was employed to collect the data. Participants were purposively selected through written correspondence assisted by school administration in both schools. The sample comprised of 20 Grade 10 learners, 5 male and 5 female learners, each from the two schools. Choice of the schools was decided based on convenience because of their nearness to the researcher. The data was analysed using thematic analysis and triangulated at data source level. Findings show that some of the Grade 10 learners found algebra as a boring topic because they do not understand the algebraic concepts due to the teachers teaching approach. It was also found that these experiences impacted them negatively and positively in their perceptions of learning algebra.

The findings implications for teaching Grade 10 algebra are that (a) given that element of algebra is important in high school mathematics, finding ways of improving teachers' ability to use effective strategies to teach for learners' understanding of the topic at this crucial level is important for the township schools, (b) in addition, in the teaching algebra concepts, teachers should consider how to effectively differentiate for those learners that struggle to understand the teaching in English language. Deliberate efforts should be made to explain concepts in ways, and using examples and in language levels that connect with these learners.

Therefore, this study recommends the following: (a) the Grade 10 teachers are encouraged to always use variations of teaching strategies to teach the Grade 10 algebra so that learners can appreciate the learning; (b) Home language need to be involved in teaching mathematical concepts at Grade 10 curriculum so that both languages, i.e., home and second language would be simultaneously used to enable the learners consolidate their learning.

DECLARATION

I, Remigius Nnadozie Amaefule hereby declare that this dissertation is my own work, and that all the sources used have been acknowledged. Furthermore, this research study has not been previously submitted for a degree at any other university.

[redacted] 12-08-2022

Student's signature **Date**

[redacted] **12 of August, 2022**

Supervisor's signature **Date**

ACKNOWLEDGEMENT

My special thanks goes to Almighty for His grace and mercies for making this possible and for strengthen me to carry out this research study successfully. I would like to express my sincere appreciation to the following individuals for their support.

- Firstly, I would like to thank my Supervisor, Ms Goba Busisiwe for her help in guiding me, her patience and encouragement was instrument to the successful completion of this study.
- My family for their prayers, support and encouragements.

- And to the participants of this study, who trusted, shared their experiences and without whom this study would not have been possible.

Also, I will not fail to express my gratitude to Dr. Shongwe and other lecturers in Mathematics Education Cluster (UKZN).

LIST OF TABLES

LIST OF FIGURE

Table of content

CHAPTER ONE

BACKGROUND TO THE STUDY

1.1.1 INTRODUCTION

In the global context, learners are reported as under-achieving in mathematics (Foong & Ee, 2002; Agaliotis & Kalyva, 2019; Shamaki, 2015; Han, &Xu, 2020). Kumah and Wonu (2022), explain that learner underachievement in mathematics is usually associated to poor teaching of mathematics in schools. However, findings indicate that learners' poor mathematics achievement is as a result of the outdated teaching practices (Onah, Ugwuanyi, Okeke, Nworgu, Agwagah, Ugwuanyi, & Okeke, 2020; Colbert, 2021; Chand, Chaudhary, Prasad, & Chand, 2021) and lack of basic content knowledge result in poor teaching standards of mathematics in schools (Copur-Gencturk, 2021; Chand, et al,2021; Mulawarman, 2021). This suggest that there is a possible explanation of the connection between poor learners' achievement in mathematics and poor teaching of mathematics is perhaps the lack of teaching strategy in classroom delivery of the subject. Therefore, a good teaching strategy is known to have the potential of not only ensuring adequate delivery of subject content by the teacher, but perhaps more importantly, of making learning concrete in ways that connect to the lives and lived experiences of the learner (Voltz, Sims & Nelson, 2010).

In South African schools, mathematics teachers are often seen as a key in learners' performance in mathematics. However, an experienced teacher has a richer background of experience to draw from and can contribute insight and ideas to the course of teaching and learning, are open to correction and are less dictatorial in classroom (Bwenvu, Adhiambo, & Anyona, 2020; Onyenyili, 2018; Fatoba, Adeleye & Olofin, 2020; Lano-Maduagu, & Salami, 2020; Akanbi, Omosewo, & Ilorin, 2018; Kosgei, Mise Odera, & Ayugi, 2013).

This assertion is supported in Jones and Kahn (2018; Korpershoek, Hams, de-Boer, Van-Kujik, & Doolaard, 2014) who emphasise that teachers play a fundamental role in the cognitive and social emotional development of learners. It can then be argued that the effectiveness of the teaching strategy for in classroom delivery of the lesson is critical to the way the learner learns.

However, what we know about how learners experience the teaching of mathematics in the classroom may be limited. Of particular interest is how learners in Grade 10 experience the teaching of algebra using the strategies that teachers use to teach this topic in the Grade 10 classroom.

1.2 RATIONALE FOR THIS STUDY

From my personal and professional experience as a learner and teacher, I observed that learners usually associate their interest and achievement in algebra to the subject teacher. The popular narrative of the teacher is that of someone who has a mythical key to an abstract knowledge. However, I also observed that most students usually fail to perform well in algebra in their FET phase level despite their interest and engagement in the classroom during the teaching and learning process of the subject as well as based on their claims of being highly motivated by their teachers.

As a professional mathematics teacher with 7 years of teaching experience, I noticed that the Grade 10 learners tends to face mathematical problems when they transition from Grade 9 to Grade 10 mathematics class because the level of algebra, they are taught in Grade 10 is higher than that they encounter during their Grade 9 class. I also noticed that the problem with learners' low performance and underachievement in algebra might be as a result of the teacher's poor knowledge and lack of effective teaching strategy for classroom delivery of the subject, which prompted me to conduct research on Grade 10 learners' experiences of the teaching strategies in algebra used by their mathematics teachers.

Contextually, recent studies have shown that learners' access to mathematics is skewed in South Africa because it is erroneously perceived as difficult to learn (Paul & Ngirande, 2014). The report by the Institute of Race Relations (IRR, thereafter) in South Africa in 2017 shows that only 33% of Matric candidates passed mathematics at 40% or higher (IRR, 2018). Furthermore, the report indicates that between 2008 and 2021, the number of candidates that passed mathematics at 70% or higher decreased (IRR, 2018).

Again, in the 2016 the report of the Science, Technology and Innovation indicators report states that the percentage pass in Matric mathematics at 50% and above is low (STI, 2016). An

interesting dimension to the report also indicates the gender nuancing, which is that female Matric candidates who passed mathematics at 60% or higher has declined over the period 2008 to 2016 (STI, 2016). In addition, the 2015 report points out the downward spiral in mathematics performance of Matric candidates.

According to the report, a third of the learners who wrote mathematics in their Matric exams received poor marks of 20% or lower. Furthermore, the report indicated that about eighty percent of the learners scored marks less than 50%. In KwaZulu-Natal Province (KZN), reports also indicate a poorer performance in Matric mathematics compared to the national average. In 2015 for an example, KZN is reported as having the largest number of learners that performed poorly in Matric mathematics in a second year in a row. The performance chart of the KZN schools, in terms of their percentage pass rate according to the 2015 report, also showed a skewed result across school districts and particularly school types, with the ex-model C schools clearly performing better than the rural and under-resourced township schools. However, poor performance in Mathematics is not just a South African problem. Therefore, exploring the Grade 10 learners' experiences of the teaching strategies in algebra since algebra is the key topic in learning mathematics and in this case, is considered relevant and adds to the paucity of literature given the context of poor mathematics performance in the KZN province.

1.3 STATEMENT OF THE PROBLEM

Despite the different methods suggested by the South African Departments of Basic Education (DBE) through the CAPS policy to be employed by mathematics teacher in order to effectively teach this subject to the learners, several studies confirm the persistent of learners' poor performance in mathematics education (Department of Basic Education, 2013, Prinsloo, Arends & Rogers, 2015, Spaull, 2016, Pretorius & Spaull, 2016). The study by Oliphant and McCarthy (2013) reveal that there is an increase in the number of learners underperforming in education, particularly in the area of algebra. This is supported by various reports by the DBE (2014, 2015, 2015, 2016, 2017, 2018, 2019, 2020, & 2021) such as the Annual National Assessments (ANAs) and matric diagnostic reports.

The evaluation of the ANAs shows that the average achievement of learners in mathematics declined from 68% in Grade 1 to 37% in Grade 4 and 11% for Grade 9. In addition, the matric

diagnostic reports show in the Grade 12 mathematics result only about 20% of the learners achieved a 50% pass rate and above (DBE, 2014, 2015, 2015, 2016, 2017, 2018, 2019, 2020 & 2021). In particular 'in 2021, 750,478 learners enrolled in matric, but only 35% of them wrote the final mathematics examination, 20% Grade 12s passed, but only 5% passed with 60% or more (Gatticchi, 2022). This shows a challenge in the learners' performance from Grade 9 to matric. More so, the study in South Africa by Spaull (2015) reveals that learners encounter problems in algebra during their Grade 10 level in the FET phase. Spaull (2015) indicated that most learners drop out from the mathematics classroom in their Grade 10 and 11 classes. Therefore, it is the intention of this study to explore learners' experiences of how they view the teaching strategies in algebra used by their mathematics teachers at the entry of FET phase, which is Grade 10.

There is a plethora of studies arguing that mathematics teachers emphasize procedural knowledge as opposed to conceptual understanding of the mathematical concepts (National Council of Teachers of Mathematics, 2014; Rittle-Johnson & Jordan, 2016; Lawson, 2007; Protheroe, 2007; New Mathematics Teaching and Learning Framework for South Africa, 2018). This suggests that if mathematics teachers emphasise procedural knowledge to teach Algebra, then they might not be using a variety of teaching strategies such as problem-based teaching supporting conceptual understanding. The idea is that learners not only have to retain ideas, but relate them to other things they encounter, using each new situation to add nuance and sophistication to their thinking. These kinds of teaching strategies promote deeper learning.

Algebra as a section of mathematics curriculum is offered to Grade 10 learners from first term. Usiskin (2004) contends that lack of depth in understanding of algebra may result in the learner being unable or inept in applying or even understanding ideas and concepts in related areas of the sciences, economics. However, the researcher chose this Grade 10 level because this is when the learners chose their option, they will be doing mathematics literacy or pure mathematics. In addition, it is when the learners begin to move to higher concepts of algebra. Hence, this proposed study intends to gain a deeper understanding of the Grade 10 learner's views, opinions,

values, experiences and or perceptions of the teaching strategies used in their mathematics classroom. However, it is also important to gain an in-depth understanding of what Grade 10 learners have to say about their experiences of the teaching strategies used by their mathematics teachers.

1.4 AIMS AND OBJECTIVES OF THE STUDY

The above statement problem prompted me to formulate the aim and objectives of this study. This study aims to explore intersections of teaching strategies and the learner experience in mathematics teaching of Grade 10 algebra using a case study of mathematics teachers and learners in the two selected high schools in Pinetown district. Based on the aim of this study, this study was conducted using the following objectives:

- To identify the teaching strategies that the Grade 10 mathematics teachers use in the teaching of algebra in the two schools in Pinetown.
- To explore the Grade 10 learners' experiences of the teaching strategies of algebra using the teaching strategies their mathematics teachers' use in the two schools.

1.5 KEY RESEARCH QUESTIONS

The following key research questions were used to conduct this study:

- What are the teaching strategies the Grade 10 mathematics teachers use in teaching their learners algebra in the two schools in the Pinetown District?
- How do the Grade 10 learners experience the teaching of algebra by their mathematics teachers using the teaching strategies they use in the two schools in the Pinetown District?

1.6 SIGNIFICANCE OF THE STUDY

This study is considered significant because its findings will contribute to knowledge on the role of the learners in the effective delivery of algebra as a school topic. In addition, as an outcome, this study will contribute to advancing knowledge on how teachers can teach mathematics for understanding, particularly in Grade 10 algebra, at which level reasoning and strategic competence for working with mathematical concepts starts.

1.7 LOCATION OF THE STUDY

This study was carried out in two high schools in the township in Pinetown Education District, in KwaZulu-Natal Province as detailed in Chapter four. Pinetown is an industrial suburb of Durban with a dense population of mostly working-class people. In South Africa, a township is referred to as underdeveloped urban areas, residential and industrial sites. The major population is made of working-class people who are located in the townships where they live with families, and they move from there to work in the industrial areas. The schools are located in the township and children that attend the schools are children of the working-class people.

However, these schools in the townships are under-resourced schools, which in contrast to Ex-model C schools in the Pinetown Suburbs. They lacked adequate teaching and learning resources (Chetty, 2019; Mupa, & Isaac Chinooneka, 2019; Maila, & Ross, 2018). One thing that distinguishes resourced and under-resourced schools is the quality of teaching personnel. Ex-model C schools are well resourced as they have highly qualified teachers with teaching experience (Kanyopa, & Haleem, 2021; Adewumi, & Mosito, 2019), whereas in under-resourced schools, sometimes the teaching personnel are recently qualified teachers with limited professional teaching experience (Mupa, & Isaac Chinooneka, 2019; Shawe, 2015). Therefore, the choice of under-resourced schools as site of the proposed study is justified because of the following reason: (a) I want to look at the places where the most mathematics learners are challenged, perhaps in part largely because of the teaching strategies; (b) In these schools selected for this study, all two-boast big enrolment of learners; (c) Algebra is a compulsory topic for all the Grade10 pure mathematics learners.

1.8 DATA GENERATION METHODS

The study is a qualitative case study within the interpretivist paradigm. Methods of data collection include a semi-structured questionnaire. The participants were purposively sampled and data was triangulated at methods level and, interpretively analysed using thematic analysis. Ethical protocols were formally sought and received from the UKZN College of Humanities and the site gatekeepers.

1.9 OUTLINE OF EACH CHAPTER OF THE THESIS

This study is organised in six chapters: **Chapter one** comprises the introduction, background information, purpose and rational of the study. It also introduces the statement of the problem, the research objectives, the key research questions and the significance of the study.

Chapter two: In this chapter, the literature relevant to this study were used. Further in this chapter, the reviews were drawn from the issues on learner's experiences of teaching strategies in Algebra used by their mathematics teachers. This draws on the basis of different scholars withinthe area who had done similar work the researcher undertook.

Chapter three: Presents the theoretical framework that was employed to understand the Grade 10 learner's experiences of teaching strategies in algebra used by their mathematics teachers. In addition, the relevance of Vygotsky's Social Constructivism (1978) theory is clearly indicated and discussed in details.

Chapter four explains in details the research design and the method guiding this research study. The research made use of the qualitative research approach using interpretivist paradigm. This chapter also discussed the research style, sampling procedures used in selecting the Grade 10 learners, the procedure for data collection as well as analysis, location of the study and procedures for ensuring trustworthiness, while some ethical considerations were also not ignored.

Chapter five: This chapter includes the data analysis and discussions of the findings. In this data presentation, analysis, interpretation and discussions of the findings were presented according to the key research questions.

Chapter six: Concludes the study by presenting a summary of the findings in relation to knowledge about the Grade 10 learner's experiences of teaching strategies in algebra used by their mathematics teachers in the selected schools. The limitations of the study were also presented. Thispresent chapter concludes with the summary and recommendations and areas for further research studies.

CHAPTER TWO

REVIEW OF LITERATURE

2.1 INTRODUCTION

The purpose of this chapter was to review the literatures relevant to this study. Researchers have argued that a literature review provides an in-depth understanding of what has been done on a research field or topic (Cohen, Marion & Morrison, 2001; Hart, 1998; Manion & Land, 2011). In their study, a literature review is a critical portion of a research process in any field of enquiry and as such the main component of the final research report (Avin, Burley, Casey, Cherney, Christiansen, Daly & Minotti, 2015). Thus, reviewing literature helps the researchers to find the gaps in the area of the new research (Snyder, 2019; Creswell, 2012).

Therefore, this chapter presents a review of related literature relevant to this study. This would provide a foundation and ground theory for an organized study of the Grade 10 learners' experiences of the teaching strategies in algebra used by their mathematics teachers.

2.1.2 THE GAP IN THE LITERATURE

Mathematics is perceived as a challenging subject, which is only accessible to few people (Mutodi & Ngirande, 2014). Hence, several factors such as learners, schools and families have been indicated to contribute to the challenges of mathematics in general (Ngema, 2016; Ngidi & Qwabe, 2006). On one hand, a study shows that mathematics is for the intelligent ones or only for those who have inherited mathematical ability (Mutodi & Ngirande, 2014). On the other hand, it is also perceived as a subject meant for boys only, as they do better in mathematics than girls (Mutodi & Ngirande, 2014). Therefore, this perception could affect the attitude of girls towards learning mathematics. In contrast, Sinyosi's (2015) study on mathematical numeracy in South Africa identified that some learners tend to go for an easier option by enrolling for mathematical literacy in place of pure mathematics.

Several studies have also revealed that mathematics teachers concentrate more on procedural content knowledge than conceptual knowledge (Taole, Chakalisa, 1995; Mapolelo, 2001). Mapolelo (2009) found that mathematics teachers in Botswana schools used static collection of definitions, rules and algorithms as their teaching strategies when solving mathematical problems. However, mathematics teachers engage learners set of procedures and rules which are considered as the 'proper way' of solving problems.

This pose dangers since this technique would only assist them to solve problem without knowing the basic reasons for each step of solving problems (Borji, Radmehr, Front, 2019; French, 1992). In addition, learners are also required to memorize methods and procedures in mathematics and this inevitably makes them believe that mathematics is mainly a matter of following disconnected rules and symbols (Hiebert & Carpenter, 1992).

Boaler (1998) findings on the experiences and understanding of open and close mathematics reveals that learners who learn mathematics in an open, project-based environment developed conceptual understanding. Thus, provides them with advantages in a range of assessment and situations, while learners who followed a traditional approach developed procedural knowledge that was of limited use to them in unfamiliar situations. Therefore, he argues that the traditional approach that focus on procedures is disadvantageous to learners because it encourages learning that is inflexible.

Furthermore, Mapolelo (2009) study on learners' experiences with mathematics teaching and learning identified that mathematics was lecture oriented. In agreement, Hlalele (2012) explores rural high school learners' experiences of mathematics anxiety in academic setting also found that learners always experience anxiety due to the kind of teaching strategies employed by their mathematics teachers. He then recommends the need for mathematics teachers and schools to implement good teaching strategies' that will alleviate the effects of mathematics anxiety. It is clear that the literature reviewed focused minimally on learners' general experiences with mathematics teaching and not on the learners' experiences of the teaching strategies in algebra. Therefore, this study aims at exploring learners' experiences of teaching strategies in algebra used by their mathematics teachers.

Drawing from the above scholarship, identifying and bridging the gap in literature on the Grade 10 learners' experiences of the teaching strategies in algebra becomes vital. Also, evidence fromthe above literatures suggest that the learners' voices concerning the teaching strategies in algebraused by their teachers have always remained silent and unheard especially the Grade 10 learners in the selected South African schools.

In addition, most studies on teachers' experiences of teaching mathematics to learners showed that only limited study has been conducted on the learners' experiences, which makes this study relevant **(**Debba, 2011; Zuma, 2015; Madide, 2018; Khathi, 2019; Ramiah, 2018; Manyuchi, 2016; İflazoğlu, Saban, & Bal, 2012; Bojuwoye, Moletsane, Stofile, Moolla, & Sylvester, 2014). However, the study by Bojuwoye, et al. (2014) which focused on learners' experiences emphasised the need for learners to have learning support. Therefore, this suggests the importance of using effective teaching strategies as well as giving learning support to learners. Of course, teaching them algebra their mathematics teachers to gain and develop deep knowledge of the topic, criticalskills and to enhance their learning experiences becomes important in their learning. However, thenext section discusses the teaching of algebra in schools.

2.2 ALGEBRA IN SCHOOLS

Algebra is referred to as a language through which most of mathematics is communicated (Iji, Abakpa & Takor, 2015). Also, there is research evidence that algebra plays a major role for learners' opportunities to pursue many different types of education in a modern society (Gronmo, 2018; Kat, 2007; Kendal & Stacey, 2004). Understanding algebra is a key success in future mathematics courses including geometry and calculus (Star, Caronongan, Foegen, Furgeson, Keating, Larson, Lyskawa, McCallum, Porath & Zbiek, 2015).

Makonye and Stepwell (2016) claim that elements of algebra are found in all mathematics topics including geometry, statistics, trigonometry, vectors, and metrics at basic high school Grade 10 level. However, Makonye et al (2016) and Gronmo (2018) noted that learners need algebra to understand and possess the mathematical skills of reasoning and to make connections that are necessary to human daily living, they need algebra. However, Star et al, (2015) argue that such skills of reasoning are sometimes described as imposing high cognitive load or challenging working memory which can interfere with learner's ability to learn.

Therefore, Yerushalmy and Chazan (2008) recommend that learners should have access to algebraic reasoning since the ability to reason algebraically is a prerequisite for participation in

higher levels of mathematics. From these viewpoints, the researcher argues that developing strong knowledge of algebra in high school is important for success in learners' mathematical development (Rittle -Johnson, 2017).

According to Mhakure, Jacobs and Julie (2014), the lack of competence in algebra, poses a problem in learning mathematics for many learners in school and is a major global concern. Despite all that has been learned, algebra remains a substantial problem for many learners of high school mathematics in Africa and internationally (Pournara, Hodgen, Sanders & Adler, 2016). However, research literature addresses several factors that contribute to learner's difficulty in learning algebra (Reyes, 2012). Kieran (1992) explored the content of algebra, the way it is taught and learners approach to algebra can be traced to learner's lack of understanding.

In their work, Ramirez, Yuen and Ramey (1991) suggest that teaching the learner mathematics without ensuring a good understanding of algebra is comparable to "a child immersed under water in order to teach her to swim". Thus, they argue that algebra is a key topic in learning mathematics albeit the fact that learners complain that it is challenging (Mhakure, Jacobs& Julie, 2014). It forms the basis of high school mathematics and other topics including concepts in mathematics are dependent on competency in learning algebra (Mashaka & Makonye,2016).

It can be argued that a good foundation in algebra at Grade 10, which is perceived as the level where learners advance their learning, higher than elementary algebra, build up advanced algebraic concepts to develop competency in mathematical algebra concept.

However, study conducted by Usiskin (2004) found that lack of in-depth in understanding of algebra may result in the learner being unable to understand ideas and concepts in related areas of the sciences, economics, business, and to make wise decisions. It is therefore germane that the ways in which algebra is taught and learnt in high schools' mathematics, particularly at Grade 10, is given attention. Exploring the learners' experiences of teaching strategies, in algebra at Grade 10 level, is considered as a critical step, given the context of poor mathematics performance in the KwaZulu-Natal province. Hence, the next section explores what a teaching strategy means and the diverse teaching strategies that could be employed by mathematics teachers to teach learners algebra.

2.3 THE LEARNERS' EXPERIENCES OF THE TEACHING STRATEGIES IN ALGEBRA

This section deals with the learners' experiences of the teaching strategies in Algebra used by their mathematics teachers. Accordingly, a research study conducted by Yıldız and Ozdemir (2021), argue that teacher's knowledge of teaching algebra is very limited. In spite of numerous studies conducted on teaching strategies in algebra that reveals ineffectiveness of teaching and learning, most of the high school algebra lessons are still taught at such disconnected procedures (Star, Foegen, Larson, McCallum, Porath, Zbiek, & Lyskawa, 2015; Li, & Schoenfeld, 2019). However, a few studies have also indicated that despite the challenges the learners went through while learning the Grade 10 algebra, some of them became more successful in their academics.

Drawing from the above literatures, it shows that learners in high school had diverse learning experiences (negative and positive). However, these experiences are organised in two sections. The first part in this section, (2,3.1) discussed the learners' negative experiences of learning algebra whereas the second part deals on the learners' positive experiences. The next section addresses these experiences in details as follows.

2.3.1 LEARNERS' NEGATIVE EXPERIENCES OF THE TEACHING STRATEGIES IN ALGEBRA

According to Kunwar (2020) learner's difficulty in learning the algebra lessons are due to teacher's aversive teaching approach. However, a plethora of studies on the learners' experiences have identified several factors affecting their learning at school. Researchers reported that majority of the learners experience difficulties while learning algebra at high school (Djam'an, 2021; Umbara, Susilana and Puadi, 2021; Agustyaningrum, Sari, Abadi, & Mahmudi, 2021; Gafoor, &Kurukkan, 2015; Li, Lemieux, Vandermeiden, & Nathoo, 2013; Kathard & Pillay 2015). However, the literatures highlighted these barriers to learning algebra. For example, learners complain about finding the algebra lessons boring (Djam'an, 2021; Umbara, Susilana & Puadi, 2021; Li, Lemieux, Vandermeiden, & Nathoo, 2013; Agustyaningrum, Sari, Abadi, & Mahmudi, 2021) not interesting and an avenue for them to dose off as a result of the teaching approach used by their mathematics teachers (Davis, 2018).

Furthermore, research studies (Agustyaningrum, Sari, Abadi, & Mahmudi, 2021; Gafoor, & Kurukkan, 2015) argue that teachers' medium of instruction and lack of understanding are some of the reasons learners find algebra boring. Barrios, Lopez-Gutiérrez and Lechuga (2016) also put forward that this challenge is associated with the medium of the instruction. In agreement, Mpho (2018) argue that mathematics teachers are not ready to apply varieties of teaching methods in their teaching and resort to the use of a particular teaching method that makes the lesson boring and uninteresting. In addition to un-engaging lessons, the nature of the topic is very challenging and calls for diversified and suitable methods for teaching algebra to make the learning more engaging and connect to their reality. Some of the points raised here constitute into barriers that inhibits learners from learning and understanding the topic as it should be.

Furthermore, Mupa and Chinooneka (2015), argues that teachers of this subject do not go extra mile to make learning easier for their learners. They could not explain the subject concepts clearly to their learners by giving accurate illustrations and examples to make them understand better. Researchers note that many of these teachers do not really know how to teach to give better understanding to their learners (Guerriero, 2014). He further reveals that, those who are competent enough to give their best are not willing to do so and debarred by their ego, at some point learners become discouraged and learning fails to take place.

Some research into teaching and learning mathematics, reported that majority of the learners in South African high school are faced with challenges of language barriers (Baugh, 2021 & Geiger, 2009). They indicated that some of these learners struggle to understand the medium of instruction used by their mathematics teachers. Jourdain and Sharma (2016) argues that language barriers are one of the challenges experienced by the Grade 10 learners learning algebra at school.Literatures pointed out that South Africa is a prime example of a country facing the dilemma of effective mother tongue and English language in communicating mathematics algebra (Foncha, Abongdia, & Mkohlwa, 2016; Chikasha, 2021). In this context, some of the learners do not speakEnglish as their home language but required to take their school examinations in English language(Leung, & Valdés, 2019).

According to Jourdain and Sharma, (2016) the difficulty in understanding Algebra is likely to results from the use of English language in its teaching among many other factors. Plethora of studies (Pather, Motilal, & Fleisch, 2017; Nndwamato, 2017; Pretorius, & Klapwijk, 2016; Butler, Peng, & Lee, 2021) argue that some of these learners are also struggling to understand the basic concepts of English language, pointing that there are teachers who suffer with learners who are lacking the basic English skills.

Other studies came to a similar conclusion that learners fail to understand algebra concepts due to the language barrier because the concepts are not being explained or broken down in a language, they are able to access. (Ladson-Billings, 2021; Frank, 2018; Darragh, & Valoyes- Chávez, 2019; Miller, 2021). This is to say that the teachers are using abstract language that does not connect to their reality.

Saneka, and de-Witt, (2019) argue that a learner who is nervous or reluctance to answer questions may be more outspoken when talking about their own values that tie with their home language. Therefore, if home language is the key instruments associated with gaining understanding to algebra, then, there is need for school algebra to be taught in the language the learners will be able to understand. More so, there is evidence that learning school subjects in a language that is not the learner's home language do have a negative impact on their learning. For example, a research study carried out in Lae Southeast of Asia, shows that students at Papua New Guinea had difficulties understanding Algebra because they are not being taught by their home language (Kik, Adamec, Aikhenvald, Bajzekova, Baro, Bowern, & Novotny, 2021; Clarkson, 1994).

Then, another issue arising from the literature is the language of algebra which some learners in high school are still struggling to understand. Accordingly, Bone, Bouck, and Witmer, (2021) indicated that learning algebra is more like learning a different language. Recent researcher, Planas (2021) share similar view and define algebra as a language with expressions and sentences. In a study that sought evidence to the issues raised above, Herscovics (2018) disclose that learners find it challenging evaluating algebraic expressions due to poor understanding of algebraic language.

Finally, the use of language that lacks clarity is not helpful (Moses & Mohamad, 2019). For their part, language of algebra is connected with English language and this is particularly important

when teachers realise that there is a steady increase of South African learners from different background (Mlachila & Moeletsi, 2019). They therefore advise that teachers need to be aware of the issues surrounding the teachings of algebra and strategize their teachings accordingly. Not being aware of these issues may perhaps have a negative impact on some of these learners. On the other hand, many researchers argue that the effectiveness of language of algebra also depend on the competency of the teachers on the use of the language (Santana-Monagas, Nunez, Loro, Huescar, & Leon, 2022). They further argue that some teachers overlook culture and may perhaps try to jump right into certain language without considering the learners' background.

However, once the teachers do not show a good understanding of the language of algebra they are teaching and how to efficiently use it in the classroom (Turkan, & de Jong, 2018) learners find the learning so confusing. This is to say that some mathematics teachers are not concerned about these learners who are faced with academic challenges understanding the language of algebra and the use of English language as the medium of instruction. These challenges include the need to accommodate the language the Grade 10 learners are familiar with, which can be seen as the discontinuity between the outcome of schooling in senior high school and for higher learning.

On the issue raised above, majority of South Africans learners in the high school, study a wide range of school subjects using a language that is not their mother tongue (Ying, Osman, Kurniati, Masykuri, Kumar and Hanri (2020; Madadzhe, 2019). This is meant to argue that the absorption of what is learnt might be different from first language speakers who have conceptual understanding of the language of instruction unlike those who use it as first additional language. This in part may account for the high failure rate in algebra in particular and other content subjects at large. It is undeniable that South Africa is a nation involving people with different languages and cultures must ensure learner's main language be treated as a resource rather than a problem (Zano, 2022).

Attitude can impact on a learners' performance positively or negatively (Omolara & Adebukola, 2015). Ekperi, Onwuka and Nyejirime, (2019) upheld this further and argues that teachers nonchalant attitude can impact on learners learning. However, a study of (Omolara, & Adebukola, 2015; Kathard and Pillay (2015) reveals that some mathematics teachers in high schools are exhibiting negative attitude towards their learners. As a consequence, a teacher with attitude may not be friendly to his learners like a teacher who has positive attitude.

And therefore, learners will find it hard to seek for clarity from such teacher on the grey areas he or she teaches. In their study, Panthi and Belbase, (2017) argue that some mathematics teachers are not good enough to teach the subject they are teaching. Mangwende, and Maharaj, (2019) explains that those who are competent focus more on abstract things without any reference to context that might give meanings and clarity of the topic. This is to say that some of these teachers will hide some important information that would have more beneficial to the learners. Thus, this negative attitude towards disposition of some important facts may affect learner's performance. Therefore, such attitude by these mathematics teachers can hinder learners from knowing how interesting the topic 'algebra' can be. The next section presents the learner positive experiences.

2.3.2 LEARNERS' POSITIVE EXPERIENCES OF THE TEACHING STRATEGIES IN ALGEBRA

In South Africa, majority of the high school learners are not motivated to learn algebra due to lack of understanding of the concepts (Mabena, Mokgosi, & Ramapela, 2021). Although, the key findings of a study conducted by Williamson and Paulsen-Becejac (2018) indicated that the learners who engaged in peer learning achieved their learning outcomes successfully. In the same vein, many research studies pointed out that some learners had positive learning experiences especially when they learn with peers (Clark, 2015; Fredricks, Hofkens, Wang, Mortenson, & Scott, 2018; Double, McGrane, & Hopfenbeck, 2020). This includes learners who share ideas about their subject's concepts amongst with their peers.

When learners work in peers, they learn the value of peer interaction leading to the development of teamwork and problems solving skills (Herro, McNeese, O'Hara, Frady, & Switzer 2021). Similarly, the study of (Ghavifekr, 2020) added that learners who are involved in peer learning acquire professional skills. The result further revealed that South African learners who participated in the peer sessions had positive learning experiences and developed skills. For example, problem solving skills while they work with peers. This is what social constructivism theory by Vygostsky (1978) disclosed that learners acquire new knowledge through interactions with peers. Drawing from the above literatures shows that learners acquire new skills when they work with one another.

2.4 VARIOUS TEACHING STRATEGIES USED IN THE TEACHING OF ALGEBRA

The primary purpose of teaching at any level of education is to bring a fundamental change in the learner (Tebabal & Kahssay, 2011). In order to achieve this, it is expected that a mathematics educator should be knowledgeable about the topic and teach for a better understanding.

According to Aldossari (2018) the education system still faces many challenges because of the wide spectrum of learners' differences, needs and concerns and patterns of thinking (Aldossari, 2018). Studies report that the greatest factors affecting learners' success is the method used by their teachers in teaching them algebra (Dorgu, 2016). In another study, Hechter (2011) found that many teachers tend to structure their teaching strategy directly by their own interpretation without looking at the differences that exist in the learners.

As such, Hunt, Touzel and Wiseman (2009) argue that teachers are not only challenged to identify certain instructional strategies but also challenged to develop the ability to apply the strategies appropriately to teach their learners. However, with an adept use of suitable strategies, a teacher can accomplish his goal in the content delivery of the subject (Thamarana, 2015). Against this background, the concept of teaching strategy has emerged. Thus, before defining what the teaching strategy is, it is important to describe what a strategy is. Thamara and Narayana (2015) are of the idea that a 'strategy' is a procedure used in learning which serves as away of reaching a goal. In support of this observation, plethora of studies argue that a strategy include sequences, choices made and steps taken in attempting to solve a problem (Star, Caronongan, Foegen, Furgeson, Keating, Larson, Lyskawa, William, McCallum, Porath & Zbieth, 2015).

From Bhalli, Satta and Asif (2016) teaching strategy can be viewed as a method, techniques and procedure a teacher uses during instruction to achieve a desired learning outcome. Prawat (1992) carried this further that teachers' approach of teaching strategy is seen as the type that suit ones philosophy of education. Also, studies by Ayeni (2011) and Rushton (2014) argue that the teaching approach that a teacher adopts is one factor that may affects learners' achievement and facilitates high standards of learners' outcomes. Therefore, there is a need for a teacher to set patterns, routines and help the learners to get relaxed and be able to catch up with the flow of the lesson.

Consequently, there have been reports about the lack of knowledge of basic content as being amongst the causes of poor standard of teaching. In Nigeria, Abdullahi (2007) argue that majority of teachers lack adequate knowledge of content of subject matter and the competency to teach algebra. Darling-Hammond and Ball (1997) confirm the notion that inadequate subject matter knowledge by the teacher has been found to be a major factor lowering the standard of quality teaching.

Fundamentally, in the context of South Africa, the Centre for development and enterprise (CDE, 2015) argue that the greatest challenges facing the South African education system is the production of insufficient competent teachers who can provide quality teaching for all school subject. A study of Spaull (2013) on the analysis of the Grade six pupils shows that majority of South African mathematics teachers have below-basic levels of content knowledge. In addition, plethora of studies contends that teachers' content knowledge is strikingly low (Bold, Filmer, Martin, Molina, Rock, more, Stacy, Wane, 2017). According to Ventkat and Spaull (2015) in some areas of South Africa, up to 79% of the grade 6/7 mathematics teachers have content knowledge below a grade 6/7 level.

McAuliffe's (2013) study explored a South African primary school pre-service mathematics teacher's knowledge of subject matter of early algebra. The results shows that the subject matter knowledge for teaching early algebra was not fully established as there were problems while they respond to three major aspects, such as describing the procedures used by the learners, interpreting learner productions and analyzing learners' errors to improve teaching.

Therefore, if the teacher do not have a good knowledge and skill to present algebra as more than just examples and exercises then learners will be unable to appreciate and use algebra in the context in which they find themselves (Ehrlich, 2017). Grave-Meijer, Stephan, Julie, Lin and Ohtani (2017) recommend that the school of mathematics education should prepare learners for applying mathematics in all sorts of works and everyday life situations. In line of reasoning, the main goal of primary education service is to extend opportunities for learners to develop to their potential by providing activities to develop their life skills (Office of Bueng Kan Primary Educational Service Area, 2013). To successfully achieve this objective, the high schools should engage learners with different teaching strategies that will enhance their learning of school algebra.

Drawing from the literatures reviewed, the researcher argues that using different teaching strategies in the classroom will improve and facilitates the understanding of learners learning algebra and also improve their performances. As such, it stems from the assumption that teaching strategies need to be diversified and adopted to suit the diversity of learners needs in the classroom (Aldossari, 2018).

2.5 TYPES OF TEACHING STRATEGIES FOR TEACHING ALGEBRA

However, the researcher will focus on traditional teaching approaches which involves teacher-centered and the learner-centered approach known as the modern teaching strategy (Bappoo, Buzuzi & Ksiyandima, 2004). At the same time, the researcher will also discuss some examples under the above strategies.

2.5.1 TRADITIONAL TEACHING APPROACH

According to Tularam and Machisella (2018), traditional teaching approach involve teacher-centered instructional methods where learners are taught in such a way that is conducive and listening. Liu and Long (2014) further assert that, in this teaching approach learners are just listeners and, in a teacher, centered classroom teaching, a teacher asserts control over the material that learner's study (Sawant & Rizvi, 2015). Studies also stress that this approach is the most common method of classroom instruction in the form of teacher question (Coe, Aloisi, Higgins, Major, 2014). Sadly, the majority of those questions are considered to be low-level questions which answers require mainly memory neglecting the demand for critical thinking (Almeida, 2012; Franke, Webb, Chan, Ing, Freund & Battery, 2009). Asking high level questions helps learners direct their learning as they try to merge their prior knowledge and new information in their attempts to make sense of these ideas (Almeida, 2012). In contrast, Doherty (2017) reveals that low levels of questioning and explaining on the part of the learners have been found to be correlated with lower achievement.

In a traditional teaching approach, learners usually expect knowledge to be transmitted from the teacher to the learners, thereby putting the learners in a passive role (Vincent & Akpan, 2014). To this end, teachers are information providers and then monitor learners to get the right answers, yet learners are viewed as learners who passively receive information (Emaliana, 2017).

Secondly, in a traditional classroom, the teachers introduce algebra concepts and expect the learners to understand and apply them and this leads to the difficulties learners encounter as a result of this mode of transmission of knowledge (Osei, 1998). Consequently, these practices of teaching and learning of teacher directed methods, instructions become boring for some learners resulting in their minds wondering and may miss important facts (Mpho, 2018; Alabsi, 2016; Timperly, Wilson, Barrar & Fung, 2008).

Furthermore, studies also reveal that this traditional teaching approach place emphasis on rules, as such, learners are made to learn only rules to solve problems in algebra (Liu & Long, 2014; Osei, 1998). They however, advised that teaching should not focus merely on dispensing rules and procedures for learners to memorize but should engage learners as primary participants (Zakaria, Chin & Daud, 2010).

2.5.2 LEARNER-CENTERED APPROACH

Many high school teachers have always strived to search for the ideal method to implement in the classroom for effective learning and teaching (Serin, 2018). During the last decades, teacher centered teaching style has been replaced by learner-centred teaching style in higher education (McCombs & Whistler, 1997; Weimer, 2002). According to Ahmed, (2013) for many years, the traditional teaching style, teacher-centered instruction has been dominant in higher education in North America. Similarly, Lak, Soleimani and Parvaneh, (2017) also revealed that the traditional or old-style of teaching has been dominant for many years in Iran.

Furthermore, in Saudi Arabia, ELF learners was reported to have poor achievement due to the traditional teaching style used by educators (Alrahaili, 2013; Alrashidi & Phan, 2015). Meanwhile, the South African educational policy which is the curriculum and Assessment Policy Statement (CAPS, thereafter) in Mathematics for Grade 10-12 was developed to assist teachers and learners in the learning of mathematics. Under CAPS, it was stipulated that teachers are expected to use several learner-centered approaches such as, *role-play, Inquiry-based approach, constructivist teaching, cooperative learning approach, and classroom discussion* method to ensure learners participate actively during the teaching and learning process (DoE, 2011).

Therefore, in the next section below, the researcher will be discussing the different learners' centered approaches mentioned above that could be employed by mathematics teachers to teach

their learner's algebra in the classroom. This will enable us understands the importance and effectiveness using role play, inquiry base and constructivists teaching approaches to teach algebra.

ROLE-PLAY

According to Erturk (2015) the major aim of learning design is to create educational settings that are learner activity centered. A typical role-playing activity would have learners taking on a role, acting as that individual would do in a typical setting (Jarvis, Odell & Troiano, 2002). When role-play is used in classroom, learners become active participants in their studies rather than passive observers (Alt & Reingold, 2012; Stevens, 2015; Jarvis, Odell & Troiano, 2002). In addition, role-play encourages the kind of learning where learners are required to act specific roles through saying, doing and solving problems (Altun, 2015; Morrone & Livuza, 2018). Accordingly, the purpose was to provide opportunities for learners to revise their past attitudes about teaching and learning mathematics to incorporate a more positive and informed view of how algebra can be taught (Kilgour, Reynaud, Northcote & Shieds, 2015).

However, studies have also shown that this technique has been used successfully in a variety of situations (Havens, 2019; Chesler & Fox, 1996). Among them, this teaching technique can teach some skills that are very difficult to learn such as problem solving, communication, initiative and team work (Moreno-Guerrero, Rodriguez-Jimene, Gomez-Garcia, Ramos Navas-Parejo, 2020; Nair, 2019; Sethi & Dabas, 2019; Smith, & Pellegrini, 2008; Unicef, 2018). In addition, the use of role playing, may enhance lower achievers' engagement in mathematics to experience success by contributing to the class activity and then become highly involved in their learning activities (Moreno-Guerrero, Rodriguez-Jiménez, Gómez-García, & Ramos Navas-Parejo, 2020; Chesler & Fox, 1996). Hence, a good teaching strategy that could be used to assist learners to learn how to make decisions on their own and support their ability to work with peers (Havens, 2019). Therefore, role-playing is considered to be a technique that encourage co-operative method in learning algebra (Joma, Al-Abed, & Nafi, 2016; Havens, 2019).

Under this perspective, plethora of studies also argue that teachers utilize role-playing when the opportunity presents itself as part of the continuing class activity rather than on any regular basis (Darling-Hammond, Flook, Cook-Harvey, Barron & Osher, 2020; Chesler & Fox, 1996; Darling-Hammond, Hyler & Gardner, 2017). Role-playing therefore provides not only a variation in the

According to Chesler and Fox (1996) based on their observation, role-play techniques have proved highly useful to many learners and teachers for dealing with a variety of the classroom problems and reaching certain objectives. Therefore, I perceived that presenting a role-play strategy for teaching algebra in mathematics classroom especially at the Grade 10 levels can be an effective means to scaffold learners to learn on their own.

INQUIRY-BASED APPROACH

Friesen and Scott (2013) define inquiry-based learning as a learner-centered instruction in mathematics that places learner ideas questions at the center of the learning experience. However, this technique highlights active participation and learners' responsibility for their learning (Constantinou, Tsivitanidou & Rybska, 2018). Furthermore, research studies have also shown that inquiry-based learning is also a way of learning where learners are actively involved in a self-directed inquiry, and collaborate with one another (National Research Council, 2000; Pedaste, Maeots, Siiman, De-Jong, Van Riesen, Kamp, Tsourlidaki, 2015). Evidence from prior research findings indicated that this approach places learners' ideas at the center of the learning experience (Gholam, 2019; Friesen & Scott, 2013). Therefore, it is important inquiry- based learning become necessary in daily school curricular to ensure an interactive learning journey that calls out for deep learning and engage learners (Gholam, 2019). Although, many of its characteristics are aimed at stimulating learners to adopt a critical inquiring mind and problem-solving aptitudes (Dorier and Maaß, 2012). Therefore, it is important to engage learners with inquiry-based learning as a way of enhancing their learning most especially in their learning of algebra in Grade 10 mathematics classroom.

On the contrary, Capps and Crawford (2013) argue that teachers do not apply the inquiry-based approach in their classrooms as much as expected. In addition, Isiksal-Bostan, Sahin, and Ertepinar (2015) found that teaching experience is positively related to beliefs in using traditional teaching approaches but not to beliefs in inquiry-based teaching approaches.

In a study by (Smallhorn, Young, Hunter and da-Silver 2015) that explored inquiry-based learning to improve learners' engagement in a large first year topic. The result reveals high level of learner's satisfaction and improvement in their learning outcomes. In another study by Mensah-Wonkyi and Adu (2016) to examine the effect of inquiring-based teaching approach on senior high school learners' conceptual understanding of circle theorems.

Drawing from the above literatures, shows that inquiry-based learning enhance the development of independent learners by encouraging them to take responsibility for their own learning (Smallhorn, Young, Hunter & da-Silva, 2015).

CONSTRUCTIVIST TEACHING

According to Bhowmik (2015) most traditional mathematics instruction and curricula are based on the transmission or absorption in the view of teaching and learning. This method considers learners mind a sponge which could be filled with information with the expectation that a learner will absorb all that information (Upadhyaya, 2013). As opposed to a constructivist method whichoffers a sharp contrast where a learner is seen as an active participant that construct his or her own knowledge (Adom, Yeboah, & Ankrah, 2016; Mogashoa, 2014). Bhattacharjee (2015) noted that constructivist teaching is based on the fact that learning occurs when a learner is actively involved in a process of meaning and knowledge construction as opposed to passively taken information.

However, this is to say that learning does not take place from traditional method of teachers especially when a teacher is standing in front of the class and doing all the teaching (Adom, et al, 2016). Rather, constructivism holds that learners do not acquire knowledge and skills passively but actively build or construct their own knowledge of their information or subject presented to them (Bada & Olusegu, 2015; Larochelle, 2010; Mogashoa, 2014; Ekpenyong, 2018). Meanwhile,the constructivist teacher provides learning activities that encourage experience- based learning, in which learners formulate and test their ideas in order to a draw conclusion (Sunderman, 2006).

In a constructivist learning approach, teacher provides a variety of learning situations to the learners and the learners' role changes from passively receiving information to knowledge construction (Tam, 2000; Bhattacharjee, 2015). In other words, the teachers' role is not limited to administer lessons to her learners but to create a conducive learning environment and act as an expert learner who can guide learners into adopting cognitive strategies (Schwartz, 1999; Bhattacharjee, 2015). Cognitive strategies refer to an internal process known as the learning process of control (Gagne, 1977).

Suyitno (2017) says that, if a learner is familiar with the internal process well, they will be able to self-learn and can learn independently. Moreover, Alexander, Graham and Haris (1998) believe that cognitive strategies are thought processes that are procedural, essential to solve or make progress towards solving a particular problem or completing a task. Drawing from the above literatures shows that learners learn and enjoy learning more when they are actively involved rather than passive listeners (Olusegun, 2015).

CO-OPERATIVE LEARNING

Research studies have been carried out locally and globally to identify suitable approaches and techniques to be used in the mathematics classrooms. As a result, the cooperative learning approach was introduced. According to Gull and Shehzad, (2015) traditional class activities create a win-win situation, where one can only succeed if other loose whereas in cooperative learning according to (Andala & Swai, 2016) has edge over other teaching methods due to its effectiveness for improved cognition, social skills and motivation.

It is also presented by Remillard (2015) that cooperative method when used in the classroom promotes the move away from a passive approach thereby allowing learners to become active participants in their classroom learning. As such, cooperative learning made the process of learning learner-centered (Machado & Coimbra, 2015). According to Slavins (1991) cooperative learning promotes the teacher's instruction by giving the learners an opportunity to discuss information or practice skills originally presented by the teacher. Cooperative learning, therefore involves learning that takes place in a classroom where learners are actively involved in the learning, share ideas while completing their class activities (Yemi, bin Md- Ali, 2018; Smith & Spindle, 2007).

On the other hand, Chan and Idris (2017) define cooperative learning as a learning process that requires learners to work and learn together. A study by Drakeford (2012) argues that small groups allow learners to interact with their peers and subsequently enhance their social skills. Mercendetti (2010) found that through collaboration and social interaction with peers, learners develop social skills, exchange information and insights. They also correct one another, adjust and build understanding on the basis of others' understanding. In addition to that, Karali and Aydemir (2018) surmise that, in a classroom setting where social relations are emphasized and learners are taken to the center and encouraged to cooperate on the basis of scientific values is one of the most conducive learning environments in our today's society.

Although, many research studies have indicated that cooperative learning strategy is a very suitable instructional learning strategy that upholds learners learning success (Maden, 2011; Van Dat, 2016) including their motivation (Dedi & Ryan, 2011). More so, studies of (Parveen & Batool, 2012; Gull & Shehzad, 2015) also confirm that this approach to learning has a positive impact at improving academic success on learners. The positive gains for learners who were given an opportunity to interact, listen, share ideas and interrogate one another which is more beneficial to learners than the traditional sit and get (Yu, 2019). This is to say that this approach to teaching and learning encourage pro-social skills development and have been linked to gains in learners' self-esteem (Zinsser, 2009; Villeneuve, 1997).

In spite of the above mentioned, recent research studies argue that cooperative learning improves learners' thinking skills as it allows them to communicate actively with each other (Johnson &Smith, 2014; Chatila, & Al Husseiny, 2017). Therefore, they recommend that cooperative learning be implemented in the classrooms to produce lifelong learners and critical thinkers.

CLASS DISCUSSION

This refers to an exchange of ideas amongst a teacher and her learners for the purpose of helping them to develop interactive skills and to understand academic content (Witherspoon, Sykes, Bell, 2016). According to de-Gracia, (2013) when learners have problems understanding something, having a discussion class makes it clearer to them. For example, as the teacher identifies the focus for the discussion, he or she does not prescribe what will be said during the discussion (Wilkinson, Murphy & Binici, 2015). Instead, the discussion will develop as discussions outside of the classroom do as the learners respond to one another's contributions. By so doing, learners' ideas become the foundation for building and extending both individual and collective understanding of the topic (Okolo, Ferretti, & Mark Arthur, 2007).

Thus, through class discussions, learners add in ways of thinking and behaviors that fosters the knowledge, skills to relate to other situations that require independent problem solving (Murphy, Wilkinson, Soter, Hennessey & Alexander, 2009). In mathematics for instance, learners learn

how to explore mathematical ideas, learn to use the formal language of the discipline when they are engaged in discussion (Smith, Hughes, Eagle & Stein, 2009).

Although, several scholars have recommend the use of discussion-based approach for teaching and learning because it creates opportunities for learners to develop critical skills while collaborating with one another (Larson, 1996). Thus, development of critical thinking skills can improve mathematics achievement (NCTM, 2000; Chukwuyenum, 2013). According to Krulik and Rudnick (1995) critical thinking skills involves the process of critical thinking with related to knowledge of mathematics, mathematical reasoning, and mathematical proofs in mathematical problem solving. Similarly, it can be described as a way to think logically and reasonably (Holmes, Wieman & Bonn, 2015). On the other hand, to think critically can be seen from the activities to analyze and interpret data (Cahyono, Kartono, Waluyo and Mulyono, 2019). In line with the above statement, Hadi, Susantini and Agustini, (2018) state that critical thinking is the ability to analyse, interpret, synthesise and to evaluate. Therefore, the possession of this skill will enable a learner to solve problems, analyze and interpret mathematical problems, especially in solving algebraic problems (Cahyono & Waluyo, 2019).

Thus, Witherspoon, Sykes and Bell, (2016) opine that when teachers employ discussion strategies effectively, such discourse helps learners learn to reason. Other studies (Rittle- Johnson, Star, Durkin & Loehr, 2019) indicated that class discussion either in whole class or small groups can promote learners learning and understanding of algebra. However, they argue that whole class discussion helps learners develop a deeper understanding of mathematical concept whereas small group discussions have mostly focused on the development of social skills (Gillies, 2003). Although studies argue that, through collaboration with one another, learners develop skills of working with peers (Hammar Chiriac, 2012; Jackson, Sibson & Riebe, 2014).

King and Rosenshine (1993) disclose that learners, who often ask annoying questions in a small group discussion, encourages creative answers that will increase the learning potential for one another. This assertion is supported by Mercer and Howe (2012) who argue strongly that when teachers actively engage learners in reflective discussions of what they are studying, it will help them take responsibility for their part and prepares them for self-study. Drawing from the above literatures shows that the use of class discussion in the form of small groups or whole class

discussion while teaching algebra will enable the learners to develop critical thinking skills (Erdogan, 2019), social skills (Zulkarnain, Kusumawati, & Mawaddah, 2021) and to work collaboratively in order to share ideas and information together (Koszalka, Pavlov, & Wu, 2021). On the other hand, there are indications that teaching the Grade 10 algebra in schools requires teachers to use different teaching and learning strategies that will enable the learners understand the algebraic concepts and procedures. Therefore, the next section below discusses the different ways in which algebra could be taught in schools to enable learners develop competent skills in algebra.

2.6 DIFFERENT WAYS IN WHICH ALGEBRA COULD BE TAUGHT IN SCHOOLS

2.6.1 TEACHING FOR CONCEPTUAL UNDERSTANDING

According to Andamon and Tan (2018) conceptual understanding in algebra is a knowledge that involves in-depth understanding of underlying and foundation concepts and how they relate to one another. Furthermore, conceptual understanding in algebra is concerned with the understanding of not only what to do, but also why is done (Al-Mutawah, Thomas, Eid, Mahmoud, & Fateel, 2019; Cummings, 2015). In other words, when solving algebra, learners who had no proper understanding of conceptual understanding may perhaps perform poorly or exhibit some misconceptions (Yang, & Sianturi, 2019). This indicates that learners with conceptual understanding can easily explain the methods to their peers resulting in fact retention and reconstruction when forgotten (Jojo, 2011). Although, learning with understanding is important to encourage learners to have a deep understanding of how to solve problems they will certainly facein the future. However, is obvious when some learners are through with high school education, they do not retain their conceptual understanding to solve algebra (Al- Mutawah, et al,2019).

According to Egodawatte and Stoilescu (2015) algebra is one of the most abstract branches of mathematics which also has its challenges. In their study, many efforts to teach algebra for conceptual understanding have not resulted in greater achievement outcomes (Achmetli, Schukajlow, & Rakoczy, 2019). Researchers argue that majority of the learners do not understand the algebraic problems because solving them may require an understanding of a conceptual aspect of fractions, decimal, negative numbers, and equal signs (Appleton, 2012; Booth, McGinn, Barbieri & Young, 2017; Salihu, 2017). This is further supported by (Al- Mutawah, et, al 2019; Ndlovu & Brijall, 2015) who indicated that some of the high school learners

have performed poorly in problem solving due to lack of understanding of the algebraic concepts. As a result, majority of the learners are withdrawing from studying higher level of mathematics due to their lack of success in algebra (Pegg, 2010). Therefore, the researcher stresses the need for teachers to teach for conceptual understanding in order for them to understand algebra (Zulnaidi, Zamri, 2017; Osei, 1998). Furthermore, Andamon et, al. (2018) commend that a learner must have a conceptual understanding if they were to understand algebra in-depth. This implies that learners who learn algebra with conceptual understanding know more than isolated facts than procedures and will be able to explain, describe and apply concepts in different ways (Kilpatrick, Swafford & Findel, 2001; Malatjie & Machaba,2019). Therefore, the National Mathematics Advisory Panel (NMAP, 2008) maintains that preparation for algebra requires simultaneous development of conceptual understanding.

Regardless, having a conceptual understanding of what an operation signifies helps learners to apply some skills (Nunes, Bryant, Barros & Sylva, 2012). Therefore, they advise that mathematics teachers ought to include appropriate emphasis on the teachings of conceptual understanding to teach algebra (Korn, 2014). However, it is generally supported by the South African Department of Education who outlines that teaching for conceptual understanding is an important approach to teach algebra (New Mathematics Teaching and Learning Framework for South Africa, 2018). Rittle-Johnson, Schneidner and Star (2015) confirm that conceptual knowledge is knowledge of concepts. This implies that when learners have truly mastered a concept, they should be able to show all the details steps in the process, explaining why those steps occur and connect the process to related ideas (Molina, 2014).

2.6.2 PROCEDURAL FLUENCY

According to Al-Mutawah, Thomas, Eid, Mahmoud, and Fateel, (2019) define procedural fluency as the knowledge of the procedures, and how to efficiently apply them appropriately and accurately when solving algebra. This is further upheld by (Nahdi, & Jatisunda, 2020) who confirm that it includes knowledge of algorithmic skills, techniques and methods. Although, a similar report by the National Council of Teachers of Mathematics (NCTM, 2014) carries this argument further and states that a procedural fluency is the skill to apply procedures accurately and efficiently. However, this skill includes choosing operations and procedures to solve algebra problems (Star, et al, 2015).

Thus, despite the role algebra has played in understanding other mathematical concepts, some learners still experience difficulties on how to apply algebraic concepts (Boonen, Schoot, Van Der, Wesel, Van, Varies, De & Jolles, 2013). Many of whom finds it's challenging interpreting a mathematical problem expressed in words (Kenney, An, Kim, Uhan, & Shamsul, 2020). Drawing from the emphasis of Jupri and Drijvers (2016) on 'difficulties' of procedural concepts, the researcher argue that learners sometimes cause errors or mistake while solving algebra. In South Africa, learners are experiencing difficulties understanding algebraic word problems and symbolization (Salihu, 2017).

Thus, some of this include an equation written in words, yet still could not do the symbolization (Ramírez, Brizuela, & Ayala-Altamirano, 2020). In general, the problems encountered by the learners also include, the procedures being forgotten (Burhanzade, Aygor, 2014), the application of the principle of addition to the algebraic form, multiplication on the algebraic form, implying algebraic fractions and solving algebraic related problems (Sugiarti & Retnawati, 2019). These problems pose a challenge to many high school learners all over the world (Bush & Karp, 2013). They recommend that teachers need to create learning strategies that will be meaningful for providing learners procedural knowledge in order to solve algebra related problems (Yılmaz, 2020). However, achieving procedural fluency to solve algebra is essential for learners' mathematical development (Foster, 2018). Hence, a focus on procedural fluency is sometimes seen as a threat to reform approaches of the learning of mathematics which emphasises on sense making through engagement with rich problem-solving task (Advisory Committee on Mathematics Education, ACME, 2012). Also, being secure with rich important mathematical procedures offers learners increased power to tackle more difficult algebra related problems at a more conceptual level (Codding, Burns & Lukito, 2011).

2.6.3 STRATEGIC COMPETENCE

According to Awofala, (2017), Bautista (2013), Pape and Ozdemir (2012) strategic competence consists of knowing and employing suitable strategies to analyse in order to complete classroom task. Similarly, the study by Sabilah, Siswono and Masriyah, (2018) argues that strategic competence is a mental activity that applies strategies to formulate, to represent, and

subsequently solve mathematical problems. Furthermore, a research study by Joubert Andrews (2010) with Benevento (2004) indicated that strategic learning includes analysing tasks, selecting, adapting or even inventing strategies. It also, consists of knowing and employing strategies to analyse and complete tasks or to solve a problem (Ozdemir, & Pape, 2012). According to Funke, Fischer and Holt (2018) competency is the ability to choose suitable algebra tool to solve a problem. Suh and Seshaiyer (2014) identified key attributes to learners who have achieved strategic competence is flexibility in their problem-solving processes and strategies. By 'flexibility' in mathematics education, we refer to the ability to solve algebra using a variety of strategies or different methods (Saputri, Pramudya, & Slamet, 2020).

This requires an understanding on how to flexibly solve algebra problems in different ways and know when it is most appropriate to apply suitable method for a given problem (Star & Rittle-Johnson, 2008). Therefore, teachers should not only teach how to solve problem but to strategize their teachings in a meaningful way and teach for strategic competence so that when presented with algebra problems, the learner would be able to understand the main features of the problem and choose appropriate strategy to solve problems.

2.6.4 *ADAPTIVE REASONING*

Adaptive reasoning includes the capacity for logical thinking and to justify why solutions are appropriate (Ostler, 2011; NRC, 2001; Kilpatrick, Swafford, 2001). Thus, in mathematics education, adaptive reasoning guides learning as learners navigate through facts, procedures, concepts, methods to see if they fit together in a meaningful way (Groves, 2012). Although, a study by Otten, Bleiler-Baxtex and Engledowl, (2017) argue that learners across the world experience challenges in relation to algebraic reasoning, manipulating and sense making (Otten, Bleiler-Baxtex & Engledowl, 2017). They further argue that these challenges arise from learners not being able to understand the tenets or basic principles, select appropriate problem-solving strategies and or draw logical conclusion (Simamora, & Saragih, 2019).

Regardless, learners with good adaptive reasoning skill could use logic to explain algebraic concepts, justify solutions, and generalise to extend the solution to new situation (Kilpatrick, Swafford, 2001). Whilst other studies add on the idea that learners' adaptive reasoning can be assessed when they are able to, justify and response logically, reflects, explains procedures and algebra concepts clearly (Syukriani, Juniati, Awoala, 2017; & Siswono, 2017). Hence, ability to

adaptive reasoning enables a learner to choose alternative approaches to solve algebra and to justify solutions (Siegfried, 2012). However, in light of the above literatures shows that learners build new knowledge by creating mathematical ideas through reasoning, thus building an appreciation to the connections between logical and meaningful algebra notions as opposed to rote learning (Mata-Pereira & da Ponte, 2017). Therefore, teachers should not only teach the grade 10 learners how to solve problems but how to think logically before choosing a method to solve algebra.

2.6.5 PRODUCTIVE DISPOSITION

According to Kilpatrick, (2001) and Yulian, (2018) productive disposition may be defined as the ability to see sense in algebra, useful, meaningful, and valuable and has confidence as well as perseverance in learning it. However, findings by Kilpatrick, Swafford and Findell (2001) indicate that a learner that has a productive disposition is likely to develop their algebraic proficiency in terms of conceptual understanding, procedural fluency, strategic competence and adaptive reasoning. In addition, learners with high rates of production disposition are more engaged in class and learners who are engaged are more likely to learn better than their peers who have less production dispositions (Christenson, Reschly & Wylie, 2012; Gilbert, 2014).

In a similar way, learners who have developed productive disposition are able to see sense in algebra and believe that with appropriate effort and experience they can learn (NRC, 2001; Awofala, 2017; Awofala, Lawal, Arigbabu & Fatade, 2020). Among its numerous benefits, promote high level of learner engagement with algebra skill acquisition and understanding (Ross & Willson, 2012).

2.6.6 **CONCLUSION**

This chapter has reviewed related literature that is relevant to this study. It has clarified certain definition of concepts, methods of teaching and the reasons why teachers use learner centered methods to pass on knowledge to the learners. The chapter has also clarified certain concepts that are related to mathematics as a subject and to algebra. One of the importance of this topic is the fact that it has explore abundant knowledge on the subject matter ranging from strategies to experiences used under different teaching methods. The next chapter discusses the theoretical framework.

CHAPTER THREE

THEORETICAL FRAMEWORK

3.1 INTRODUCTION

The previous chapter reviewed the relevant literature used to underpin this study. However, this chapter presents the theoretical framework which is the social constructivist theory of Vygotsky (1978) employed as a lens to guide and frame this study. The chapter begins by exploring the definitions of a theoretical framework and discusses the origin of the social constructivist theory and its applications. Furthermore, it also explored other fields in which this theory has been applied as well as the limitations of the theory. Lastly, this chapter ends with a brief summary.

3.2 THE DEFINITION OF A THEORETICAL FRAMEWORK

A theoretical framework is described as the structure that holds and supports the theory of a research (Ocholla & Roux, 2011). Anfara and Mertz (2015) also poses that a theory provides a lens to understanding a phenomenon. Thus, a theory offers researchers the framework for making sense of their observations (Yamauchi, Ponte, Ratliffe & Traynor, 2017). On the other hand, Imenda (2014) explains that research without theoretical framework lacks direction to discussionsof the findings from the research. However, there are several theoretical frameworks, depending onthe researcher's goals and purposes, to guide the qualitative research study (Ornek,2008; Collins & Stockton, 2018). For example, the researcher may want to describe behavior, understand beliefor explain phenomena. In order to achieve either of these intentions, the researcher makes choice of an appropriate theory that serves the aim (Collins, & Stockton, 2018; Ornek, 2008). Based on the above view and drawing from the objectives of this proposed study which seek reality from individuals' narratives of their experiences and feelings in order to produce in-depth descriptions of the phenomenon (Yuksel & Yildirim, 2015), the choice of social constructivism for this study is justified as an appropriate theoretical framework.

This will provide a lens to exploring the Grade 10 learners' experiences of the teaching strategies used by their mathematics teachers. As the researcher, I am interested in understanding the

phenomenon, which is the different teaching strategies, which the grade 10 mathematics learners' experiences as their teachers teach them algebra.

Most research (Drill, Miller & Behrstock-rratt, 2013; Sentence & Csizmadia, 2015; Kratt, 2019; Mahdum, Hadriana & Safriyanti, 2019; Bautista, Wong, & Cabedo-Mas, 2019; Li, 2016; DeLuca, Bolden & Chan, 2017) on teaching strategies focuses on the teachers' perspectives. This reveals that the learners are on the receiving end of these teaching strategies. As a result, it is important to explore the learners' experiences of the various teaching strategies used by their mathematics teachers to teach them. This implies that these teaching strategies might assist them to understand Grade 10 algebra. It is well reported in the literature (Isdale, Reddy, Juan & Arends, 2017; Bansilal, Long & Juan, 2019; Makgato, 2007; Mutodi, & Ngirande, 2014) reviewed that learner perform poorly in algebra in South Africa. Therefore, the researcher felt that social constructivismis the better-suited theory to understand learners' experiences of the teaching strategies in algebraused in their Grade 10 mathematics classrooms. However, the next section discusses the origin and development of social constructivist theory which was employed as a lens to frame this study.

3.3 UNDERSTANDING THE SOCIAL CONSTRUCTIVIST THEORY

For this proposed study, the researcher employed the theory of social constructivism as a theoretical framework. This theory is used to give direction to and illuminate the findings of this study since it evolves into a process that seeks reality from individuals' narratives of their experiences (Cilesiz, 2009; Neubauer, Witkop & Varpio, 2019). Added to this, Cuthbertson, Robb and Blair (2020) argue that the theory of social constructivism recognizes that individuals seek to understand their world and develop their own meanings from their lives experiences. Thus, learners' experiences in the classroom is a real source of knowledge, a kind of cultural capital thatcan be tapped by teachers to improve the pedagogic practices (Schall, McHatton, & Saenz, 2020).

Meanwhile, Rudduck and Flutter (2000) argue that research that places learner's experiences at the center of attention is relatively scarce. As a consequence, there has been strong emphasis on improving effectiveness as a means of enhancing learners learning in the classroom

(Burroughs, Gardner, Lee, Guo, Touitou, Jansen & Schmidt, 2019). Therefore, these lead the researcher towards the theoretical underpinnings of the theory of social constructivism.

Thus, social constructivism theory is a theory of knowledge that examines knowledge and understandings of the world that are developed jointly by individuals (Aminah &Asl, 2015). However, Mohammed and Kinyo (2020) are of the same notion that through sharing and socially interacting, ideas are developed. Along the same line, Ernest (2006) admits that social constructivism theory recognizes that learning and understanding are constructed by social interactions. However, the learners develop knowledge and understanding through social interactions learners have with their peers (Taylor, 2018). Consequently, social interaction has played an important role by creating opportunities for learners to engage in social skills both individually and in groups (Finn, 2020; Forsell, Forslund Frykedal & Hammar, Chiriac, 2020). However, by working together with a more knowledgeable person has also proven to be more efficient in helping the learners' organise their learning and reflect on their understanding (Okita, 2012; Hurst, Wallace & Nixon, 2013). This theory was developed down by Lev, Vygotsky (1978) who strongly suggest that individual understanding improves by the virtue of social interaction. Thus Lev, Vygotsky theory of social constructivism states that knowledge is co- constructed and that individual learn from each other in the process (Thompson, 2013; Lialikhova, 2019).

Similarly, Lev Vygotsky (1978) and many other studies (Halberstadt, Timm, Kraus & Gundolf, 2019; Salomon & Perkins, 1998) argue that learning only takes place with the help of peers who are more knowledgeable thus contributing to the social aspect of the theory. Furthermore, another part of this theory is the zone of proximal development (ZPD) in which Vygotsky (1962) and Silalahi (2019) describe as a level where a learner can achieve what would have been impossible for him to achieve alone with the help of a more knowledgeable person, peers or a guardian. Under normal circumstances, teachers are seen to be more knowledgeable (Vygotsky, 1978) because of their role in providing learners with the required social instruction in the classroom (Wilson & Devereux, 2014).

Though, scaffolding is an additional part of this theory which can assist learners to solve problem, accomplish a task which would be beyond his unaided efforts (Xi, & Lantolf, 2020; Bruner & Ross, 1976; Pitkänen, Iwata, & Laru, 2020). Scaffolding is regarded as a teaching

technique that assists learners learn more while working with a more knowledgeable person to achieve her learning objectives (Pitkanen, Iwata & Laru, 2020). This teaching technique is very useful to the learners because the learners are in charge of their lesson while getting little assistance from their teacher. When a learner can do a school task when assisted, the learner is gradually in a position to master it. Thus, this technique will not only enhance learners' motivation but subsequently improve their competence in solving algebraic problems. However, in the context of learning, Bredo (1997) posits that social construction of learning also present learning as a social and cultural process that occurs in the context of human relationships and not just in the heads of individual learners. According to Brophy (2002) learning involves negotiating understanding through dialogue or discourse shared by two or more members of the community.

Thus, scholars Chen, Li & Huang, (2020) have also argues that, in order to have an understanding and to facilitate learning, it is necessary to engage in discourse, share knowledge, and compare beliefs with others (Vygotsky, 1978). Base on the above literature shows that creation of knowledge cannot be separated from the social environment in which it is formed.

3.4 THE ORIGIN OF SOCIAL CONSTRUCTIVISM THEORY

The social constructivism theory was developed by Lev Vygotsky in the year (1978). Lev Vygotsky was born on the 17th of November, 1896 in a city called Orsha in Russia. However, before his death in June 11th 1934, he had written on many subjects although, his passion was on issues of child development. According to Vygotsky (1978) social interaction plays a vital role in children's learning. Interestingly, this implies that learners acquire knowledge as a result of social interaction (Verga, & Kotz, 2017). Furthermore, Vygotsky was also well-known for his good work on the concept of zone of proximal development (ZPD), which is the distance between what a child would be able to do properly without help and what a child would do when assisted with someone who is more knowledgeable about the task (McLeod, 2012; Zuckerman, 2007; Xi, & Lantolf, 2020). In addition, some of Vygotsky's works are in relationship between languages and beliefs, the development of language, and overall theory of development through actions and relationships in socio-cultural environment (Panhwar, Ansari, & Ansari, 2016).

3.5 APPLICATION/RELEVANCE OF THE THEORY TO THIS STUDY

The main purpose of learning and education is primary leading to development of individuals through the concept of social constructivism (Halberg, Assafi, Norholm, 2020). According to Fischer (2019) social constructivism explains that all knowledge acquired as a result of social interaction. Along the same line, Watson (2001) argues that social constructivism view teaching and learning as a shared social experience in which meanings are jointly and actively constructed.

In a constructivist classroom, the emphasis tends to move from the teacher to the learners (Palincsar, 1998). According to Alzahrani and Woollard (2013) the role of a teacher in the social constructivist classroom is to help learners to build their knowledge and to control the existence of learners during the learning process in the classroom. The teachers who are facilitators in social constructivist classroom first provide support and help to the learners, by so doing the help is decreased and learners learn independently (Amineh, & Asl, 2015). Therefore, the social constructivist-oriented teacher is seen as an organizer and potential source of information (Smith, 2020) and their role is as a facilitator (Coles, 2019) in order to provide learners with opportunities and incentives to construct knowledge and understanding (Singh, & Meyer, 2019).

On the other hand, learners in social constructivist classroom through peer interaction, the learners seek help, respond to requests for help and interact with one another (Theobald, & Ramsbotham, 2019). According to Saunders and Wong (2020) learners learn best by trying to make sense of something on their own, and with the teachers' guide or a more knowledgeable order. The word facilitator is more suitable than teacher in social constructivism context (Amineh, &Asl, 2015) where the learner is actively constructing knowledge rather than passively receiving information (Gray, 1997).

Consequently, classrooms that engage in constructivist teaching and learning empower the learners to gain access to their experiences and beliefs that reshapes their prior knowledge in the light of the applied course content (Gunduz, & Hursen, 2015). Watson, (2001) concurs and indicate that the usage of constructivist principle within the classroom reveal that teachers make use of constructivist principles to promote and accept learners' self-sufficiency and creativity, thus, leaners are motivated to become more resourceful over the use of constructive principles.

On the other hand, social constructivism learning theory can be applied in the classroom setting to encourage collaboration (Zhang, Wen, & Liu, 2019). Thus, collaborative learning is defined as a teaching and learning strategies that promote learners' collaboration in a small group in order to improve their own and one another (Brindley, Blaschke, & Walti, 2009). In Palincsars' words, (1998) peer collaboration refers to interactions between teachers and learners resulting in the generation of new technique and more mature forms of solving algebra than learners had demonstrated alone. This suggests that engaging learners in collaborative learning while learning algebra will enable them to be in a mixed-ability group where they will draw on the differences of their group members as assets to be tapped to enhance their learning. In this way, the learners would be allowed to work in pairs such that the ones who understood the problem will assist the rest of their peers who do not. For example, if a learner does not understand algebra procedures for solving systems, a process to solve an equation using a substitution method. The teacher might have a more knowledgeable peer in the group who would solve and explain the procedures to her peers who do not understand.

However, this is in accordance with the aspect of Vygotsky's (1978) theory of zonal proximal development which shows that having well knowledge adults around the lives of children's is very important in shaping the growth and development of those children as the adult will assist them learn better. Subsequently, evidence from research also depicts that the zone of proximal development offers a platform of processing for any activity with the help of a teacher, a parent, language instructor or another peer who is more knowledgeable (Christmas, Kudzai & Josiah, 2013).

In their study (Shabani, Khatib, & Ebadi, 2010), they argue that children learn best when working together with a more knowledgeable person and through those children internalize new concept (Shabani, Khatib, & Ebadi, 2010) of which algebra is based on (Kumah, & Wonu, 2020). Based on these above views, suggests that the social constructivist theory is a useful and appropriate theory for this study as it tends to understand the grade 10 learners' experiences of teaching strategies in algebra used by their mathematics teachers.

3.6 DIFFERENT FIELDS THAT HAVE USED THE SOCIAL CONSTRUCTIVIST THEORY

The relevance of this theory cannot be underrated as it has been used in other fields such as medicine, psychology, business management, accounting, sciences, literature, languages and not only in the area of mathematics. For example, this theory was employed by Marshall (2017) in order to examine the dialysis of social workers perceptions of stress. The findings reveal that social workers experienced significant stresses in their workplace. In another study by Jwili (2016) which was conducted in KwaZulu-Natal South Africa also used the social constructivism theory to explore teenage mothers' experiences of the psycho-social support services provided for them in a secondary school in KwaZulu-Natal. The findings of the study revealed that the teenagers experienced diverse supports such as educational support, financial support and emotional support (Jwili, 2016).

Moreover, the study by Yigit (2020) also used the social constructivist theory to ascertain pre-service social studies teachers‟ opinions about digital storytelling process that they were experienced. He found out that the pre-service teachers had both positive and negative experiences of the digital storytelling process they engaged in (Yigit, 2020). Amadasun (2020) also used this theory to explore the experiences of social workers regarding their services to people living with disabilities (PWD, thereafter) in Nigeria and found that social work services provided to PWDs are inadequate and is not in line with the person-in-environment focus of the social work profession Application. Whilst, Smyth and Carless (2020) also used the theory to explore how teachers of English for Academic Purposes managed the process of using exemplars. Meanwhile, the next section presents the limitation of the social constructivist theory.

3.7 LIMITATIONS OF THE SOCIAL CONSTRUCTIVISM THEORY

A limitation of using social constructivism theory is that learners would require more time in the construction process within the constructivist setting (Hoemann, Xu, & Barrett, 2019). This is very importance in constructivist classroom because the learners would need to question one another in order to find a solution. Another limitation is that learners are required to solve algebra with little or no guidance from the teacher (Cilliers, & Pylman, 2020). Therefore, this is an effect on learner’s academic

success in the classroom because when left without the guidance from the teacher, the learners would be reluctant to do their class activity (Kasama, 2020; Oosthuizen, De Lange, Wilmshurst, & Beatson, 2020). On the other hand, when they are given all the support they require, it makes way for using that knowledge individually (Jabbarova, 2020).

3.8 CONCLUSION

This chapter discussed the theoretically framework used to guide this study. It explored the social constructivism theory by discussing the definitions of a theoretical framework, the origin of the social constructivist theory and its applications. Furthermore, it also explored other fields in which this theory has been applied as well as the limitations of the theory. Therefore, the next chapter discusses the research design and methodology adopted to conduct this study.

CHAPTER FOUR

RESEARCH DESIGN AND METHODOLOGY

4.1 INTRODUCTION

This chapter presents the research design and methodology employed to conduct this research. It also discusses the research approach, sampling procedures followed and the methods that were used to address the research questions. It also discusses the method adopted to analyse the data as well as the issues of trustworthiness and ethics ensured to underpin this study. Lastly it ends with a brief summary.

4.2 RESEARCH PARADIGM

The study was underpinned using the interpretivist paradigm. Bertram and Christiansen (2014) are of the view that interpretivist paradigm aim to understand the social world. They further argue that researchers working within the interpretivist paradigm do not predict what people will do, but rather describe and understand how people make sense of their worlds (Bertram & Christiansen, 2014). Antwi and Hamza (2015) affirm that the interpretivist paradigm is concerned with understanding the world as it is from subjective experiences of individuals. Likewise, Ponelis (2015) explains that interpretive research paradigm is characterised by the need to understand the world from a subjective point of view and seek an explanation within the frame of reference of the participants rather than the objective observer of the action.

Meanwhile, the purpose of using the interpretivist paradigm in this study is to gain insight and in-depth information regarding the phenomenon being studied (Thanh-Cao & Thanh-Le, 2015). In her study, Kapofu (2017) claims that the interpretive approaches are concerned with ‘what’s and ‘how’s’ of social reality and accepts the notion that knowledge of reality is socially constructed by individuals. In this study, similar questions as such as, ‘what are the teaching strategies the Grade 10 mathematics teachers use in teaching their learners algebra in the two schools in Pinetown’ and ‘how do the Grade 10 learners experience the teaching of algebra using the teaching strategies their mathematics teachers use in the two schools was explored. These two research questions are in accordance with the interpretive paradigm which the researcher seeks to answer. Thus, the Grade 10 learners’ experiences were explored through

seeking their experiences about the teaching strategies their mathematics teachers uses in teaching them algebra.

4.3 RESEARCH APPROACH

This study adopted a qualitative research approach. Qualitative research involves an in-depth study of humans in their natural and social settings using the method such as questionnaires, interviews, observations, drawings, photographs, sculptures and collage (Mohajan, 2018). According to Rahman (2017) the qualitative research approach is about the persons 'life, behaviors, emotions, feelings, and their lived experiences. Moriarty (2011) argue strongly that qualitative research approach provides an in-depth understanding of the social world of the research participants by exploring their social and lived experience, perspectives and histories.

Accordingly, Hancock, Ockleford and Windridge (2009) contends that qualitative research approach uses descriptive accounts of experiences collected as data from research participants' narratives as opposed to data or information expressed numerically. In this study, I made use of the qualitative approach to explore an in-depth of the Grade 10 learners' experiences of the teaching strategies used by their mathematics teachers to teach algebra. This informs the choice of qualitative approach to understanding the views, attitudes and behaviors of the participants.

Furthermore, the qualitative researchers access the thoughts and feelings of research participants, which can enable development of an understanding of the meaning that people ascribe to their experiences (Sutton & Austin 2015). Thus, the reason for choosing this approach is that it enabled me to access the thoughts and feelings of research participants and the ideas regarding the Grade 10 learners' experiences of the teaching strategies used by their mathematics teachers. In this way, it would enable me to gain an in-depth understanding of the teaching strategies and the learning of mathematical algebra in South African schools.

4.4 RESEARCH DESIGN

The research design of the study is a qualitative case study design. Case study research design permits the exploration of real people in ways that seek for an in-depth understanding of a phenomenon; providing thick description of the participants, their lived experiences, thoughts and feelings for a situation (Yin, 2009). Gustafsson (2017) also notes that case study is an intensive study about a person, a group of people or a unit which is aimed to generalise over

several units. In contrast, Starman (2013) argues that case studies are concerned with a developmental factor, by which the case are generated and evolve overtime.

However, Bertram and Christiansen (2014) highlight that case study is a systematic and an in-depth study of one case in its context, where the case maybe a person, a group of people, a school, community, organization or a phenomenon. In addition, Cohen et al. (2011) describe a case study as a single instance of a bounded system such as a child, a clique, a class, a school, or a community. This is however challenged by Wisker (2009) that case studies should not be defined by their boundedness but also the methodology used in the research.

The foregoing discussions inform the choice of a case study in this research. However, since this study includes more than one single case therefore, a multi case study was adopted as the research design for this study which is the case of two secondary schools Grade 10 learners' experiences of the teaching strategies use in teaching them algebra. Thus, the research wants to understand how the teaching strategies mediate learners' experiences of algebra in schools particularly using algebra as an example. In order to understand the phenomenon in-depth, the case study design enabled me to use a manageable size of participants to achieve a rich and descriptive study. Thus,this multi case study research design enabled researcher to gain an in- depth understanding of the Grade 10 learners' experiences of teaching strategies used by their mathematics teachers particularly in algebra in the selected schools.

4.5 SAMPLING TECHNIQUE AND SAMPLE

Gentles, Charles, Ploeg and Mckibbon (2015) describe sampling as the selection of specific data sources from which data are collected to address the research objectives. For this study, a purposive and convenience sampling method were used to select the research site and participants. Christiansen, Bertram and Land (2010) and Cohen, Manion and Morrison (2011) opine that purposive sampling gives researcher the opportunity to choose those participants who have the right experience and knowledge to provide rich and deep information regarding the phenomenon under research. In this study, the researcher made use of purposive sampling to select the two schools that was used in conducting this study. Purposive sampling gives the researcher the opportunity to choose those whom he wants to include in the research knowing fully well that the group does not represent the whole population (Christiansen, Bertram & Land, 2010; Cohen, Manion & Morrison, 2011).

On the other hand, the convenient sampling was also employed in this study because it is seen as the type of sampling technique that makes it easy and convenient to select those research participants that are available or close for the researcher to reach (Bertram & Christiansen 2014). In addition, Lopez and Whitehead (2016) concur that convenience isa relatively fast and easy way to achieve the sample size needed for the study. Hence, the choice of using convenient sampling technique for the purpose of this study is justified by the nearness of the selected schools to the researchers' base and the availability of research participants.

Therefore, the purposive and convenience sampling technique were used in this study to select two secondary schools in the Pinetown Districts which has a low matric pass rate in mathematics during the national grade 12 examinations (Matric exams) and comprises of twenty Grade 10 learners and their two mathematics teachers. The twenty participants were chosen for this study based on their knowledge and experiences of the phenomenon and the easy accessibility to me (the researcher).

However, the researcher purposely selected these schools located in the township because they are under resourced schools, which is in contrast to Ex-model C schools in the Pinetown Suburbs.This is because they lacked adequate teaching and learning resources. The schools were located inthe Pinetown District and have predominantly black learners and teachers. Secondly the schools were convenient to access because as they were within my (the researcher's) base.

4.6 THE RESEARCH SITE

These sites of this study are two schools in Pinetown Education District in the KwaZulu-Natal Province of South Africa. This District is located in Pinetown, a suburban industrial area north of the city of Durban. Like most industrial areas, Pinetown is a densely populated area with a population of mostly working-class people that work in industries most of which are located in the Westmead layout. Surrounding the industrial layout is a cluster of townships, where majority of the people live. Two of such townships are Clermont Township (School A) and Kwandegezi Township (School B). The schools are located one each in these two townships.

In South Africa, a township is an underdeveloped urban area, usually close to an industrial layout. The townships are, therefore, communities where families of the industrial workers live

and move from there to work in the industrial areas. Schools are also built in these settings there for their children; hence these schools are commonly referred to as Township Schools. Again, the two site schools in this study are located in a township and the children that attend the schools are children of the working class people as explained above. However, these schools in the townships are under resourced schools, meaning that School A and B are under resourced school compared to schools that are called Ex-model C schools usually do not have adequate teaching and learning resources. However, an important thing that distinguishes a resourced and under- resourced school is the quality of the teaching personnel.

Resource school like the Ex-model C schools usually have highly qualified teachers with good teaching experience while the under resourced schools most often lack qualified and experienced teachers, particularly for those subject areas considered as core or important, for example Mathematics teachers. In many instances, under resourced schools are mainly staffed with recently qualified teachers with limited professional teaching experience.

The researcher selected under resourced schools because he believed is where he can gather useful information. School A is a mixed school with a total enrolment of 860 learners and 36 teachers. The school buildings are properly maintained. Each classroom has average class size to accommodate large number of learners. However, leaners in school A are socio-economic better off. This is not to argue that the learners are well off but when compared to school B, they are better off. This is evident from the way they are dressed and are able to pay their tuition. On the other hand, school B is also a mixed school with a total enrolment of 925 learners and 30 teachers.The school buildings are also maintained. Each classroom is well equipped to accommodate the learners. But, most of the learners come from families where the income level from employment is so low. However, these learners are on Non-fee paying school. Furthermore, the learners in these schools depend on the Government Feeding Scheme for their daily lunch.

4.6.1 THE PARTICIPANT'S INFORMATION FOR SCHOOL (A)

Grade 10 Learners and Teachers were employed as participants for this study. The brief profile information of School 'A' Grade 10 learners and teachers are presented in Table (4.1) and Figure (4.2) below.

Table 4.1 Participants brief profile information of (School A)

Participants'	Gender	Age	Grade	Hobbies	Best Subject
Learner 1	M	17	10	Traveling	Life Orientation
Learner 2	M	16	10	Reading	IsiZulu
Learner 3	M	18	10	Dancing	Mathematics
Learner 4	M	16	10	Singing	Business Studies
Learner 5	M	18	10	Reading	Mathematics
Learner 6	F	17	10	Traveling	Life Orientation
Learner 7	F	17	10	Reading	Geography
Learner 8	F	16	10	Cooking	Life Science
Learner 9	F	16	10	Singing	Life Science
Learner 10	F	16	10	Cooking	IsiZulu

Table 4.2 Participants brief profile information (School A)

Participant	Gender	Age	Highest degree	Best Subject	Length of Service
Teacher	Female	41	Bachelor of Education	Mathematics	15 years

4.6.2 THE PARTICIPANT'S INFORMATION FOR SCHOOL B. The Grade 10 learners and their teachers were presented in Figure (3) and Figure (4) below.

Table 4.3 Participants brief profile information of (School B)

Participants'	Gender	Age	Grade	Hobbies	Best Subject
Learner 1	M	16	10	Reading	Geography
Learner 2	M	17	10	Singing	Life Science
Learner 3	M	19	10	Traveling	Life Orientation
Learner 4	M	16	10	Baking	Life Science
Learner 5	M	17	10	Cycling	Geography
Learner 6	F	17	10	Exercising	IsiZulu
Learner 7	F	16	10	Singing	IsiZulu
Learner 8	F	18	10	Cooking	Agricultural Science
Learner 9	F	18	10	Dancing	Life Science
Learner 10	F	17	10	Swimming	IsiZulu

Table 4.4 Participants brief profile information of (School B)

Participant	Gender	Age	Highest degree	Best Subject	Length of Service
Teacher	M	45	B. Education	Mathematics	18 years

Data were then generated using the method as mentioned below

4.6.3 RESEARCH METHODS

The method that was used to generate data for this study was semi-structured questionnaires only. Initially, I intended to use the following research instruments, for example, semi-structure interviews, Focus group discussions and classroom observation for data generation but due to the

impact of the covid-19 pandemic which affected the school activities and the attendant precautions, I had to take necessary precautions in order to maintain safety of learners and the school personnel, by ensuring that no physical contact would take place with the participants while conducting this study in the school. Meanwhile, the copies of the questionnaire instruments were handed over to the school administrators with the permission and approval of the school principal, and it was collected back together with the signed consent form from them, upon completion by the participants.

4.6.4 SEMI-STRUCTURED QUESTIONNAIRE

Questionnaires were the data generation tool that was used in this study. However, a questionnaire is a list of questions which the respondents answer (Bertram & Christiansen 2014, p. 73). Mather's and Hunn (2009) argue that questionnaires are very convenient way of collecting useful comparable data from a number of research participants. As such data can be collected relatively quickly because the researcher would not need to be present when the questionnaires are complete (Mcleod, 2018).

According to Ruane (2016) a good questionnaire can stand on its own and enable researcher to collect data without requiring any personal contact with the respondent. Alison (2017) contends that a questionnaire is required to stand alone; the researcher is rarely looking over the respondent's shoulder while he or she completes the questionnaire. On one hand, questionnaires are without doubt the single most popular data collection tools in any research involving human. On the other hand, while the questionnaire lacks the personal touch of the interview, it can nonetheless be an extremely efficient data collection tool (Ruane, 2016).

Similarly, Bird (2009) concurs and affirms that questionnaires are popular and fundamental tools for acquiring information on public knowledge. In the same vein, Artino, La-Rochelle, Dezee and Gehlbach (2014) claimed that questionnaires are good for gathering data about abstract ideas or concepts that are otherwise difficult to quantify such as opinions, attitudes and belief. They argue that it can be useful for collecting information about behavior's that are not directly observable. However, there are different types of questionnaires in research which include structured questionnaire, unstructured questionnaire and semi-structured questionnaire but for

this study, the researcher made use of semi-structured questionnaire because it was easy to code and analyze.

Additionally, in China, studies indicated that the questionnaire-based survey is an effective approach for obtaining the publics' opinions (Qiu, Wang, Fan, Liao, Wang & Huang, 2018). Therefore, the questionnaire allows the researcher to reach to a large number of people at a very short period of time (Christiansen et al 2010). And since this study selected and work with the learners and teachers in the Grade 10 Mathematics classrooms in each of the selected schools, therefore this research instrument is an appropriate and effective approach for obtaining the perceptions of the Grade 10 learners about their experiences of the teaching strategies in algebra used by their mathematics teachers.

4.6.5 DATA GENERATION PROCESS

The data were generated within a period of three months (September-November). I began generating data for this study during the third week of September 14th up till second week of November, 2020 from the two schools in KwaZulu-Natal, Pinetown District. On the 10th of September, l visited the two research sites (School A and B), one of the schools is located at Clermont while the other one at Kwandegezi. During my first visit, I met with the school principals and informed them about my interest of using and selecting their schools for this study. Having got all the required gatekeeper permission letters from the school principals, the mathematics teachers as well as the research participants. Furthermore, I explained to the school principal the purpose of my study, the benefits of the study and how the study would be conducted. Due to the current covid-19 pandemic, I ensured there was no physical contact. For my study, I employed thesemi-structured questionnaires as my data generation instruments which I submitted some of the copies of the Semi-structured questionnaire instruments to the two school administrators with their permission and with the consent and permission of the principals and I was instructed to come back after two months (November) to collect them back together with the signed consent form from the administrators upon completion by the selected learner participants from the two schools.

4.6.6 DATA ANALYSIS

Harding and Whitehead (2013) argue that qualitative data analysis is a formal interpretation of collected data to create order, elicit meaning and communicate findings.

Bihani and Patil (2014) claim that analysis of a data is a process of inspecting, cleaning, formatting and modeling data with the goal of highlighting useful information, suggesting conclusions and supporting decision making. Furthermore, Lafler (2017) was insisting that the purpose of data analysis is to discover, evaluate, understand and derive useful information from the data to support decision-making. Thus, there are different kinds of data analysis. However, data collected for this study were analyzed using a thematic analysis.

Additionally, the study made by Maguire and Delahunt (2017) revealed that thematic analysis involves identifying patterns and themes in a qualitative data. Yakhymenko, Brown, Lawless, Brodowinska and Mullin (2014) also identified in their study that thematic analysis is used to extract general patterns found in the data by reading the data over again and again. Ali and Smith (2018) observed that reading of the data over and again enable the researcher to group together keywords, ideas, concepts emerge from the data. The data for this study were collected through Semi-structured Questionnaire. The researcher coded the data collected using Braun and Clarke's (2006) steps of qualitative data analysis for this study.

Thus, in keeping with brown and Clarke (2006) six steps of data analysis. The following steps below serve as a foundation in conducting this thematic analysis. ***Step one.*** I familiarized myself with the data collected in a form of a semi- structured questionnaire. Brown and Clarke (2006) phase one involves the immersion of the researcher in the data by continuously reading the text over a period of time to identify patterns and meanings. This was done by reading and re-reading the text several times in order to make sense of it (Belotto, 2018).

Phase two. Coding. In this phase, having familiarizing myself with the data and moving on from there to develop the codes. According to Brown and Clarke (2006), phase two involves identifying initial codes which appears interesting and more meaningful. To this end, the data was coded into manageable chunks of text.

Phase three. Generating themes. This stage involves generating themes, collating data that could match into specific or appropriate themes (Brown & Clarke, 2006). In doing this, similar data

were grouped together giving the overarching theme. To this end, the researcher looked at the data that says the same thing, crystallize them for a theme to emerge.

Phase four. Reviewing themes, this phase consists of reviewing of themes generated whether it's matching with the data the researcher already has**.** In addition, Brown and Clarke (2006) also explain that this phase involves a thorough crosscheck if the data within themes corresponds meaningfully to the extract and the entire data.

Phase five. Defining and Naming Themes**.** This phase begins with concretizing the themes by defining and naming the themes (Brown and Clarke, 2006). Thus, the aim of this phase was to define what the themes and naming what the themes are. To achieve either of these intentions, the researcher concentrated on defining each theme and naming them, and looking at what is interested about the themes.

.***Phase six.*** Finally, the final stage emphasizes on analyzing and reporting about the data. To this end, the data was reported verbatim using rich and convincing extract that emerged as themes, research questions as well as literature.

4.7 ISSUES OF TRUSTWORTHINESS

Mandal (2018) emphasises that the trustworthiness of qualitative research is one of the aspects which determines the quality of a research or study. Quality in qualitative research cannot be addressed by a single or constant method. Quality or rigor is ensured in qualitative research studies by the use of various criteria that include credibility, dependability, conformability, and transferability (Chowdhury, 2015). Credibility involves evaluating the internal validity of a qualitative research (Hammarberg, Kirkman, & De-Lacey, 2016). However, research is seen as credible when the researcher has confidence in the truth of the findings with regard to the subjects of the research and the context where it was conducted (Johnson & Rasulova, 2016).

Thus, some of the ways to ensure credibility in a qualitative study is achieved by prolonged engagement with participants, persistent observation in the field, and use of peer debriefers (Morrow, 2005). Subsequently, researcher's prolonged involvement may perhaps help to detect the occurrence of best responses (Gupta, 2017). According to Guba (1981) peer debriefing

provides inquirers the opportunity to text their growing insights and expose themselves to searching questions. In this case, the researcher looks for a support from colleagues who are willing to provide scholarly guidance.

Credibility for this study was achieved firstly, by having a prolonged engagement with the study participants. Secondly, the researcher also seeks the support of her supervisor and other research colleagues as peer debriefers. Thirdly, the researcher also seeks a good understanding of the context of this proposed study, particularly the culture and social meanings of the research field site and school communities.

Dependability is concerned with members evaluating the findings and interpretation of the study to ensure they are all in line with the information received from the informants of the study (Cohen et al., 2011; Tobin & Begley, 2004). Thus, dependability can be achieved by the use of audit trail, Process logs, or code record strategy (Ary, Jacobs, Razavieh & Sorensen, 2010; Chilisa & Preece, 2005). Meanwhile, studies had confirmed that an audit trail is a process by which a researcher reports in detail all the research activities on how data were collected and decisions made during the enquiry (Bowen, 2009; Swanson & Holton, 2009; Li, 2004). Whereas process logs are researcher's records of all the activities that took place for the period of the study including choices of the participants (Connelly, 2016).

However, dependability in this study was ensured by providing adequate audit trail of how the data generation process was conducted and how the data was analyzed. In addition, the researcher made use of process logs in order to keep records of all the research activities and choices made inthe course of the research process over the period of the study.

Conformability implies that the data interpretation is consistent and derives from the data (Tobin & Begley, 2004). In essence, conformability may be defined as a process whereby findings of a study are shaped by the participants and are not the researcher's bias or interest (Lincoln & Guba, 1985). On the other hand, conformability which is the objectivity of the study depends on how the data accurately represents the information that the participants provided and that interpretations of those data are not created by the enquirer (Guba 1981; Kyngas, Utriainen, Polkki, Kanste, Kaariainen & Elo, 2014). Additionally, studies (Lincoln & Guba, 1985; Polit & Beck, 2012) argued that findings should reflect the participants' views and conditions of the enquiry neither the researcher's neither biases nor viewpoints Koch (2006). On one hand,

conformability can be maintained by the use of reflexive journal (Palaganas, Sanchez, Molintas & Caricativo, 2017). And on the other hand, can be described as the researchers' field notes to reflect on, and means of collecting data in qualitative research (Palaganas, et, al, 2017; Phelps, 2005). For this study, conformability was ensured through the steps to see that the data accurately represents the information that the participants provided. Secondly, the researcher ensured that the data interpretation of the study is consistent with and is derived from the data.

An additional criterion to ensure trustworthiness is transferability. According to Polit and Beck (2012) transferability may be defined as a process by which research findings can be transferred to other settings or group. Furthermore, they argue that transferability is concerned with the abilityof others to judge whether the findings of the study can be transferred to other settings (Mabuza, Govender, Ogunbanjo & Mash 2014). Thus, transferability was enhanced in this study by providing detailed descriptions of the research processes, the participants' perceptions and their experiences (Brown, Stevens, and Troiano & Schneider, 2002) in order to provide the readers with detailed information to make decision with regards to the research findings whether it can be applied to other settings.

4.8 ETHICAL CONSIDERATIONS

In the course of collecting data for this study, different ethical issues were considered. Firstly, the researcher applied for ethical clearance from the university ethical committee for the purpose of the research study. Secondly, he sought for the gatekeeper permission from the Department of Education and from the principal of the two schools (A and B) to enable him conducts the research study in their schools. However, on the interest of participants, informed voluntary and formal consent from all participants were obtained in written form prior to the commencement of the research study, including parental and guardian consent for the learner participants. In addition, the right of the participants was properly and clearly outlined and explained to them, including thatthey have the right to discontinue their participation in the study without any harm or prejudice tothem or their study or work as the case may be (Pillay, 2014). Thus, the confidentiality and anonymity of the information by participants was also considered in the study (Benson & Gibson, 2012) using pseudonyms. Finally, all other information collected for the purpose of the study weresafely stored with the School of Mathematics Education at the

Edgewood Campus for the stipulated period and in accordance with the ethical clearance, and will be subsequently properly destroyed as required.

4.9 CONCLUSION

This chapter presented the research design and methodology that was employed to conduct this study. It also discussed the research approach, sampling methods and the research method that was adopted to generate data for this study and how the data was analyzed. Lastly, the chapter explained how it ensured the different issues of trustworthiness and presented how ethical issues in this study were considered. Therefore, the next chapter presents the data analysis and discussion of the findings of this study.

CHAPTER FIVE

DATA ANALYSIS AND DISCUSSIONS

5.1 INTRODUCTION

In Chapter 4 of this study, I identified the research method that I utilized to generate data that answers the research questions. This chapter analyses and discusses the data. However, the data collection in 2020 was interrupted by the COVID-19 pandemic. I was finalizing going to the field for data collection when the pandemic induced national lockdown started and schools had to close down. This is detailed in the preceding chapter. It suffices to recap that because schools resumed after a period of hard lockdown to the teaching and learning shifted to strict social distancing/remote and online learning, the initial data collection plans and strategies for this study was reworked. To pragmatically collect the data, certain steps had to be taken. When I got the permission to go to the site to collect data there were COVID-19 regulations in place which now made it impossible for me to carry out the originally planned method of Semi-structured interview. Therefore, I had to resort to the use of questionnaire to improvise as the means of collecting the data, which is mentioned in the introduction chapter and detailed in chapter four.

However, the use of questionnaire in this study only serves as an improvisation for the research tool in place of the interview. Therefore, in this data analysis chapter, I am not presenting my data like data collected using questionnaires. It suffices that the responses of the participants are responses elicited as individual interview. Next, the analysis and discussion of data is presented using emerging themes from the data. When exploring the learners' experiences of the teaching strategies used in teaching algebra by their Mathematics' teachers in this section, the findings that emerged from the data revealed that they had both negative and positive experiences.

According to the social constructivist theory, learning experiences is derived from the social interaction between social groups within a context (Lev, Vygotsky, 1978; Hart, Oliveira, & Pike, 2020). The overarching themes used to organize the analysis and discussions are characterised as the negative and positive experiences of learners. These are then explored using the subthemes as the diverse categories were identified. The analysis and discussion below start with the negative learners' experiences.

5.2 LEARNERS' NEGATIVE EXPERIENCES OF THE TEACHING STRATEGIES

5.3 Theme One: The emerging themes under the negative learner experiences are: (1) Algebra is boring; (2) It's difficult; (3) The language (4) Teacher's nonchalant attitude; (5) Lack of teacher's content knowledge

5.3.1 "Algebra is boring…"

The participants experience their algebra lessons as boring. Accordingly, their lessons were unexciting, and the learners were not motivated enough to engage both the learning content and classroom learning interactions. The participants indicated that they felt so bored each time during the lessons because the teacher neither interacts nor explain how they arrive at the right answers.

Learner 4 (School A) commented.

> *I really don't like the way our teacher teaches us. I can't say I understand a thing he taught us on Algebra. Sometimes he makes it boring. All I can say is most of the time in class I feel like I want to sleep, the lessons are not exciting at all especially as I don't understand how our teacher is arriving at the answer to the problem he is solving on the board.*

Learner 7 (School B) corroborates.

> *I always get bored during the class. He* (the lesson teacher) *is hardly audible, no one could hear him well, just like mumbling to himself. Not even when he tries to explain the concepts, we can barely understand his heavy accent. Our teacher is a foreigner you know… Eish, he can't say these things in isiZulu and there also is the problem…*

Another participant, Learner 9 (School B) has this to say.

> *He* (the teacher) *usually gets angry and frowns at us when we complain and ask him to repeat what he said after we didn't hear him well. Secondly, it's always difficult for me to*

answer questions because there are things, I could only say in isi-Zulu, so I felt so bored in the classroom since he does not like it when you try talk in Zulu.

The participants perceive the topic 'algebra' as a difficult one, pointing to the teacher as key to making it uninteresting. According to the comments, they struggle to follow what their teacher is teaching and how the teacher arrives at the right answers. This is not helped when their teacher, as …… puts it, "*usually gets angry and frowns… when we… ask*(ed)*… to repeat what he* (they) *said…"* The participants echo each other in their assertion that the topic is 'boring', given the combination of the situations where; 1. they are unable to understand some concepts, 2. their teachers hardly explain in a way they can understand, 3. they find the lesson un-engaging because they are not allowed to ask questions, and 4. their teachers do not encourage conversation to clarify learning.

One of the participants from school B (Learner 5) comments that algebra lessons are boring where the teacher is not audible when explaining the algebraic concepts. This makes the teacher- learner communication ineffective, which hinders the learner interactions with both the lesson content and their teacher. Kathard and Pillay (2015) suggest that quality of teacher-learner interaction impact mathematics learning in high school. These studies affirm the findings in this present study, and together suggest the key role effective teacher-learner communication in classroom teaching of high school mathematics plays. As the findings further suggest, learners in this study experience their learning of algebra as boring because they were not actively engaged as they barely hear what their teacher say.

Ying, Osman, Kurniati, Masykuri, Kumar and Hanri, (2020) also identified language barrier experienced by Grade 10 learners as cause of less commitment to learning algebra. The findings of this present study show language barrier as one challenge the Grade 10 learners experience in their classroom that affect their understanding of algebra. The study participants found their algebra lessons boring because their teacher usually gets angry whenever they complain about the language and sought for the concepts to be explained in their first language which is isiZulu. One of the participants points to their teacher's limitation to speak isiZulu as the barrier. Accordingly, the interaction in the classroom is influenced by this limitation because the teacher could not answer questions or engage their conversation in the first language. Yet, there are certainthings their teacher could not explain to their understanding in English but could have

easily explained if expressed and made clear in isiZulu for all learners to understand. This reveals that some of the learners found algebra boring, owing to an array of factors, some related to language of instruction. The findings resonate with Djam'an, (2021) and Umbara, Susilana and Puadi (2021) studies that suggest that learners in high schools and colleges in South Africa find algebra lessons in mathematics a boring topic. Other studies (Agustyaningrum, Sari, Abadi, & Mahmudi, 2021; Gafoor, & Kurukkan, 2015; Li, Lemieux, Vandermeiden, & Nathoo, 2013) document learners experiences of learning algebra as boring due to the teacher related issues and teaching styles.

When probed further to find if it is only algebra or they also find learning other mathematics topics and the concepts boring, the participants responses were revealing. They confirm that some other topics in their mathematics are also boring, because if their teacher fails to make the lesson come alive by engaging conversation and break the concepts down in way they can understand or use their first language to make clearer.

There was communication barrier between the mathematics teachers and their learners since the Grade 10 learner could only actively interact and participate in the lesson using isiZulu which their teachers do not use to clarify and make the lesson topic interesting and easy to follow. In contrast, the study by Sharma (2019) reported that teachers use English to teach algebra because they struggled with how to use their home language to maximize learning in their classrooms. Regardless, in the context of this present study, it is contentious to assert that the teachers' use of English, which is the learners' second language, 'maximizes' learning in the Grade 10 algebra lesson classroom. It would be interesting to explore this in future studies.

5.3.2 "It's difficult to understand…"

The participants' responses that relate to their negative experiences of learning algebra in the second theme that emerged is that the topic is difficult to understand. Pointing out that the methods their Mathematics teachers use to teach the algebra was not only difficult to understand, they comment also that they find it not easy to apply to solve the problems on their own.

According to Learner 3 (School A)

> *My worry is how I can understand the processes in Algebra to be able to solve expressions. I find it difficult to follow the teacher, and because I hardly participate during his* (the teacher's Math lesson) *class discussion, as I don't know anything to contribute. But it's just me, some of my classmates feel the same though. It feels like wired if you* (are) *just there sitting and don't just get anything, yooo… it's difficult ehn…*

Like Learner 3, several of the participants also comment about their difficulties in understanding the processes their teacher makes in solving algebra expressions. They mention that their main challenge is where their teacher does not clarify with them that they are following the learning but would go on and on while learners are lost and are not catching up. And because the learner-teacher communication becomes de-linked when they are having difficulty to follow the lesson, the participants in this study say they find it difficult to understand their teachers' method of teaching them algebra. This confounds their negative experiences of learning the topic.

Learner 5 (School, B) asserts.

> *… is difficult to learn and understand because our teacher does not explain to us why he uses those methods and when to use them. So, I am always getting confused when am going through the examples of the work we did in class to do my assignments… it's just like, t's not there, I mean I can't see how to solve that…*

From the participants' comments, they are finding the learning difficult because of the methods that their teachers adopt to teach the topic, which did not enable sufficient learner engagement with the learning. The teacher seems to be immersed in the solving of the mathematical problem thereby negating the underlining and important pedagogical requirement of teacher-learner communication involved in interactional and active learning (Hassana, 202; Dine, 2021). Use of lesson approaches that ensure that content is well planned and designed, lesson is adequately developed, and tasks are well defined and followed is important in achieving a successful lesson, and in this instance, the algebra topic lessons. Simply due to the lesson method, in which the steps in solving algebraic expressions are not explained and broken down to the level that learners are able to understand, the teacher shortcomings lead to the negative experiences these learners have in learning the topic.

However, studies (Baidoo, 2019; Samuel, Mulenga, & Angel, 2016; Marpa, 2019; Huang, & Kulm, 2012: Oliveira, Polo-Blanco, & Henriques, 2021) suggest high school teachers do not have required knowledge of solving algebraic expressions. The present study findings align with this suggestion as the participants comments point to the esoteric nature of the teachers' methods of teaching that leaves their learners confounded and disengaged.

The learners' loss of concentration in their learning, which for some mean 'difficulty' in learning algebra because of how their teachers teach them, leads to their conclusion that their teacher do not care about them, and that is, if the intended learning is taking place or not. Therefore, a similar view is taken from (Konicek-Moran, & Keeley, 2015) who suggest that the teachers should teach for a conceptual understanding.

Learner 11 (School, A).

> *Our mathematics teacher doesn't get to find out if we really understood what was being taught in the class or not, he just gives lessons and leave.*

Learner 10 (School, B) also comments.

> *I find it was challenging because since when we walk into the classroom and do mostly copy what our math's teacher writes, and as soon as time is up, our teacher leaves without minding if we understood well or not.*

Learner difficulty to understand the lesson topic is affected by their level of engagement or non-engagement in the learning. Hence, Babincakova and Bernard (2020) explain that learners have difficulty understanding some of the methods their mathematics teachers use to teach algebra. They further argue that learner that struggle with understanding their teachers' lesson because teaching methods also struggle to consolidate any learning that may take place (Babincakova & Bernard, 2020). A similar study (Mupa & Chinooneka, 2019) affirms that lack of proper teaching methods influences learners' understanding of algebra. Likewise, other scholars like Magableh and Abdullah (2020) Juanda Shidiq and Nasrudin (2021) encourage use of appropriate teaching methods or teacher ingenuity to modify that in a manner that suits all learners in the classroom and enhance their understanding.

Drawing from the participants' verbatim comments, the present study confirms these findings that some mathematics teachers feel less concern about their classroom learners, that is, whether they understand what was being taught or not. Regardless, a plethora of other studies suggest that teachers apply different strategies to enhance their teaching of algebra and take time to see that their learners show understanding of the lesson before they leave the classroom (Sadita, Hirashima, Hayashi, Wunnasri, Pailai, Junus, & Santoso, 2020). However, in this present study, the teachers do not ensure learners understand what was taught in the classroom before they leave the class. In their verbatim responses, the participants' comments echo the literature, for examples, Khalid, Yakop, Ibrahim (2020) and Cholily, Kamil, Kusgiarohmah (2020) that indicate learners' poor understanding of the algebraic concepts lead to negative experiences of learning the topic. As a foregoing observation, Mohd-Rustam (2016) argues that the greatest challenges surrounding learning in public high schools is the inability of learners to understand what was being taught by their teachers in the classroom. This difficulty for the learner participants in present study is core to what they relate and express as negative experiences of learning algebra.

5.3.3 Teacher *"goes on forever… School A"*

The Grade 10 teacher responses suggest diverse teaching strategies they are using to teach the Grade 10 learners' algebra. Given that learner perceptions of their teachers' content knowledge and subject competency matters for their levels of interest and engagement in the learning process and thus influence their learning experience, it was important to explore the teachers' teaching approaches.

Learner 3 (School, A) remarks.

> *…I think he knows answers to the mathematical problems but seems to me he lacks the skill to impact this knowledge to us learners, you see. He goes on forever solving this thing without explaining it well to us. Sir, how do we know by just sitting there writing what he writes on the board? I want to follow him to know how is getting the right answers.*

The above responses from the learner participant's show their negative experiences. Although, the approach in which teachers in mathematics utilize to teach their Grade 10 learners' algebra

goes a long way in determining the success of the learners, the learner's responses show that their teachers' wrong approach or lack of appropriate approach that is supportive impact their experience of the learning negatively. Their responses also corroborate their teachers' which show what they explained as teacher-centered approach seems not to be working for these learners.

Teacher 1 (School, A).

> *….for me, teacher-centered remains the best approach for now due to the time shot to teach Algebra to get all learners in the class practically involved. I use this approach as I want to benefit every one of the learners and make sure they all have inputs including the slow learners.*

In a vague allusion to same approach that Teacher 1 above commented about, he further adds

> *What is important especially when planning to teach Algebra is to devise a means for every learner in the class to be part of the lesson. What I do is to allow them to solve and provide answers then I do the corrections. So, I normally use this approach in my classroom so that all learners will participate, and no single learner will be left out.*

One thing that is coming out strong is the contradiction between learners' perception of their experiences of the algebra lessons and the teachers' assumptions of the learners' participation and full involvement in their class. The teacher participant in school "A" in this present study are unaware of how delinked and lost their learners tended to be as he deploy the 'teacher-centered' approach in their teaching. More so, the teacher seems unaware of the dynamics the approach creates, and the resulting experiences that these learners' perceptions of their teachers' approach had in the learning environment.

Yet, from the participants' comments, it can be inferred that such teacher approach does not only inhibit learner active participation, but also negate promotion of the learners' fun and interest in the topic that are necessary to demystify algebra, make the learning exciting, relevant and concrete. Serin (2018) discusses issues of teacher-learner dynamic that play out in the classroom where teachers were, and or inadvertently assert they are, in charge. This present study resonates

well with Mpho's (2018) assertion that when the classroom is teacher-centered, teachers tended to retain full control of activities. Hence, the learners' urge to express themselves, ask questions, direct their own learning, and interactively participate is overlooked in such teacher-centered teaching. Thus, the combination of the teacher choice of approach to teaching algebra, in this case, the 'teacher-centered approach', and the apathy, disinterest and barriers to the learner active engagement that an unfitting approach results in, together plays crucial role in the high school experiences of learning algebra. This present study affirms these in negative experiences that the learner participants expressed, and the limitations of teaching approach can pose in terms of advancing the learning of algebra and indeed, mathematics, at this crucial grade in high school mathematics curriculum.

The study also agrees with the contention that learners lose sight of their goals, become disinterested and are not actively involved in classroom learning of algebra (Du Plessis, 2020). These are crucial matters, and this present study posits that the meld of teacher-learner dynamics in terms of classroom interactions, learning environment, and the teacher's use of teaching approach, as well as learner expectations can be either enabling or disenabling of learners' negative experiences of the topic.

5.3.4 "…some of us are left behind school B"

The reluctance the teachers tend to have in ensuring differentiation in their teaching is narrated by the learner participants. The narratives seem to suggest that not enough accommodation is made by the teacher for the varied and differential learner learning styles and their learning needs and levels of understanding of the topic in their lessons. Hence these participants' perception of their teaching as focusing on some learners and not all learners in the class. The learners' disappointment with what they see as their teacher's selective focus on certain learners is evident in the comments.

Learner 1 (School, B)

> …(the teacher) *looks at bright learners and talks and interact with them only, some of us* (other learners) *are left behind as he talks to them and goes on. So, actually I feel lost and struggle to catch up but sometimes it's hard…*

Learner 2 (School, B).

> *Ehmm… for me I don't give chances, I had seemed to develop my own method of studying which actually been helping me. In class, if you are not asked, I will keep solving along so long as I understand… just to tag along.*

The participants seem frustrated by the poor teacher-learner interactions. Their comments suggest that the teacher seems only to do teach a section of the class while ignoring others. Keiler (2018) highlight the importance of the classroom teacher teaching for a whole class and not focusing on just a section or certain learners in class. However, the teacher says:

Teacher 1 (School, B) highlighted,

> *Teacher and learner centered approach works well for me. Simply because my learners are different, those who are smart learn better with learner centered approach whereas for slow learners, I use more of teacher centered.*

The above responses confirm the statement made by the learners. The teacher labeled some of his learners as slow learners or not being smart enough to be taught using a leaner centered. In order words, he uses teacher centered to administer lessons for these learners he labeled as slow learners and this in turn has negatively impacted on the way they learn. This is also a serious matter because lack of teacher-interaction negatively impacts on the way the learners learn (Afshar, & Doosti, 2016).

This finding is consistence and in accordance with some recent literatures, such as (Murphy, Eduljee, & Croteau, 2021) who argue that when classroom is teacher centered, learners work alone and tends to have less opportunity to work with one another (Muganga, & Ssenkusu, 2019). The finding of this study also reveals that some of the Grade 10 learners are not benefitting from their teacher, instead the teacher constrains their learning. Drawing from social constructivism theory, which indicates that human development and knowledge is socially constructed through interactions with others (Campbell, Shotter, & Draper, 2018; McKinley, 2015). Thus, when the teacher refuses to neither interact nor support their learners, the learners learning becomes negatively affected (Cicekci, & Sadik, 2019). A similar view is taken by (Willemse, Venketsamy & Swanepoel, 2022) who suggest that teachers should provide with their

learners all the necessary support for them to be competent and confident in their Grade 10 learning. But this was not the case in this study.

5.3.5 The language

The findings in this study suggest that some participant's expressed challenges in understanding the language used by their mathematics teachers. This may explain why they have negative experiences of learning Algebra. In the line with discussion, the following views of learners were stated here related to language:

Learner *10 (School, A) has this to say:*

> *Ehmm…. one of the things I find challenging is the language used by our mathematics teacher. Most of the time, the lesson becomes very difficult to understand as the teacher does not use the language that we are familiar with.*

Other participants noted that the mathematics teacher does not speak nor understand the local vernacular, isiZulu, a language well-spoken in the Kwa-Zulu Natal Province where the study is conducted led to their difficulty in understanding the topic. In line with the discussion, the following view of the learner is shared below:

Learner 11 (School, A) indicated:

> *The language was a little bit challenging, some of us feel shy to ask the teacher questions or seek for clarification of learning points in the language we are familiar with since the teacher doesn't speak or even understand the same language that we speak.*

Learner 9 (School, B) also noted:

> *Regarding my experience about learning the mathematical symbols and formulas in Algebra was problematic. Eiish…. this teacher fails to interpret them further in the language I can understand better. Instead, he uses high words in mathematics I don't even understand well.*

The above responses show that the weak familiarity of language use by the mathematics teacher posed as a significant threat by the participating learners. These findings resonate well with the

studies by (Owen-Smith, 2010; Saneka & de-Witt, 2019) that majority of learners in South African schools face a language barrier in their classrooms. For example, scholars like Janse van Rensburg (2016) and Joubert (2015) found that learners in South African schools were afraid to answer questions requiring language skills due to the language barriers. Conversely, in another study by Bhengu (2015) on exploring the Grade 10 learners' responses towards the teachings of Isi-Zulu as first additional language. The finding also shows a massive positive response by these learners when taught by their native language.

According to Tavoosy and Jelvey (2019) learners who cannot use the language he or she can understand well, for example her home language in the classroom is disadvantaged and not likely to do well in class. This finding also supported the existing studies by (O'Neill, Russell 2019; Mehan, 2020) who indicated that some learners cannot ask question nor make suggestions in class when the home language cannot be used. This in turn has a negative impact in the way they learn.

Drawing from the learners' responses and literatures reviewed above shows that these Grade 10 learners experienced challenges due to a language barrier that impacted on their experiences because, mathematical symbols and formulas are in themselves a language on their own, and for high school learners, interpreting them in language they understand cannot be anything short of effective teaching. Therefore, the learners' perception of their effective leanings experience is one that concretizes their learning by using terms, imageries, examples and illustrations in the language the best understands which is and makes the learning accessible to the learners.

5.3.6 Teacher's nonchalant attitude

The responses from the learner participants from both schools also indicated that the teacher's attitude was another inhibiting factor that strongly impacted on their learning. These ranged from the teacher's lack of interaction and communication, poor teacher and learner interpersonal relationships etc. One of the participants expressed concern about the teacher's nonchalant attitude and how they teach them gave rise to absenteeism.

Learner 2 (School, A) noted;

Our teacher does not like interacting with us learners even to catch up with some jokes with us during the class… when we have challenges understanding the Algebra lessons, we are afraid to ask help from him because of the way he shouts, talks and treat us. Sometimes I do not attend his class.

Learner 4 (School, A) said;

Eiish…. there was a day I asked our teacher if I could be seeing him whenever I need some help in Algebra which he agreed, So I had only seen him twice for help since this term and many times I went to his office, he will either say I came late or I must see him the next day. The next day he shouted at me when I went to remind him. He has attitude and less concern about us.

Additionally, other than the observed negative attitude by the learners, some of the participating learners from School B noted that on several occasions, their mathematics teachers were not always in school, thus affecting how much they covered in preparation for their examination. Thefollowing quote provided evidence of the views generated from the participant:

From Learner 6 (School, B):

Sometimes he will be out for a medical check at the clinic and do not return to school before school closes for the day.

The above responses from the participants showed that the Grade 10 learners 'developed the attitude of not attending classes due to poor teacher and the learner's relationships. As reported in Odike and Nnaekwe (2018) that the teachers' nonchalant attitude discourages learners, causes an unpleasant learning environment, and limits their course choices thus, negatively impact on them i.e. if the foundation for a good relationship of a teacher and a learner is lacking (Blazar & Kraft, 2017).As a result, the learners will resist rules and procedures and will neither trust their teachers nor pay attention to what they are saying if they sense teachers do not respect them (Kirby, 2020).

Additionally, the above findings corroborate with Lazarevic and Bentz (2021) who identified that the lack of teacher and learner interaction can lead to stress and when a learner experiences ahigh level of stress, regardless of her age or level of studies in class, this may interfere with her

ability to learn. The above findings also resonate with Sabates, Carter and Stern (2021) who in their study identified that the lack of teacher and learner interactions could lead to a low learner attainment level and consequently results to a lack of respect from the same learner. Conversely, the study by Akhtar, Hussain-Muhammad, Afzal-Muhammad and Gilani (2019) concurred that if there is no-interaction between a teacher and his learners, impacts on learners' mind may be impossible.

In contrasts to this study, plethora of studies (Zandvliet, Den Brok, & Mainhard, 2014; Dietrich, Zimmermann & Hofman, 2021; Xu, & Qi, 2019; Li, 2021; Varga, 2017; Alemu, & Woldetsadik, 2020; Chen, Bao, & Gao, 2021; Engels, Spilt, Denies & Verschueren, 2021; Syahabuddin, Fhonna, & Maghfirah, 2020) have shown that a good relationship between a teacher and his or her learners can have a considerable impact on learners' academic success. Therefore, learners who have positive relationships with their teachers are less likely to avoid school (Rimm- Kaufman & Sandilos, 2012).

Drawing from the findings, the study discovered that some Mathematics teachers always absent themselves from their class duty with the excuse of going to the clinic for a medical checkup sometimes and do not return to the school before it closes for the day. Therefore, these teachers' attitudes negatively impacted on the learners' learning experiences. This finding is in line with the recent literatures that when a teacher is absent from the classrooms, learners' learning is disrupted and when that occurs repeatedly, learner's success in academics can be seriously impacted in a negative way (Wallace, 2020; Medrano, 2019). Consequently, Finlayson (2009) states that the more the teacher is away from school the lower the learners will score during classroom test. However, the findings in this study also agrees with Wallace (2020) and Medrano (2019) who in their studies argue that when a teacher could not be found in the classroom during working hours, learners learning are disrupted and when that happens often, learners learning may be affected.

5.3.7 Lack knowledge

Another theme emerging from the participants' responses was the lack of teacher's content knowledge. The comments from these learners indicated that the manner in which they are

taught algebra at the Grade 10 levels did not guarantee much in quality as this has greatly affected their learning. The following comments were made by the participants.

Learner 1 (School, B)

> *'Ehmm, one of the things I noticed about our class teacher is that during class lessons, he focuses more on the worked examples from the mathematics textbooks. And when we ask why he always focus on the worked examples, he would say it's part of our class work. Eiish…. this thing is a problem and this has made some of us to begin to lose interest in learning mathematics.*

Another participant pointed out that in certain instances their mathematics teacher will get stuck while solving question on the board and he will ask the learners to find the solution to the problem. As a result, some of the learners do not want to be attending mathematics class. As expressed by the following participants:

Learner 3 (School, B) noted:

> *There used to be time when our Mathematics teacher will get stuck with a question, he will then say guys attempt this question. Sometimes we encounter additional obstacles as we attempt to solve the question and because of this some of us do not want to be attending our Mathematics lesson.*

Another of the participant indicated:

Learner 4 (School, B)

> *Most times our teacher cannot comfortably solve questions freely on the board without having to carry his Mathematics textbook and look at previous examples. And this has made me to have the feeling he isn't good with the subject content.*

Hence, some of the participants advised that a professional teacher ought to be creative by the use of diagrams or pictures in order for their learners to have a better understanding of the concept. In line with the discussion, the following quote of the learners below serves as evidence of the raised view:

Learner 11 (School, B) suggested:

> *An experienced teacher has to create conditions that will encourage us and help us to understand the Algebraic concept, by the use of diagrams or show some pictures while teaching some of the Algebra concepts. But in our own case, our Mathematics teacher could hardly do the same.*

Therefore, the findings from the above verbatim statements from the participants showed that the Grade 10 learners had diverse negative learning experiences. For instance, Learner 11 (school B) noted that her experience made her to lose interest in attending mathematics lessons as the teacher always focuses more on the worked examples on the textbooks. In a similar vein, Learner3 (school A) also asserted that their mathematics teacher sometimes gets stuck while solving questions on the board and what he does is to ask them (learners) to find the solution.

Meanwhile, this finding from this study corroborates with the study by Panthi and Belbase (2017) who discovered that when teachers do not get to the roots of the mathematical equation, learners experience difficulty in problem solving and fall behind academically. Thus, making these learners who are about completing their high school education to lose confident in mathematics related skills and subsequently avoid careers that would relate to those content areas (Mazana, Suero Montero & Olifage, 2019; Mutegi, Gitonga, & Rugano, 2021).

Learner 4 (School, B) also noted that the lack of teacher's knowledge therefore explains why sometimes her teacher could not solve difficult questions without having to look at some previous examples on the mathematics textbook. This finding therefore suggests that the lack of content knowledge of some high school mathematics teachers may limit the impact of other educational inputs, such as using textbooks effectively (Molise, 2020). Therefore, improving the knowledge of teachers would be more important rather than investing in physical resources (Granziera, Collie, & Martin, 2021).

In addition, the findings in this study also revealed that the lack of teacher's knowledge created a lot of challenges for the learners. This is because the data showed that some of the mathematics teachers could not make use of the maps or show some diagrams to explain the algebraic concepts to the learners so they could grasp or understand the content better (Melhuish, Lew, Hicks, & Kandasamy, 2020; Sholihah, & Maryono, 2020). Similarly, a recent study by Hatisaru,

(2020) also points out that there are some mathematics teachers who only solve correctly but neither use pictures nor diagrams to represent the algebraic concepts and procedures for a better understanding. Significantly, the findings suggest that the lack of teacher quality might explain why the use of resources to teach algebra has proven to be so little effective in enhancing the learners learning (Rusilowati, & Wahyudi, 2020).

Therefore, a closer examination of the findings in this theme have shown that there were many inhibiting factors that these Grade 10 learners experienced while learning algebra in the classroom and that if nothing is done faster, it will likely hinder their learning of algebra. However, evidence of the above claims is relevant to social-constructivism theory (Lev, Vygotsky, 1978), where Vygotsky posits that individual understanding improves by the virtue of social interaction (Lev, Vygotsky, 1978 & Hart, Oliveira, & Pike, 2020). This is what the social constructivism theory reveals that the interaction between a teacher and learner indirectly affects a learner's learning which can act as a powerful influence (negatively or positively). In this regards, non-interactions between a teacher and her learners can lead to their negative experiences (Doyumgac, Tanhan, & Kiymaz, 2021).

Hence, the participants in this study were able to identify factors in their school which according to them were seen as negative experiences as shown in the above discussion. However, not all factors contributed to learners' negative experiences, but there were also other factors that were noted by the participants as positive experiences. In the next section, the researcher discussed findings related to this second sub-theme titled, *the learners positive experiences of learning algebra.*

5.4 THE LEARNERS 'POSITIVE EXPERIENCES'

In this theme, the participants' positive learning experiences revealed five subthemes such as: algebra is enjoyable, fun, exciting, enhance critical thinking and problem-solving skills. These themes are presented below:

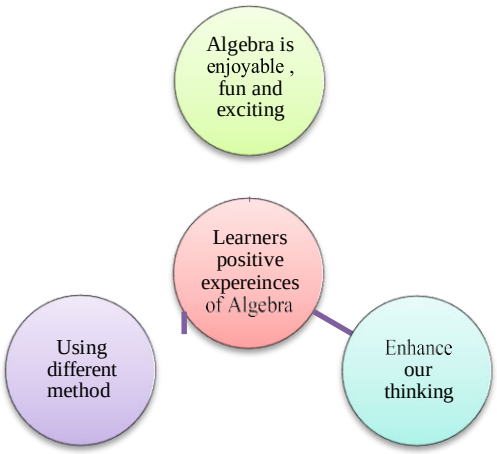

Figure: (1), *Diagrammatic expression of theme one learners' positive experiences*

5.4.1 "……Algebra is enjoyable"

Data from the participants (learners) responses indicated that they enjoyed learning algebra because it makes them to think of how to solve an algebraic equation without the use of mathematical calculator. They further revealed that the study of algebra enabled them better understanding even in other branches of mathematics. It was noted by *Learner 1 (School A)* that he enjoy algebra a lot because it makes them to solve a question directly without having to use a mathematical calculator. He also pointed out that this topic has assisted him to have a basic knowledge not only in algebra but in other areas of mathematics. Furthermore, learner 2 (School, A) also disclose that the Grade 10 algebra lessons has helped a lot in developing her mathematicalthinking which in turn enabled him better understanding in other branches of mathematics, for example trigonometry and calculus etc. Other participant, learner 6 (School, A) noted that the experience he had in learning the Grade 10 algebra assisted him to develop competency in learningmathematics in general. The story of these participants is shown in the following quote below.

Learner 1 (School A):

> *"It is an enjoyable topic because it makes us to use our mind most of the time and not using a Mathematical calculator". It's actually helping me to believe I can do it myself*

and to have an understanding that without a solid foundation in Algebra, understanding other branches of mathematics will be difficult for me.

Another participant supported:

Learner 2 (School, A)

I enjoyed learning and attending the Algebra lessons because it develops our mind to understand other areas of mathematics such as trigonometry, calculus. In fact it's actually preparing me for more difficult problems in mathematics of which I will be doing in the university.

Learner 6 (School, A)

Another participant stated:

To me I have realized that the challenge I had during my GET level was due to the poor knowledge of algebra in mathematics. Initially, I didn't take my studies in mathematics very serious and always had this mind that mathematics can be studied like every other subject until I realized that for you to be good in mathematics in general, one must have a good knowledge of algebra. So, a lot of things are beginning to change in my life and I'm so happy since I could solve the simple problems in Mathematics.

From the above data, it is apparent that these learners enjoyed learning the Grade 10 algebra. Their responses also have shown that mastering algebra helped them to develop conceptual understanding not only in algebra but in other branches of mathematics. These findings resonate with the studies of Star, Caronongan, Foegen, Furgeson, Keating, Larson, Lyskawa, McCallum, Porath & Zbiek (2015) that understanding of algebra is a key success to future mathematics and in other areas of mathematics. Although, plethora of studies emphasized that elements of algebra are found in other branches of Mathematics such as trigonometry and geometry (Makonye and Stepwell 2016; Mhakure, Jacobs & Julie, 2014; Mashaka & Makonye, 2016).

Therefore, drawing from the above findings suggests that mastering the Grade 10 algebra is a gateway to understanding other branches of mathematics. The next section discuses findings related to another sub-theme titled, *algebra is fun.*

5.4.2 "……Algebra is fun"

The responses from the participants' shows that the Grade 10 algebra was fun. For example, the participants mentioned that the algebra was fun as numbers and signs are used to represent words and vice versa. In particular, learner 2 (School B) noted that the Grade 10 algebra is fun as numbers are used to represent words in an algebraic equation. He further indicated that without the knowledge he had in learning the Grade 10 algebra, he wouldn't have noticed numbers,signs and symbols could be used to represent words. In relation to algebra is fun, learner 4 (School, A) commented that he finds the Grade 10 algebra as fun as he plays with some numbers and mathematical symbols which enabled him understanding on how to solve equations without difficulties.

The participant's verbatim quotes are presented as follows:

Learner 2 (School, B) stated:

> *I have learnt a lot about algebra, like how to represent numbers and signs of an algebraic equation into words. So, using numbers and signs to represent words in algebra is something that I have never known before but now it's more like a fun to me.*

Another participant *indicated:*

Learner 4 (School, A) stated:

> *Learning algebra was quite fun because, for example playing with numbers and some mathematical symbols helped me to solve questions more easily.*

However, the participants' responses above shows that the Grade 10 learners developed diverse academic skills such as representing numbers, signs and symbols of algebraic equations into words and also improved on problems solving. The above findings are consistent with the study of Guhl (2019) who indicated that a learner develops diverse academic skills through learning algebra.

5.4.3 **"…..Algebra is exciting"**

From the participant's responses, it was evident that the learners were finding the Grade 10 algebra very exciting. In particular, the participants spoke about their lesson being exciting because it is connected to what they already know. The following comments were made by the learner participants.

Learner 7 (school, A) stated:

> *The Algebra lesson was exciting because some of the things we are learning in class are what we already know.*

Another participant, *learner 11 (school, A)* indicated that:

> *As for me I find the lesson very exciting because it's linking with most of the things, I learnt during my Grade9.*

Participant, learner *(school, 10)* adds:

> *'Yes', I do find the Grade 10 Algebra lesson exciting because our teacher uses examples that connect to what we know before.*

The above responses show that some of the participants found the lesson very exciting. They mentioned that their mathematics teachers are using examples that connect to what they have been taught before. While we know that learners find their lessons exciting is because it is connected to what they already know to make the lesson come alive (Cheung, 2018; Schmidt, Cannon, 2017; Marques, Botti & Marques, 2019). When the lesson comes alive, the learners will not dose off nor disengage (Willis, 2021; Burgoyne, & Cohn, 2020) rather they will become contributors (Hargreaves, & O'Connor, 2018). When the lesson comes alive, the learners become active and participate fully in the class teaching and learning (Bovill, 2020).

5.4.4 "……Enhance our thinking"

When talking about their experiences of learning algebra, the participants also comment that learning the Grade 10 algebra enhanced their ability to think deeply in order to solve problems. These include the ability to think of the appropriate procedures to solve algebra. The utterances of some of the participants say this clearly:

Learner (School, A) explained:

> *I wish our teacher would be teaching the Grade 10 algebra on daily basis because learning this topic has developed my thinking ability. I could remember what I used to do during my Grade 8 and Grade 9 when I am given a question to solve. I would start solving without having to think of the appropriate method to use.*

Additionally, some of the participants mentioned that from their experiences such as learning the Grade 10 algebra enhanced their thinking. The participants below provided a candid comment that sums this up as follows:

Learner 2 (School, B) stated:

> *To me the positive aspect I found about learning Algebra is because, it's always making me to think and remember how our teacher usually solves it, some of the things he says while solving problems in algebra. It has actually helped to develop my thinking ability and I'm able to think clearly whenever I am solving Algebra.*

Learner 3 (School, B) supported:

> *I have learnt a lot while learning algebra. You can't solve Algebra without having to think of the right method to use. I could remember what our mathematics teacher usually tells us. One thing is to pay attention during classes and that it would help you to remember some of the things that took place in the classroom. For example, the methods he used and some kinds of questions he always asking before finding the answer. So, this topic actually helped to develop this skill and to believe that the solution of this thing is in thinking.*

The above responses confirmed the argument made by other studies. For instance, plethora of studies have supported the idea that learners who are critical thinkers are able to reflects on their own understanding and knowledge about the information that has been presented to them or explain procedures or concepts clearly (Syukriani, Juniati-Awoala, 2017; Siswono, 2017). Similarly, Simamora and Saragih (2019) indicated that learners who have acquired critical thinkingability are able to make good decision in order to solve problem. Therefore, the findings of this study have clearly shown that the Grade 10 learners developed the skill of thinking which

positively impacted on their learning. The next section discusses the findings related to the sub-theme titled, *Algebra enhance problem solving.*

5.4.5 "…..using different method."

All participants' responses suggest that they were able to improve in using different methods to solve algebra. Ability to solve questions using different approaches were terms repeatedly mentioned by the participants as examples illustrates below.

Learner 9 (School, B) stated:

> *Hmmm,…….,I am good at mathematics especially in algebra is because I took my studies serious. I could remember a number of times I picked up a mathematics question to solve and couldn't get the answer. I keep trying until I get used to solving algebra using different methods. So, at some point I became use to using different methods to solve questions in Algebra.*

Learner 7 (School, B) further states:

> *To me, I like challenges especially algebra. This topic has really taught me a lesson and I have come to realize that certain questions could be solved correctly using different methods. And now I am able to solve equations using different methods and get the right answer.*

Learner 11 (School, A) excitedly said:

> *From my own experiences, algebra is not like every other subject that you just read to understand the contents. Rather, is a topic in mathematics you basically need to practice (solve) from time to time and once you are doing that, you will definitely learn how to approach it using different methods to find the solution.*

The findings show that the participants experienced improved self-confidence in learning the Grade 10 algebra. This was evident in their responses of becoming an independent problem solver in mathematics, having to solve algebraic questions using different methods, feeling competent as mathematics professionals. This finding resonates with the studies of Anggraini,

Setyaningrum and Retnawati (2020) who reported that Algebra enhance problem solving ability where learners gain more confidence and becomes independent problem solvers.

In the light of the above-mentioned theme, literatures suggest that learners build new knowledge by creating mathematical ideas through problem solving (Mata-Pereira & da-Ponte, 2017). Thus, the findings from the study showed that the participant's developed self-confidence as they work hard to attain proficiency in solving the algebra their teachers taught them.

5.5 CONCLUSION

This chapter focused on the data analysis and discussions of the findings of the data generated from the open-ended questionnaires which explored the Grade 10 learner's experiences of the teaching strategies in algebra used by their mathematics teachers. The data presentation was done as themes generated from the study. In addition, verbatim quotations were employed to make sure the participant's voices were heard. In the discussion of the findings, relevant literature used to back up claims were infused accordingly. The following chapter discusses the summary, recommendations and conclusion of this study.

CHAPTER SIX

SUMMARY OF FINDINGS AND RECOMMENDATIONS

6.1 INTRODUCTION

In chapter five of this study, the researcher presented the data analysis as well as discussions of the findings accordingly. And in this chapter, the researcher provides the summary of the findings showing how this study response to the two research questions. Recommendations from the findings as well as limitations are provided by the researcher. The recommendations for future research are also highlighted accordingly.

6.2 SUMMARY OF THE KEY RESEARCH FINDINGS

This section provides the summary of the findings that responded to the key research questions used to guide this study as stated again below:

1. What are the teaching strategies the grade 10 mathematics teachers use in teaching their learners algebra in the two schools in Pinetown?
2. How do the Grade 10 learners experience the teaching of algebra by their mathematics teachers using the teaching strategies they use in the two schools in the Pinetown District? In responses to the above questions, the researcher presented the themes as emerged from this study.

6.2.1 SUMMARY OF FINDINGS ON RESEARCH QUESTION ONE

Using the key highlights, the findings of the present study on research question one is summarized as follows.

The Grade 10 mathematics teachers in this study did not use a variety of teaching strategies in teaching their learners algebra. However, it is noticeable from the findings that the onset of the COVID-19 pandemic and subsequent impact on the teaching and learning in schools influenced the teachers' choice and use of teaching strategy. This is a possible explanation to the teachers' responses to their use of strategy that emphasizes what they explained as "teacher-centered and a learner centered approach'. The teachers' concerns about being able to complete their scheduled

learning content in the specified period as well as the loss of classes by the Grade 10 learners, many of which were unable to attend classes normally meant that the teachers attempted to re- strategize their teaching approaches, leaving little or no room for variations.

The second issue of note is when another teacher mentioned that she normally uses teacher centered approaches so that all learners would participate in the class. However, the teacher seems unaware of the dynamics of this approach and the disconnect it creates while the learners are lost and experience difficulties following the lessons. Perhaps, differing from her objectives, not only did the class teacher made use of the appropriate teacher's guide closely with respect to teaching approaches, but should have use the approaches where the Grade 10 learners would need to think for themselves.

6.2.2 THE SUMMARY OF FINDINGS ON RESEARCH QUESTIONS TWO

Using the key highlights, the findings of the present study on research question two is summarized as follows:

The findings in this theme suggest that the learners had both negative and positive experiences while learning the Grade 10 algebra. This shows that the Grade 10 learners had a realistic view concerning the way they are learning. The findings however, identified some factors inhibiting their learning as discussed below. One which revealed the Grade 10 learners experienced their teachers' teaching of algebra as boring given the combination of the situations (a) where they are unable to understand some concepts (b) their teachers hardly explain in a way they can understand (c) they find the lesson un-engaging because they are not allowed to ask questions (d)their teachers do not encourage conversation to clarify learning. As such, the above findings suggest the teachers' strategy was experienced as difficult because they could not understand. The learners were unable to follow the lesson and could not easily apply the learning to solve problems on theirown.

There have become other issues in this study that makes the learning difficult, for example, learners' perceptions of their teachers' care and competence posing the barrier in communication some of the learners felt between them and their mathematics teachers that impacted the quality of classroom experiences of learning algebra, Challenges in understanding their teachers explanation of concepts in English (meaning that another added barrier to their difficulties with

learning algebra is weak familiarity with its mathematical concepts), Poor teacher and their learners' interactions, teacher absenteeism from her classroom duty. When learners are faced with such challenges can cause a high level of stress and therefore their participation, engagementand interest in the classroom activities also becomes affected.

Regardless, the findings from this theme have also shown positive learning experiences of some of the Grade 10 learners learning algebra which helped in developing and shaping their mind academically. The finding shows that some of the Grade 10 learners were resilient to the challenges they identified within the classroom, and therefore had developed and adapting strategies of becoming independent problem solvers. For example, some of the Grade 10 learners mentioned algebra as a vital resource to their knowledge in understanding mathematics as learning the Grade 10 algebra has helped them to grow academically.

6.3 RECOMMENDATIONS

The present study findings suggest the following recommendations:

- There is need for Grade 10 mathematics teachers to use variations of teaching strategies in their classroom teaching of algebra.
- The importance of use of learner's home language in making mathematical concepts like algebraic concepts explicit and in ways that Grade 10 learners can connect to the learning cannot be overemphasized. This will to assist the learners who are still struggling to learn and master concepts using the second additional language rather than home language at this level.

6.4 RECOMMENDATIONS FOR FURTHER RESEARCH

The recommendations for further research were presented below:

- The study was specifically aimed at the Grade 10 learners in under-resourced schools. Further research could explore Grade 10 learners' experiences at well-resourced (Ex-model-C schools) for comparative views.

6.5 LIMITATIONS OF THE STUDY

A study limitation explains barriers to the research outcomes and possible gaps. It also explains the researchers' limitations in mitigating such barriers (Rahiem, 2021) and justifies its viability. Major limitation of the study was the use of only one method of data collection, that is, the qualitative individual interview administered by means of open-ended questionnaires.

Due to the unforeseen changes the COVID-19 pandemic brought the two school sites of data collection for the study were on lockdown at the time the data was collected. This meant that I could not go to the school to collect the data from the Grade 10 learners using the originally planned research methods of focus group and individual interviews. Thus, there was no physical contact involved in collecting data for this study. The research participants were required to answer the research interview questionnaires as discussed in details in chapter four.

However, data generated from one research instrument (interviews) in this study may not provide rich and accurate findings for this study. Therefore, if this study were to be conducted again, more research instruments, for example, focus group discussions, individual interviews, would be included to complement the research instrument that was used in order to get rich findings of the study.

6.6 CONCLUSION

This study suggested ways to enhance the learning experiences of the Grade 10 learners learning algebra in the selected schools. It also indicated that their learning experiences were both negative and positive. In order to help these learners, enhance their learning experiences, teachers in these selected schools need to use variations of teaching approaches to teach the Grade 10 learners. This study also recommends the use of home language to enhance their learning experiences and support them dealing with all the challenges they are facing in their classrooms. Whilst there are several challenges the Grade 10 learners encountered, the findings also show that the Grade 10 learners' development and academic growth were determined by their learning of the Grade 10 algebra which influences their learning positively

REFERENCES

Achmetli, K., Schukajlow, S., & Rakoczy, K. (2019). Multiple solutions for real-world problems, experience of competence and students' procedural and conceptual knowledge. *International Journal of Science and Mathematics Education, 17*(8), 1605-1625.

Adom, D., Yeboah, A., & Ankrah, A. K. (2016). Constructivism philosophical paradigm: implication for research, teaching and learning. *Global Journal of Arts Humanities and Social Sciences, 4*(10), 1-9.

Adewumi, T. M., & Mosito, C. (2019). Experiences of teachers in implementing inclusion of learners with special education needs in selected Fort Beaufort District primary schools, South Africa. *Cogent Education, 6*(1), 1703446.

Afshar, H. S., & Doosti, M. (2016). Investigating the impact of job satisfaction/dissatisfaction on Iranian English teachers' job performance. *Iranian Journal of Language Teaching Research, 4*(1), 97-115.

Agaliotis, I., & Kalyva, E. (2019). Motivational Differences of Greek Gifted and Non-Gifted High-Achieving and Gifted Under-Achieving Students. *International Education Studies, 12*(2), 45-56.

Ahmed, A. K. (2013). Teacher-centered versus learner-centered teaching style. *Journal of Global Business Management, 9*(1), 22.

Ainsworth, H., & Eaton, S. (2010). Formal, Non-formal and informal Learning on the Sciences.

Onate Press and Eaton International Consulting (ELC) lnc

Akanbi, A. O., Omosewo, E. O., & ILorin, B. O. N. (2018). Teachers' characteristics and availability of laboratory as predictors of senior school students' performance in physics in Ilorin, Nigeria. *Journal of Teacher Education and Educators, 7*(1), 43-56

Akhtar, S., Hussain, Muhammad, afzal, Muhammad, & Gilani, S. A. (2019). The impact of teacher-student interaction on student motivation and achievement. *European Academic Research, 7*(2), 1201-1222.

Alabsi, T. A. (2016). The effectiveness of role play strategy in teaching vocabulary. Theory and practice in language studies, 6(2), 227-234.

Alanazi, A. (2016). A critical review of constructivist theory and the emergence of constructionism. American Research Journal of Humanities and Social Sciences, 2, 1-8.

Almeida, P. A. (2012). Can I ask a question? The importance of classroom questioning. *Procedia-Social and Behavioral Sciences, 31, 634-638.*

Alt, D., & Reingold, R. (Eds.). (2012). Changes in teachers' moral role: From passive observers to moral and democratic leaders (Vol. 6). *Springer Science &Business Media.*

Al-Mutawah, M. A., Thomas, R., Eid, A., Mahmoud, E. Y., & Fateel, M. J. (2019). Conceptual Understanding, Procedural Knowledge and Problem-Solving Skills in Mathematics: High School Graduates Work Analysis and Standpoints. *International Journal of Education and Practice, 7(*3), 258-273.

Al-Mutawah, M. A., Thomas, R., Eid, A., Mahmoud, E. Y., & Fateel, M. J. (2019). Conceptual Understanding, Procedural Knowledge and Problem-Solving Skills in Mathematics: High School Graduates *Work Analysis and Standpoints. International Journal of Education and Practice, 7*(3), 258-273.

Ali, A. & Smith, D. (2018). Developing Program objectives in data analytic field of study using three frameworks. *Indian university of Pennsylvania, 6(1).*

Alemu, B. M., & Woldetsadik, D. A. (2020). Effect of Teachers and Students Relationships on the Academic Engagement of Students: A Qualitative Case Study. *Journal of Education, Society and Behavioural Science*, 48-62.

Al-Smadi, O. A., Ab Rashid, R., & Hussain, D. A. (2020). A Linguistic Ethnography of Teacher Talk in English for Medical Purposes Classroom. *International Journal of Arabic- English Studies, 20*(1), 51-66.

Alemu, B. M., & Woldetsadik, D. A. (2020). Effect of Teachers and Students Relationships on the Academic Engagement of Students: A Qualitative Case Study. *Journal of Education, Society and Behavioural Science*, 48-62.

Altun, M. (2015). Using Role-Play Activities to Develop Speaking Skills: A Case Study In The Language Classroom. Paper given at a conference in Ishik University, Erbil, Iraq, *In Book of Proceedings. p. 354.*

Amineh, R. J., & Asl, H. D. (2015). Review of constructivism and social constructivism. Journal of Social Sciences, Literature and Languages, 1(1), pp.9-16.

Andrini, V. S. (2016). The Effectiveness of Inquiry Learning Method to Enhance Students' Learning Outcome: A Theoretical and Empirical Review. *Journal of Education and Practice, 7*(3), 38-42.

Anderson, R. C., Nguyen-Jahiel, K., McNurlen, B., Archodidou, A., Kim, S. Y., Reznitskaya, A., & Gilbert, L. (2001). The snowball phenomenon: Spread of ways of talking and ways of thinking across groups of children. *Cognition and instruction, 19(*1), 1-46.

Andala, H. O., & Swai, E. V. (2016). The Effects of the Teaching Methods Used on the Cognitive Learning Achievements among the Students in Rwandan Universities.

Andamon, J., & Tan, D. A. (2018). Conceptual understanding, attitude and performance in mathematics of grade 7 students. *International Journal of Scientific & Technology Research, 7*(8), 96-105.

Antwi, S. and Hamza, K. (2015): Qualitative and Quantitative Research Paradigms in Business Research: *A Philosophical Reflection. European Journal of Business and Management*

Anastas, J., & Macdonald M. (2012). *Research Design for social work and the human services.* Columbia: Columbia university press.

Anfara, V.A. & Mertz N.T. (2015). *Theoretical frameworks in qualitative research* (2nd ed) Los Angeles: Sage.

Ary, D., Jacobs, L. C., Razavieh, A., & Sorensen, C.K. (2010). Introduction to research in education (8ed.). New York, NY.

Anggraini, S., Setyaningrum, W., & Retnawati, H. (2020, July). How to improve critical thinking skills and spatial reasoning with augmented reality in mathematics learning? In *Journal of Physics: Conference Series (Vol. 1581, No. 1, p. 012066). IOP Publishing.*

Appleton, S. J. (2012). Conceptual understanding of fractions and decimals for fourth grade students.

Asbury, K., & Kim, L. (2020). "Lazy, lazy teachers": Teachers' perceptions of how their profession is valued by society, policymakers, and the media during COVID-19.

Attorps, I. (2005). Secondary school teachers' conceptions about algebra teaching. In Fourth Congress of the European Society for Research in Mathematics Education. Sant Feliu de Guíxols, Spain. Retrieved October (Vol. 5, p. 2005).

Avni, A., Burley, P., Casey, P., Cherney, J., Christiansen, L., Daly, J. S.& Minotti, J. (2015). Literature searches and literature reviews for transportation research projects. How to search, where to search, and how to put it all together: *Current practices. Transportation Research Circular, (E-C194).*

Avong, H., (2013). Poor Performance in Mathematics among Senior Secondary School Students in Kaduna state: what's to blame?

Awofala, A. O. (2017). Assessing senior secondary school students' mathematical proficiency as related to gender and performance in mathematics in Nigeria.

Awofala, A. O., Lawal, R. F., Arigbabu, A. A., & Fatade, A. O. (2020). Mathematics productive disposition as a correlate of senior secondary school students' achievement in mathematics in Nigeria. *International Journal of Mathematical Education in Science and Technology*, 1-17.

Bansil, S, (2015). A Rasch analysis of Grade 12 test written by mathematics teachers. *South African Journal of Science. 111(5), 1-9.*

Bada, S. O., & Olusegun, S. (2015). Constructivism learning theory: A paradigm forteaching and learning. *Journal of Research &Method in Education, 5*(6), 66-70.

Ball, L., & Forzani, M., (2009): The work of Teaching and the Challenge for Teacher Education.

Barnes, C. P., & Ellner, C. L. (1983). The present perspective. Studies of college teaching: Experimental results, theoretical interpretations and new perspectives, *(13-21)*

Baidoo, J. (2019). Dealing with grade 10 learners' misconceptions and errors when simplifying algebraic fractions. *Journal of Emerging Trends in Educational Research and Policy Studies, 10*(1), 47-55.

Baugh, J. (2021). Linguistics, education, and the law: Educational reform for African-American language minority students. In *African-American English* (pp. 313-334). *Routledge.*

Barrios, E., López-Gutiérrez, A., & Lechuga, C. (2016). Facing challenges in English Medium Instruction through engaging in an innovation project. *Procedia-Social and Behavioral Sciences, 228,* 209-214.

Babincakova, M., & Bernard, P. (2020). Online experimentation during COVID-19 secondary school closures: Teaching methods and student perceptions. *Journal of chemical education*, *97*(9), 3295-3300.

Belotto, M. J. (2018). Data analysis methods for qualitative research: Managing the challenges of coding, interrater reliability, and thematic analysis. *The Qualitative Report*, *23*(11), 2622-2633.

Bertram, C., and I. Christiansen (2014). Understanding Research. Pretoria, Van Schaik Publishers.

Bhalli MA, Sattar A, Asif M. Teaching strategies; perception of medical students, used in basic sciences years. Professional Med J 2016; 23(5):614-619. DOI: 10.17957/TPMJ/16.320

Bhattacharjee, J. (2015). Constructivist approach to learning–an effective approach of teaching learning. International *Research Journal of Interdisciplinary & Multidisciplinary Studies,1*(4), 23-28.

Bhowmik, M. (2015). Constructivism approach in mathematics teaching and assessment of mathematical understanding. Basic Research Journal of Education Research and Review, 4(1), 08-12.

Blandford, A., (2013). Semi-Structured qualitative Studies: The Encyclopedia of human computer interaction, 2nd Edu.

Blazar, D., & Kraft, M. A. (2017). Teacher and teaching effects on students' attitudes and behaviors. *Educational evaluation and policy analysis, 39*(1), 146-170.

Blomeke, S., & Kaiser, G. (2017). Understanding the development of teachers' professional competencies as personally, situationally and socially determined.

Bojuwoye, O., Moletsane, M., Stofile, S., Moolla, N., & Sylvester, F. (2014). Learners' experiences of learning support in selected Western Cape schools. *South African Journal of Education, 34*(1)

Boaler, J. (1998). Open and closed mathematics: Student experiences and understandings. *Journal for research in mathematics education*, 41-62.

Brown, S.C., Richard a. Stevens, J., Troiano, P.F., and Schneider, M.K. (2002) "Exploring Complex Phenomenon: Grounded Theory in Student Affairs Research.

Booth, J. L., McGinn, K. M., Barbieri, C., & Young, L. K. (2017). Misconceptions and learning Algebra. *In And the rest is just Algebra (pp. 63-78). Springer, Cham.*

Boonen, A. J. H., Schoot, M. Van Der, Wesel, F. Van, Vries, M. H. De, & Jolles, J. (2013). What underlies successful word problem solving? *A path analysis in sixth grade students. Contemporary Educational Psychology, 38*(3), 271–279.

Bold, T., Filmer, D., Martin, G., Molina, E., Rockmore, C., Stacy, B& Wane, W. (2017). What do teachers know and do? Does it matter? *Evidence from primary schools in Africa. The World Bank.*

Bone, E., Bouck, E., & Witmer, S. (2021). Evidence-Based Systematic Review of Literature on Algebra Instruction and Interventions for Students with Learning Disabilities. *Learning Disabilities: A Contemporary Journal*, *19*(1), 1-22.

Bovill, C. (2020). Co-creation in learning and teaching: the case for a whole-class approach in higher education. *Higher Education*, *79*(6), 1023-1037.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, *3*, 77–101.

Brewer, W. Ernest. (1997). Thirteen Proven Ways to Get Your Message Across: The Essential Reference for Teachers, Trainers, Presenters, and Speakers.

Burgoyne, N., & Cohn, A. S. (2020). Lessons from the transition to relational Tele-therapy during COVID19. *Family Process*, *59*(3), 974-988.

Burhanzade, H., & Aygor, N. (2014). Problems that the students face while solving 1st degree equations with two unknowns, during their prepare to the high school entrance exam (SBS). *Procedia-Social and Behavioral Sciences, 122*(1), 477-483.

Bunrasi, J. B. T. (2012). Algebra I achievement of eighth grade Mexican American Students using cooperative learning versus traditional instruction. *Doctoral dissertation, Walden University.*

Butler, Y. G., Peng, X., & Lee, J. (2021). Young learners' voices: Towards a learner-centered approach to understanding language assessment literacy. *Language Testing, 38*(3), 429-455.

Bwenvu, G., Adhiambo, J. M., & Anyona, J. (2020). Teacher Experience as Determinants of Students' academic Performance in Science Subjects in Uganda Certificate of Education Examinations in Buikwe District, Uganda. *European Journal of Education Studies, 7*(8).

Cahyono, B., & Waluyo, B. (2019). Analysis critical thinking skills in solving problems algebra in terms of cognitive style and gender. *In Journal of Physics: Conference Series* (Vol. 1321, No. 2, p. 022115). *IOP Publishing.*

Capps, D. K., & Crawford, B. A. (2013). Inquiry-based instruction and teaching about nature of Science: Are they happening? *Journal of Science Teaching Education, 24*(3), 497-526.

Campbell, D., Shotter, J., & Draper, R. (2018). *The socially constructed organization*. Routledge.

Cannon, A. (2017). When statues come alive: Teaching and learning academic vocabulary through drama in schools. *Tesol Quarterly, 51*(2), 383-407.

Chand, S., Chaudhary, K., Prasad, A., & Chand, V. (2021). Perceived causes of students' poor performance in mathematics: A case study at Ba and Tavua secondary schools. *Frontiers in Applied Mathematics and Statistics, 7, 614408.*

Chan, L. L., & Idris, N. (2017). Cooperative learning in mathematics education. International *Journal of Academic Research in Business and Social Sciences, 7*(3), 539-553.

Chatila, H., & Al Husseiny, F. (2017). Effect of cooperative learning strategy on students' acquisition and practice of scientific skills in Biology. *Journal of Education in Science Environment and Health, 3*(1), 88-99.

Cheung, D. (2018). The key factors affecting students' individual interest in school science lessons. International *Journal of Science Education, 40*(1), 1-23. Frontiers in Psychology, a12, 1824.

Chen, P., Bao, C., &Gao, Q. (2021). Proactive Personality and Academic Engagement: The Mediating Effects of Teacher-Student Relationships and Academic Self-Efficacy. Frontiers in Psychology, a12, 1824.

Chetty, R. (2019). Literacy teaching in disadvantaged South African schools. *Literacy, 53*(4), 245-253.

Chilisa, B., & Preece, J. (2005). African perspective in adult learning: Research methods for adult educators. Hamburg, German: UNESCO Institute of Education.

Chikasha, J. (2021). Multilingualism in Education: The Lived Experience of the Marginalized Language Learner. *Language Matters*, *52*(3), 26-44.

Chistmas, D., Kudzai, C., & Josiah, M. (2013). Vygotsky's zone of proximal development theory: What are its implications for mathematical teaching. Greener Journal of social sciences, 3(7), 371-377

Cholily, Y. M., Kamil, T. R., & Kusgiarohmah, P. A. (2020). Secondary school students' error of term of algebraic forms based on mathematical communication. *AKSIOMA: Journal Program Studi Pendidikan Matematika*, *9*(2), 252-258.

Chesler, M., & Fox, R. (1966). Role-playing methods in the classroom.

Cicekci, M. A., & Sadik, F. (2019). Teachers' and Students' Opinions about Students' Attention Problems during the Lesson. *Journal of Education and Learning*, *8*(6), 15-30.

Cirillo, M. (2013). What does research say the benefits of discussion in mathematics class are. Research Brief, 19.

Cilesiz, S. (2009). Educational computer use in leisure contexts: A phenomenological study of adolescents' experiences at Internet cafes. *American Educational Research Journal*,*46*(1) 232-274

Christiansen, I., C., Bertram, et at, (2010). Understanding Research, durban, university of Kwazulu-Natal

Clement, I., Benjamin, A., & David, T.,(2013). Improving The Teaching and Learning of Mathematics for the Attainment of Millenium Development Goals through the use of mathematical games in Markurdi local government area, Benue State, Nigeria, 4(1)

Constantinou, C. P., Tsivitanidou, O. E., & Rybska, E. (2018). What is inquiry-based science teaching and learning? *In Professional development for inquiry-based science teaching and learning (pp. 1-23). Springer, Cham.*

Cummings, K. (2015). How does tutoring to develop conceptual understanding impact students understanding?

Cohen, L., & Morrison, k. (2011). Research Methods in Education (7th Ed). London: Routledge

Cohen,L., Manion, et at. (2001). Research Methods in Education, London, Routledge

Coulson, D., & Harvey, M. (2013). Scaffolding Student reflection for Experience base-learning, *18(4).*

Collins, C. S., & Stockton, C. M. (2018). The Central Role of Theory in Qualitative Research: International journal of Qualitative Methods. 17: 1–10.

Colbert, M. (2021). Effects of a Computer-Assisted Instruction Program on Mathematics Achievement Growth at Urban Title I Middle Schools.

Cope, D. G. (2014). Methods and Meanings. Credibility and Trustworthiness of qualitative Research, 14(1), 89-91.

Copur-Gencturk, Y. (2021). Teachers' conceptual understanding of fraction operations: results from a national sample of elementary school teachers. Educational Studies in Mathematics, 107(3), 525-545.

Cresswell, J., W. (2008). Educational research: Planning, Conducting and Evaluating Quantitative and Qualitative Research. Upper saddle River, New Jersey: Pearson Prestice Hall

Coe, R., Aloisi, C., Higgins, S., & Major, L. E. (2014). What makes great teaching? Review of the underpinning research.

Cronin, P., Ryan, F., & Coughlan, M. (2008). Undertaking a literature review: a step-by- step approach. British journal of nursing, 17(1), 38-43.

Crooks, N. M., & M. W. (2014). Defining and measuring conceptual knowledge in Mathematics. Development Review, 34, 344-377.

Cresswell, J., W. (2008). Educational research: Planning, Conducting and evaluating qualitative Research. Upper saddle River, New Jersey: Pearson Prestice Hall.

Creswell, J. W. (2012). Educational research: Planning, conducting, and evaluating quantitative and qualitative research (4th ed.). Boston, MA: Pearson Education, Inc.

Darling-Hammond, L., & Ball, D.L. (1997). What Policymakers Need to Know and Be Able

Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2020). Implications or educational practice of the science of learning and development. Applied developmental Science, 24(2), 97-140.

Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2017). Effective teacher professional development. Learning policy institute

Danisman, S., & Tanisli, D. (2018). Examination of mathematics teachers' pedagogical content knowledge of probability. MOJES: Malaysian Online Journal of Educational Sciences, 5(2), 16-34.

Darragh, L., & Valoyes-Chávez, L. (2019). Blurred lines: Producing the mathematics student through discourses of special educational needs in the context of reform mathematics in Chile. *Educational Studies in Mathematics*, *101*(3), 425-439.

Davis, R. B. (2018). Research studies in how humans think about algebra. In *Research issues in the learning and teaching of algebra* (pp. 266-274). *Routledge*

Davis, B., & Sumara, D. (2002). Constructivist discourses and the field of education: Problems and possibilities. *Educational Theory, 52*(4). 409-428.

Day, C. (2020). How teachers' individual autonomy may hinder students' academic progress and attainment: Professionalism in practice. *British Educational Research Journal*, *46*(1), 247-264.

Debba, R. (2011). An exploration of the strategies used by grade 12 mathematical literacy learners when answering mathematical literacy examination questions based on a variety of real-life contexts (Doctoral dissertation).

De-Jager, T.(2015). Considering the Impact of anonymity on the quality of data obtained in an insight community, *Annual conference delegate.*

Department of Basic Education. (2018). *Mathematics teaching and learning framework for South Africa. Teaching mathematics for understanding*. Pretoria: *Department of Basic Education.*

De Garcia, L. A. (2013). How to Get Students Talking! Generating Math Talk That Supports Math Learning. Math Solutions, *http://www.mathsolutions.com/documents*

Dewing, T., (2013). Instructional Strategies Motivate and Engage Students in Deeper Learning.

Dine, R. (2021). *Teacher's Attitudes and Practices to promote classroom Interaction: A comparative Study between the ESP teacher and the General English Teacher in University, Saida* (Doctoral dissertation).

Dorgu, T. E. (2016). Different teaching methods: A panacea for effective curriculum implementation in the classroom. *International Journal of Secondary Education, 3*(6),77.

Dorier, J.L., & MaaB, K. (2012). The primas project: Promoting Inquiry-Based Learning (IBL) in Mathematics and Science Education across Europe Primas Context Analysis for the implementation of (IBL).

Doherty, J. (2017). Skillful questioning: the beating heart of good pedagogy. Retrieved February, 5, 2018.

Doyumgaç, I., Tanhan, A., & Kiymaz, M. S. (2021). Understanding the most important facilitators and barriers for online education during COVID-19 through online photovoice methodology. *International Journal of Higher Education*, *10*(1), 166-190.

Du Plessis, E. (2020). Student teachers' perceptions, experiences, and challenges regarding learner-centered teaching. *South African Journal of Education*, *40*(1).

Du Plessis, E. (2020). Student teachers' perceptions, experiences, and challenges regarding learner-centered teaching. South African Journal of Education, 40(1).

Echazarra, A., Salinas, D., Méndez, I., Denis, V., & Rech, G. (2016). How teachers teach and students learn.

Egodawatte, G., & Stoilescu, D. (2015). Students' Interconnected Use of Conceptual Knowledge, Procedural Skills, and Strategic Competence in Algebra: A Mixed Method Study of Error Analysis. European Journal of Science and Mathematics Education, 3(3), 289-305.

Ehrlich, S. A. (2017). Assessing the Algebraic attainment of South African grade 9 learners: designing a test using Rasch analysis (Doctoral dissertation).

Ekpenyong, L. E. (2018). Constructivist approaches: An emerging paradigm for the teaching and learning of business education. Nigerian Journal of Business Education (NIGJBED), 3(1), 149-158.

Ekperi, P., Onwuka, U., & Nyejirime, W. (2019). Teachers' attitude as a correlate of students' academic performance. International Journal of Research and Innovation in Social Science (IJRISS), 3(1), 205-209

Engels, M. C., Spilt, J., Denies, K., & Verschueren, K. (2021). The role of affective teacher-student relationships in adolescents' school engagement and achievement trajectories. Learning and Instruction, 75, 101485.

Emaliana, I. (2017). Teacher-centered or student-centered learning approach to promote learning? Jurnal Sosial Humaniora (Jsh),10(2), 59-70.

Erturk, E. (2015). Role playas a teaching strategy.

Erdogan, F. (2019). Effect of cooperative learning supported by reflective thinking activities on students' critical thinking skills. Eurasian Journal of Educational Research, 19(80), 89- 112.

Ernest, P. (2006). Reflections on theories of learning. Zentralblatt Für Didaktik Der Mathematik, 38(1), 3-7.

Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. *American journal of theoretical and applied statistics*, *5*(1), 1-4.

Fatoba, J. O., Adeleye, A. M., & Olofin, S. O. (2020). Teachers' Teaching Experience And Secondary School Students' Performance In Science Subjects In Ondo State, Nigeria.

Farrell, T. S. C. (2016). TESOL, a profession that eats its young! The importance of reflective practice in language teacher education. Iranian Journal of Language Teaching Research 4(3), 97-107.

Firdaus, F., Kailani, I., Bakar, M. N. B., & Bakry, B. (2015). Developing critical thinking skills of students in mathematics learning. *Journal of Education and Learning, 9*(3), 226-236.

Finlayson, M. (2009). The impact of teacher absenteeism on student performance: The case of the Cobb County School District.

Fletcher, J. A. (2008). Developing Algebraic thinking through group discussion. Mathematics Connection, 7, 25.

Foncha, J. W., Abongdia, J. F. A., & Mkohlwa, T. (2016). The Impact of English First Additional Language as Medium of Instruction on the Teaching of Mathematics in Schools. *International Journal of Educational Sciences, 13*(3), 285-290.

Foong, P. Y. & Ee, J. (2002). Enhancing the Learning of Underachievers in Mathematics Association for Supervision and Curriculum Development (S'pore) Review, *11(2),* 25- 35

Frank, T. J. (2018). Teaching our kids: Unpacking an African-American mathematics teacher's understanding of mathematics identity. *Journal for Multicultural Education*.

Francisco, J. M. (2013). Learning in collaboration settings: Students building on each other's ideas to promote their mathematical understanding. *Educational Studies in Mathematics, 82*(3), 417-438

Friesen, S., & Scott, D. (2013). Inquiry-Based Learning: A Review of the Research Literature. Alberta: Alberta Ministry of Education.

Furrer, C. J., Skinner, E. A., & Pitzer, J. R. (2014). The influence of teacher and peer relationships on students' classroom engagement and everyday motivational resilience. *National Society for the Study of Education, 113*(1), 101-123.

Gagne, R. M. (1977). The condition of learning. New York: Holt, Rinehart, and Winston

Gallo, A. M., Sheehy, D. A., Patton, K., & Griffin, L. (2006). Assessment benefits and barriers: What are you committed to? Journal of Physical Education, Recreation & Dance, 77(8), 46-50.

Gholam, A. P. (2019). Inquiry-Based Learning: Student Teachers' Challenges and Perceptions. *Journal of Inquiry and Action in Education, 10*(2),

Gentles, S. J., Charles, C., Ploeg, J., & McKibbon, K. (2015). Sampling in Qualitative Research: Insights from an Overview of the Methods Literature. The Qualitative Report, 20(11), 1772-1789. Retrieved from http://nsuworks.nova.edu/tqr/vol20/iss11/5.

Gillies, R. M. (2003). Structuring cooperative group work in classroom. International Journal of Educartion research, 39(1), 35-49.

Gouws, F. E. (2007). Teaching and learning through multiple intelligences in the outcomes- based education classroom. Africa Education Review, 4(2), 60-74.

Gravemeijer, K., Stephan, M., Julie, C., Lin, F. L., & Ohtani, M. (2017). What mathematics education may prepare students for the society of the future? *International Journal of science and mathematics education*, *15*(1), 105-123.

Granziera, H., Collie, R., & Martin, A. (2021). Understanding teacher wellbeing through job demands-resources theory. *In Cultivating Teacher Resilience (pp. 229-244). Springer, Singapore.*

Groves, S. (2012). Developing mathematical proficiency. Journal of science and mathematics education in Southeast Asia, 35(2), 119-145.

Gronmo, L. S. (2018). The Role of Algebra in School Mathematics. In Invited Lectures from the 13th International Congress on Mathematical Education pp. 175-193.

Guba, E., G. (1981). Criteria for assessing the trustworthiness of naturalistic inquiries. Education Resources Information Centre annual review paper, *29*, *75-97.*

Gull, F., Shehzad, S. (2015). Effects of Cooperative Learning on Students' Academic Achievement. *Journal of Education and learning*. *9*(3) pp. 246-255.

Guerriero, S. (2014). Teachers' pedagogical knowledge and the teaching profession. Teaching and Teacher Education, 2(1),

Guhl, P. (2019). The Impact of Early Math and Numeracy Skills on Academic Achievement in Elementary School.

Hamzeh, M. A. (2014). Teaching Strategies used by mathematics teachers in the Jordan public schools and their relationship with variables. American journal of educational research, 2(6), 331-340.

Hancock, B., Ockkleford, E., & Windridge, K. (2009): An Introduction to Qualificative Research. East Midlands: National Institute for Health Research Design Service.

Harisman, Y., Noto, M. S., & Hidayat, W. (2020). Experience student background and their behavior in problem solving. Infinity Journal, 9(1), 59-68.

Hassana, H. (2021). Sociocultural Backgrounds and Quality Teacher Education in Africa: A Qualitative Case Study of Pedagogical Reform Projects of the Evangelical Church of

Cameroon (EEC) in Mbouo-Bandjoun, West-Cameroon (Doctoral dissertation, Staats- und Universitäts bibliotheca Hamburg Carl von Ossietzky).

Hargreaves, A., & O'Connor, M. T. (2018). Collaborative professionalism: When teaching together means learning for all. Corwin Press.

Hart, P., Oliveira, G., & Pike, M. (2020). Teaching virtues through literature: learning from the ' Narnian Virtues' character education research. Journal of Beliefs & Values, 41(4), 474-488.

Hatisaru, V. (2020). Exploring evidence of mathematical tasks and representations in the drawings of middle school students. International Electronic Journal of Mathematics Education, 15(3)

Harris, J., Spina, N., Ehrich, L. C., & Smeed, J. (2013). Literature review: Learner centred schools make the difference.

Hayward, C. N., Kogan, M., & Laursen, S. L. (2016). Facilitating instructor adoption of inquiry-based learning in college mathematics. *International Journal of Research in Undergraduate Mathematics Education, 2*(1), 59-82.

Havens, R. (2019). Using Role Play to Teach Social Emotional Skills in the Early Childhood Classroom.

Herscovics, N. (2018). Cognitive obstacles encountered in the learning of algebra. In Research issues in the learning and teaching of Algebra (pp. 60-86). Routledge

Hiebert, J. & Carpenter, T. P. (1992). Learning and teaching with understanding, in Handbook of Research on Mathematics Teaching and Learning, New York: MacMillan,

Hlalele, D. (2012). Exploring rural high school learners' experience of mathematics anxiety in academic settings. South African Journal of Education, 32(3), 267-278.

Howie, S. (2003). Language and other background factors affecting secondary pupils' performance in mathematics in South Africa. African Journal of Research in Mathematics, Science and Technology Education,7(1), 1-20.

Huang, R., & Kulm, G. (2012). Prospective middle grade mathematics teachers' knowledge of algebra for teaching. The Journal of Mathematical Behavior, 31(4), 417-430.

Hutchinson, S., & Skodol-Wilson, S. (1992). Validity threats in Scheduled Semi-structured research interviews, 41(2), 117-119.

Iflazoglu Saban, A., &Bal, A. P. (2012). An analysis of teaching strategies employed in the elementary school mathematics teaching in terms of multiple intelligence theory. *Journal of Theory &Practice in Education (JTPE), 8*(2)

Isiksal-Bostan, M., Sahin, E., & Ertepinar, H. (2015). Teacher beliefs towards using alternative teaching approaches in science and mathematics classes related to experience in teaching. *International Journal of Environmental and Science Education, 10*(5), 603-621.

Jackson, D., Sibson, R., & Riebe, L. (2014). Undergraduate perceptions of the development of team-working skills. Education Training, *56*(1), 7-20.

Jacobi-Vessels, J. L., Brown, E. T., Molfese, V. J., & Do, A. (2016). Teaching preschoolers to count: Effective strategies for achieving early mathematics milestones. Early Childhood Education Journal, 44(1), 1-9.

Jabbarova, A. (2020). The issue of emotionality, expressiveness, evaluative Ness and renewal of phraseological units. 1(1), 136-140.

Jamshed, S. (2014). Qualitative research Method-interviewing and Observation. *Journal of basic and clinical pharmacy, 5*(4), 87-88.

Jarvis, L., Odell, K., & Troiano, M. (2002). Role-playing as a teaching strategy. Strategies for application and presentation, staff development and presentation.

Jojo, Z. M. M. (2011). An APOS exploration of the conceptual understanding of the chain rule in calculus b first year engineering students (Unpublished Doctoral Thesis), *University of KwaZulu-Natal, South Africa.*

Johnson, D., W.; Johnson, R., T., & Smith, K., A. (2014). Cooperative Learning: Improving University Instruction by Basing Practice on Validated Theory. *Journal on Excellence in College Teaching, 25* (4),1-26.

Joma, Mar., Al-Abed, S. F. M., & Nafi, J. S. I. (2016). The effect of "Role-playing" on students' achievement and motivation in the Governmental Schools of Bethlehem District in Palestine. *Journal of Education, Society and Behavioral Science,* 1-25.

Jourdain, L., & Sharma, S. (2016). Language challenges in mathematics education: A literature review. *Waikato Journal of Education, 21*(2), 43-56.

Jones, S. M., & Kahn, J. (2018). The evidence base for how learning happens: A consensus on social, emotional, and academic development. *American Educator, 41*(4), 16.

Juanda, A., Shidiq, A. S., & Nasrudin, D. (2021). Teacher Learning Management: Investigating Biology Teachers a TPACK to Conduct Learning During the Covid-19 Outbreak. *Jurnal Pendidikan IPA Indonesia, 10*(1), 48-59.

Jupri, A., & Drijvers, P. (2016). Student difficulties in mathematizing word problems in Algebra. *Eurasia Journal of Mathematics, Science and Technology Education, 12*(9), 2481-2502.

Kadijevich, D. M. (2018). Relating Procedural and Conceptual Knowledge; The teaching of Mathematics. Pp. 15-25.

Kanyopa, T. J., & Hlalele, D. J. (2021). The learning experiences of learners transitioning from rural and township schools to ex-Model C schools. The Independent Journal of Teaching and Learning, 16(1), 96-114.

Karali, Y., & Aydemir, H. (2018). The Effect of Cooperative Learning on the Academic Achievement and Attitude of Students in Mathematics Class. *Educational Research and Reviews, 13*(21), 712-722.

Kathard, H., Pillay, D., & Pillay, M. (2015). A study of teacher–learner interactions: A continuum between monologic and dialogic interactions. *Language, speech, and hearing services in schools*, *46*(3), 222-241.

Katz, V. (2007). Algebra gateway to a technology future: The mathematical Association of America.

Khathi, B. T. (2019). Exploring teaching strategies used by grade 8 mathematics teachers to teach probability (Doctoral dissertation).

Keiler, L. S. (2018). Teachers' roles and identities in student-centered classrooms. *International journal of STEM education*, *5*(1), 1-20.

Kenney, R., An, T., Kim, S. H., Uhan, N. A., Yi, J. S., & Shamsul, A. (2020). Linear Programming Models: Identifying Common Errors in Engineering Students' Work with Complex Word Problems. *International Journal of Science and Mathematics Education, 18*(4), 635-655.

Keeffe, Buytaert, Mijic, Brozovic & Sinha (2016): The Use of Semi-structured Interviews for the characterization of farmer irrigation practices.

Kendal, M., & Stacey, K. (2004). Algebra a world of difference: The future of the teaching and learning of Algebra, pp. 329-346.

Kik, A., Adamec, M., Aikhenvald, A. Y., Bajzekova, J., Baro, N., Bowern, C, & Novotny, V. (2021). Language and ethno biological skills decline precipitously in Papua New Guinea, the world's most linguistically diverse nation. *Proceedings of the National Academy of Sciences*, *118*(22).

Kirby, P. (2020). 'It's never okayto say no to teachers': Children's research consent and dissent in conforming schools' contexts. *British Educational Research Journal*, *46*(4), 811-828.

Korpershoek, H., Hams, T., de-Boer, H., Van-Kujik, M., & Doolaard, S. (2014). Effective Classroom Management Strategies and Classroom Management programs for educational practice. *Groningen: GION onderwijs/onderzoek.*

Koszalka, T. A., Pavlov, Y., & Wu, Y. (2021). The informed use of pre-work activities in collaborative asynchronous online discussions: The exploration of idea exchange, content focus, and deep learning. *Computers &Education*, *161,* 104067.

Konicek-Moran, R., & Keeley, P. (2015). Teaching for conceptual understanding in science. Arlington: *NSTA Press, National Science Teachers Association.*

Kodisang, S., (2015). Teaching Strategies used by Mathematics teachers to teach grade 6 probability in Nkangala District.

Koch, T. (2006). Establishing rigour in qualitative research: The decision trail. Journal of Advanced Nursing.

Kosgei, A., Mise, J., Odera, O., & Ayugi, M., (2013). Influence of Teacher Characteristics on Students Academic Achievement among Secondary schools, 4(3)

Kilgour, P. W., Reynaud, D., Northcote, M. T., & Shields, M. (2015). Role-playing as a tool to facilitate learning, self-reflection and social awareness in teacher education. *International Journal of Innovative Interdisciplinary Research,2*(4), 8-20.

Krulik, S. and Rudnick, J.A. (1995). The New Sourcebook for Teaching Reasoning and Problem Solving in Elementary School.

Kyngas, H. Utriainian, K. Polkki, T., Kaarianen. M. (2014). Qualitative Content Analysis: A Focus on Trustworthiness. Pp. 1–10.

Kuennen, E. W., & Beam, J. E. (2020). Teaching the mathematics that teachers need to know: Classroom ideas for supporting prospective elementary teachers' development of mathematical knowledge for teaching. *The Mathematics Enthusiast, 17*(2), 771-805.

Kunwar, R. (2020). Math mania: meaning, problems and ways of effective teaching and learning mathematics at basic level education in Nepal. International Journal of Science and Research, 9(8), 1136-1141.

Kumah, M. S., & Wonu, N. (2022). Factors affecting the mathematics learning outcome of underachieving students at Colleges of Education. Faculty of Natural and Applied Sciences Journal of Mathematics, and Science Education, 3(2), 1-10.

Kumah, M. S., & Wonu, N. (2020). The Effectiveness of Geogebra in the Teaching of Elementary Algebra at St Theresa's College Ghana.

Lano-Maduagu, A., & Salami, R. A. (2020). Influence Of Teachers' variables On Basic School Home-Economics Students' knowledge of Sustainable Development in Lagos State. Nigerian Online Journal of Educational Sciences and Technology, 2(1), 40-52.

Lopez, V & Whitehead, D. (2013). Sampling data and data collection in qualitative research

Ladson-Billings, G. (2021). Culturally relevant pedagogy: Asking a different question. Teachers College Press.

Lack, M., Soleimani H., & Parvaneh, F. (2017). The effect of teacher-centeredness method Vs. Learner centeredness method on reading comprehension among Iranian EFL learners.

Lazarevic, B., & Bentz, D. (2021). Student perception of stress in online and face-to-face learning: the exploration of stress determinants. American Journal of Distance Education,35(1), 2-15.

Li, Y., & Schoenfeld, A. H. (2019). Problematizing teaching and learning mathematics as "given" in STEM education. International Journal of STEM Education, 6(1), 1-13.

Li, D. (2004). Trustworthiness of think-aloud protocols in the study of translation processes. International Journal of Applied Linguistics, 14(3), 301-313

Lincoln, Y. S, & Guba, E. A. (1985). Naturalistic inquiry. Beverly Hills, CA: Sage Publications

Liu, L. (2017). Applications of Cooperative Principle and Politeness Principle in class question-answer process. Theory and Practice in Language Studies, 7(7), 563.

Liu, C., & Long, F. (2014). The discussion of traditional teaching and multimedia teaching approach in college English teaching. In 2014 International Conference on Management, Education and Social Science (ICMESS 2014). Atlantis Press.

Leedy P., D. & Ormond, J. E. (2010). Practical Research: Planning and Design (9th Ed). New Jerseyupper saddle, river: Pearson Education, Inc.

Leung, C., & Valdés, G. (2019). Tran-slanguaging and the trans-disciplinary framework for language teaching and learning in a multilingual world. The Modern Language Journal, 103(2), 348-370.

Leung, K. S. F. (2006). Mathematics education in East Asia and the West: Does culture matter? In Mathematics education in different cultural traditions-A comparative study of East Asia and the West (pp. 21-46). Springer, Boston, MA.

Mabena, N., Mokgosi, P. N., & Ramapela, S. S. (2021). Factors contributing to poor learner performance in mathematics: A case of selected schools in Mpumalanga Province, South Africa. Problems of Education in the 21st Century, 79(3), 451.

Machi, L. A., & McEvoy, B. T. (2016). The literature review: Six steps to success. Corwin Press.

Madadzhe, R. N. (2019). Using African languages at universities in South Africa: The struggle continues. Stellenbosch papers in linguistics plus, 2019(58), 205-218.

Madide, C. H. (2018). An exploration of teaching strategies in teaching area and perimeter in grade 6 at Mahlabathini Circuit Management Centre (Doctoral dissertation).

Magableh, I. S. I., & Abdullah, A. (2020). On the Effectiveness of Differentiated Instruction in the Enhancement of Jordanian Students' Overall Achievement. International Journal of Instruction, 13(2), 533-548.

Mabuza L.H, Govender, I, Ogunbanjo G.A, Mash B. (2014). African Primary Care Research: Qualitative data analysis and writing results. Afr. J Prm Health Care FAM Med, 6(1).

Maila, P., & Ross, E. (2018). Perceptions of disadvantaged rural Matriculants regarding factors facilitating and constraining their transition to tertiary education. *South African Journal of Education, 38*(1).

Makonye, K & Mashaka, H. (2016). Understanding of Grade 10 learners' errors and Misconceptions in Elementary Algebra.

Makonye, J., & Stepwell, N. (2016). Eliciting learner Errors and Misconceptions in simplifying rational Algebraic expressions to improve teaching and learning. *Marang Center for Science and Mathematics Education, University of Witwatersrand, 12*(1): 16-28.

Malatjie, F., & Machaba, F. (2019). Exploring Mathematics Learners' Conceptual Understanding of Coordinates and Transformation Geometry through Concept Mapping. EURASIA *Journal of Mathematics, Science and Technology Education, 15*(12), em1818.

Mangwende, E., & Maharaj, A. (2019). Barriers to Mathematics Teachers' Use of Their Knowledge of Students' Learning Styles in Mathematics Teaching: A Case of Secondary Schools in Zimbabwe. EURASIA *Journal of Mathematics, Science and Technology Education, 16(1), em1806.*

Manyuchi, T. (2016). Exploring teachers' scaffolding practices in the teaching of primary school mathematics at a school in Swaziland (Doctoral dissertation).

Marpa, E. P. (2019). Common Errors in Algebraic Expressions: A Quantitative-Qualitative Analysis. *International Journal on Social and Education Sciences, 1*(2), 63-72.

Mata-Peirera, J., & Ponte, J. P. (2017). Enhancing students' mathematical reasoning in the classroom: teacher actions facilitating generalization and justification. *Educational studies in mathematics, 66*(1), 23-41.

Martin, A. (2000). A national survey of teachers' promotion of self-determination and student directed learning. *Journal of Special Education, 34*(2), 13-18.

Mazana, Y. M., Suero Montero, C., & Olifage, C. R. (2019). Investigating students' attitude towards learning mathematics.

McAuliffe, S. (2013). The development of pre-service teachers' content knowledge for teaching early algebra. Doctor of Philosophy in Mathematics Education, Cape Peninsula University of Technology, South Africa.

McKinley, J. (2015). Critical argument and writer identity: Social constructivism as a theoretical framework for EFL academic writing. Critical inquiry in language studies, 12(3), 184- 207.

Mhakure, D., Jacobs, M. & Julie, C. (2014). Grade 10 students' facility with rational algebraic fractions in high stakes examination: observations and interpretations. Paper presented at the 20th Annual National Congress of the Association for Mathematics Education of South Africa, Kimberly, South Africa.

Medrano, M. M. (2019). The Impact of Teacher Absenteeism on Student Achievement in Mathematics and Reading among 8th Graders: A Causal-comparative Inquiry (Doctoral dissertation, Texas A&M University-Corpus Christi).

Mehan, H. (2020). Why I like to look: On the use of videotape as an instrument in educational research. *In Qualitative voices in educational research (pp. 93-105). Routledg*

Mensah-Wonkyi, T., & Adu, E. (2016). Effect of the inquiry-based teaching approach on students' understanding of circle theorems in plane geometry. African Journal of Educational Studies in Mathematics and Sciences, 12, 61-74.

Mercendetti, D. (2010). Connecting Social Skills and Cooperative Learning.

Mercer, N., & Howe, C. (2012). Explaining the dialogue processes of teaching and learning: The value and potential of sociocultural theory. Learning, Culture and Social Interaction, 1, 12-21.

Mji, A., & Makgato, M. (2006). Factors associated with high school learners' poor performance:a spotlight on mathematics and physical science. South African journal of education, 26(2), 253-266.

Michael, I., (2015). Factors leading to poor Performance in Mathematics Subject in Kibatta Secondary Schools

Miller, D. (2021). Empathy in the Math Classroom (Doctoral dissertation, Rhodes College).

Mlachila, M. M., & Moeletsi, T. (2019). Struggling to make the grade: A review of the causes and consequences of the weak outcomes of South Africa's education system.

Mohajan, H. (2018). Quality Research Methodology in Social Sciences and Related Subjects. Premier University, Chittagong, Bangladesh. Journal of Economic Development and People, 7(1), pp.23-48.

Molina, C. (2014). Teaching Mathematics Conceptually; advancing research, improving education, 4(1).

Mogashoa, T. (2014). Applicability of constructivist theory in qualitative educational research. American International Journal of Contemporary Research, 4(7), 51-59.

Moreno-Guerrero, A. J., Rodríguez-Jiménez, C., Gómez-García, G., & Ramos Navas-Parejo, M. (2020). Educational Innovation in Higher Education: Use of Role Playing and Educational Video in Future Teachers' Training. Sustainability, 12(6), 2558.

Moses, R. N., & Mohamad, M. (2019). Challenges faced by students and teachers on writing skills in ESL Contexts: A literature review. Creative Education, 10(13), 3385-3391.

Morrone, V., & Livuza, H. (2018). Action learning: Teaching others to engage with learners.

Morrow, S., L. (2005). Quality and Trustworthiness in qualitative Research in Counselling Psychology. Journal of counseling psychology, 52(2), 250-260.

Mulawarman, W. G. (2021). Overcoming Obstacles in Implementing 2013 Curriculum Policy. Cypriot Journal of Educational Sciences, 16(3), 967-980.

Mpho, O. M. (2018). Teacher centered dominated approaches: Their implications for today's inclusive classrooms. International Journal of Psychology and Counselling, 10(2), 11- 21.

Muganga, L., & Ssenkusu, P. (2019). Teacher-Centered vs. Student-Centered: An examination of student teachers' perceptions about pedagogical practices at Uganda's Makerere University. Cultural and Pedagogical Inquiry, 11(2), 16-40.

Mupa, P., & Isaac Chinooneka, T. (2019). Factors contributing to ineffective teaching and learning in primary schools: Why are schools in decadence.

Mupa, P., & Chinooneka, T. I. (2015). Factors Contributing to Ineffective Teaching and Learning in Primary Schools: Why Are Schools in Decadence? Journal of Education and Practice, 6(19), 125-132.

Murphy, L., Eduljee, N. B., & Croteau, K. (2021). Teacher-Centered versus Student-Centered Teaching. Journal of Effective Teaching in Higher Education, 4(1), 18-39.

Murphy, P. K., Wilkinson, I. A., Soter, A. O., Hennessey, M. N., & Alexander, J. F. (2009). Examining the effects of classroom discussion on students' comprehension of text: A meta-analysis. Journal of educational psychology, 101(3),

Mutegi, C. M., Gitonga, C. M., & Rugano, P. (2021). Mathematics anxiety, attitude and performance among secondary school students in Kenya. Educational Research and Reviews, 16(6), 226-235.

Mutodi, P. & Ngirande, H. (2014). The influence of Students perceptions on mathematics performance: A case of a selected high school in South Africa, Mediterranean Journal of Social Sciences,5(3), pp. 431-445.

National Council of Teachers of Mathematics, (2014). Principles of actions; Ensuring mathematics success for all.

Nahdi, D. S., & Jatisunda, M. G. (2020). Conceptual Understanding and Procedural Knowledge: A Case Study on Learning Mathematics of Fractional Material in Elementary School. *In Journal of Physics: Conference Series (Vol. 1477, p. 042037).*

Ngema, M. H. (2016). Factors that cause poor performance in science subject at Ingwavuma circuit.

Nair, B. T. (2019). Role play–An effective tool to teach communication skills in pediatrics to medical undergraduates. Journal of education and health promotion, 8.

National Mathematics Advisory Panel (2008). Foundations for Success: The Final Report of the National Mathematics Advisory Panel, U.S. Department of Education: Washington, DC

National Research Council. (2000). Inquiry and the National Science Education Standards. Washington, DC: National Academy Press and Practice, 6(19), 125-132.

Nora, B., (2012): Methods of Teaching and their Implications for quality of Student Learning at Samara University.

Ncube M. (2016). Analysis of errors made by learners in simplifying algebraic expressions at Grade 9 level (Doctoral dissertation).

Nndwamato, N. M. (2017). An analysis of written concord errors among Grade 12 First Additional Language learners in Vhembe district of Limpopo Province, South Africa (Doctoral dissertation).

Odey, C. (2020). Value Orientation and Peaceful Interpersonal Relationship among Students in Calabar Education Zone of Cross River State, Nigeria. Nigeria (May 21, 2020).

Odike, M. N., & Nnaekwe, K. (2018). Influence of Teachers' Attitude towards Teaching Profession on Under Graduate Non-Education Students Perception of Teacher Education. *International Journal of Academic Research in Progressive Education & Development*, *7*(4), 67-79.

O'Dwyer, L., & Bernauer, J. (2014). Quantity research for the quantitative research, Los Angeles, SAGE Publication.

Oliveira, H., Polo-Blanco, I., & Henriques, A. (2021). Exploring Prospective Elementary Mathematics Teachers' Knowledge: A Focus on Functional Thinking. Journal on Mathematics Education, 12(2), 257-278.

Omolara, S. R., & Adebukola, O. R. (2015). Teachers' attitudes: a great influence on teaching and learning of Social Studies. JL Poly & Globalization, 42, 131.

Onah, E. N., Ugwuanyi, C. S., Okeke, C. I., Nworgu, B. G., Agwagah, U. V., Ugwuanyi, C. C., & Okeke, A. O. (2020). Evaluation of the impact of computer-assisted instruction on

mathematics and physics students' achievement: implication for industrial technical education. International Journal of Engineering Research and Technology, 13(7), 1786-1794.

O'Neill, R., & Russell, A. (2019). Stop! Grammar time: University students' perceptions of the automated feedback program Grammarly. Australasian Journal of Educational Technology, 35(1).

Onyenyili, S. (2018). The Effects of Teachers' qualification On Student's Achievement in Junior Secondary School in Enugu North.

Okoli, C., & Schabram, K. (2010). A Guide to Conducting a Systematic Literature Review of Information Systems Research. Sprouts: Working Papers on Information Systems, 10(26).

Osei, C. M. (1998). Student teachers' knowledge and understanding of algebraic concepts: The case of colleges of education in the Eastern Cape and Southern KwaZulu Natal, South Africa (Doctoral dissertation).

Ostler, E. (2011). Teaching adaptive and strategic reasoning through formula derivation: beyond formal semiotics. International Journal of Mathematics Science Education, 4(2), 16- 26.

Otaala, J., Maani, J. S., & Bakaira, G. G. (2013). Effectiveness of university teacher education

Curriculum on the secondary school teacher performance in Uganda: The case of Kyambogo University. Journal of International Cooperation in Education, 15(3), 95- 112.

Otten, O., Bleiler-Baxter, S. K. & Engledowl, C. (2017). Authority and whole-class proving in high geometry: The case of Ms. Finley. *The journal of mathematical behavior, 46, 112- 127.*

Ozdemir, İ. E. Y., & Pape, S. J. (2012). Supporting students' strategic competence: A case of a sixth-grade mathematics classroom. *Mathematics Education Research Journal*, *24*(2), 153-168.

Panthi, R. K., & Belbase, S. (2017). Teaching and learning issues in mathematics in the context of Nepal.

Parveen, Q. & Batool, S. (2012). Effect of cooperative learning on achievement of students in general science at secondary level. *International Education Studies, 5*(2), 154-158.

Pather, K., Motilal, G., & Fleisch, B. (2017). The patterns and prevalence of monosyllabic three-letter-word spelling errors made by South African English First Additional Language learners. *South African Journal of Childhood Education, 7*(1), 1-10.

Palaganas, E. C., Sanchez, M. C., Molintas, M. P., & Caricativo, R. D. (2017). Reflexivity in Qualitative Research: A journey of Learning. The Qualitative Report, 22(2), 426-438. Retrieved from https://nsuworks.nova.edu/tqr/vol22/iss2/5.

Phelps, R. (2005). The potential of reflective journals in studying complexity 'in action'. Complicity: *An International Journal of Complexity and Education, 2*, 37–54.

Planas, N. (2021). How specific can language as resource become for the teaching of algebraic concepts? *ZDM–Mathematics Education, 53*(2), 277-288.

Pedaste, M., Maeots, M., Siiman, L.A., De Jong, T., Van Riesen, S.A., Kamp, E.T., & Tsourlidaki, E. (2015). Phases of inquiry-based learning: Definitions and the inquiry cycle. *Educational Research Review, 14*, 47-61.

Petty, G (2006). Teaching Today Business Education (need to look for a related scholar. Pramesti,

T. I., & Retnawati, H. (2019). Difficulties in learning algebra: An analysis of students' errors. *In Journal of Physics: Conference Series (Vol. 1320, No. 1, p. 012061). IOP Publishing.*

Prawat, R. S. (1992). Teachers' beliefs about teaching and learning: A constructivist perspective. American journal of education, 100(3), 354-395.

Pretorius, E. J., & Klapwijk, N. M. (2016). Reading comprehension in South African schools: Are teachers getting it, and getting it right? *Per Linguam: A Journal of Language Learning 32*(1), 1-20.

Polit, D. F., & Beck, C. T. (2012). Nursing research: Principles and methods. Philadelphia, PA: *Lippincott Williams &Wilkins.*

Ponelis, S. R. (2015). Using interpretive qualitative case studies for exploratory research in doctoral studies: A case of Information Systems research in small and medium enterprises. *International Journal of Doctoral Studies, 10*, 535-550.

Rahman, M. S. (2017). The Advantages and Disadvantages of Using Qualitative and Quantitative Approaches and Methods in Language" Testing and Assessment" Research: *A Literature Review. Journal of Education and Learning,* 6*(1), 102-112*.

Rahiem, M. D. (2021). Remaining motivated despite the limitations: University students' learning propensity during the COVID-19 pandemic. *Children and youth services review, 120, 105802.*

Ramiah, D. (2018). The use of visual strategies by educators at tertiary level and its influence on student teachers' development of mathematical concepts (Doctoral dissertation).

Ramirez, J. D., Yuen, S.D., & Ramey, D. R. (1991). Longitudinal study of structured English immersion strategy, early-exit and late-exit transitional bilingual education programs for language minority children, 1 & 2, San Mateo, CA: Aguirre International.

Ramadhan, A., Ramdhani, M. A., & Amin, A. S. (2014). Writing a Literature Review Research Paper: A step-by-step approach. *International Journal of Basic and Applied Science, 3*(1), 47-56.

Remillard, H. A. (2015). The Effect of Cooperative Learning on Middle School Math Students. Online Submission.

Rittle-Johnson, B. (2017). Developing mathematics knowledge. Child Development Perspectives, 11(3), 184-190.

Rittle-Johnson, B., Star, J. R., Durkin, K., & Loehr, A. (2019). Compare and discuss to promote deeper learning. *Deeper Learning, Dialogic Learning, and Critical Thinking: Research-based Strategies for the Classroom*, 48.

Rizki, H. T. N., Frentika, D., & Wijaya, A. (2018, March). Exploring students' adaptive reasoning skills and van Hiele levels of geometric thinking: a case study in geometry. *In Journal of Physics: Conference Series (Vol. 983, No. 1, p. 012148). IOP Publishing.*

Sabates, R., Carter, E., & Stern, J. M. (2021). Using educational transitions to estimate learning loss due to COVID-19 school closures: The case of Complementary Basic Education in Ghana. *International Journal of Educational Development, 82*, 102377.

Sahin, S. M., & Ozpinar, I. (2020). Reflections of Mathematical and Mathematics Educational Values on Pedagogical Formation Students' Teaching Preferences. *Asian Journal of Education and Training*, *6*(1), 80-92.

Saneka, N. E., & de Witt, M. (2019). Barriers and bridges between mother tongue and English as a second language in young children. *South African Journal of Childhood Education, 9*(1), 1-8.

Santana-Monagas, E., Nunez, J. L., Loro, J. F., Huescar, E., & León, J. (2022). Teachers' engaging messages: The role of perceived autonomy, competence and relatedness. Teaching and Teacher Education, 109, 103556.

Salmona Madriñan, M. (2014). The Use of First Language in the Second-Language Classroom: A Support for Second Language Acquisition. *Gist Education and learning research journal*, *9*, 50-66.

Samuel, K., Mulenga, H. M., & Angel, M. (2016). An Investigation into Challenges Faced by Secondary School Teachers and Pupils in Algebraic Linear Equations: A Case of Mufulira District, Zambia. *Journal of Education and Practice*, *7*(26), 99-106.

Saleh, S., & Rahman, M. A. A. (2016). A Study of Students' Achievement in Algebra: Considering the Effect of Gender and Types of Schools. European Journal of STEM Education, 1(1), 19-26.

Salihu, F. O. (2017). An investigation grade 11 learner's errors when solving algebraic word problems in Gauteng, South Africa (Doctoral dissertation, Doctoral dissertation).

Saputri, A. C. (2019). Improving Students' Critical Thinking Skills in Cell-Metabolism Learning Using Stimulating Higher Order Thinking Skills Model. *International Journal of Instruction*, *12*(1), 327-342.

Saputri, M. D., Pramudya, I., & Slamet, I. (2020). The Flexibility of Students' Mathematical Creative Thinking in Solving Mathematical Problems. In 1st International Multidisciplinary Conference on Education, Technology, and Engineering (IMCETE 2019) pp. 121-125.

Sawant, S. P., & Rizvi, S. (2015). Study of passive didactic teacher centered approach and an active student-centered approach in teaching anatomy. *International Journal of Anatomy and Research, 3*(3), 1192-1197.

Sharma, S. (2019). Addressing Language Barriers in Multilingual Statistics Classrooms: A Collaborative Study. *Mathematics Education Research Group of Australasia*.

Shawe, T. G. J. (2015). Exploring teachers' experiences of teaching isiZulu first additional language in ex-Model C schools.

Shamaki, T. A. (2015). Influence of Learning Environment on Students' Academic Achievement in Mathematics: A Case Study of Some Selected Secondary Schools in Yobe State- Nigeria. *Journal of Education and Practice, 6(34), 40-44.*

Shabani, K., Khatib, M., & Ebadi, S. (2010). Vygotsky's zone of proximal development: Instructional implications and teachers' professional development. English language teaching, 3(4), 237-248.

Schall, J. M., McHatton, P. A., & Sáenz, E. L. (Eds.). (2020). Teacher education at Hispanic-serving institutions: Exploring identity, practice, and culture. Routledge.

Schmidt, J., Marques, M. R., Botti, S., & Marques, M. A. (2019). Recent advances and applications of machine learning in solid-state materials science. *npj Computational Materials*, *5*(1), 1-36.

Schwartz, D. (1999). Ghost in the machine: Seymour Papert on how computers fundamentally change the waykids learn.

Serin, H. (2018). A comparison of teacher-centered and student-centered approaches in educational settings. *International Journal of Social Sciences & Educational Studies, 5*(1),164-167.

Sethi, S., & Dabas, R. (2019). Role-play–An effective tool to teach communication skills in pediatrics to medical undergraduates: Comments. Journal of Education and Health Promotion, 8(1), 212.

Slavin, R. E. (1991). Synthesis of research on cooperative learning. Educational Leadership, 48(5), 71.

Smallhorn, M., Young, J., Hunter, N., & da Silva, K. B. (2015). Inquiry-based learning to improve student engagement in a large first year topic. *Student Success, 6*(2), 65-72.

Simamora, R. E., & Saragih, S. (2019). Improving Students' Mathematical Problem-Solving Ability and Self-Efficacy through Guided Discovery Learning in Local Culture Context. International Electronic Journal of Mathematics Education, 14(1), 61-72.

Smith, M. S., Hughes, E. K., Engle, R. A., & Stein, M. K. (2009). Orchestrating discussions. Mathematics Teaching in the Middle School, 14(9), 548–556.

Smyth, P., To, K. Y. J., & Carless, D. R. (2020). The Interplay between Exemplars and Rubrics. Facilitating Student Learning and Engagement in Higher Education through Assessment Rubrics.

Spaull, N. (2011), A preminary analysis of SACMEQ III South Africa. Stellenbosch Economic Working Papers

Star, J. R., Caronongan, P., Foegen, A. M., Furgeson, J., Keating, B., Larson, M. R., & Zbiek, R. M. (2015). Teaching strategies for improving Algebra knowledge in middle and high school students.

Starman, A. B. (2013). The case study as a type of qualitative research. Journal of contemporary educational studies, 28-43

Star, J. R., Foegen, A., Larson, M. R., McCallum, W. G., Porath, J., Zbiek, R. M., ... & Lyskawa, J. (2015). Teaching Strategies for Improving Algebra Knowledge in Middle and High School Students. Educator's Practice Guide. What Works Clearinghouse. ™ NCEE 2015-4010. What Works Clearinghouse.

Stevens, R. (2015). Role-play and student engagement: reflections from the classroom. Teaching in Higher Education, 20(5), 481-492.

Suh, J. M & Seshaiyer, P. (2014). Developing strategic competence by teaching using the common core mathematically practices, Annual Perspectives in Mathematics Education, 77-87.

Sunderman, G. L. (2006). Do supplemental educational services increase opportunities for minority students? Phi Delta Kappan, 88(2), 117-122.

Suyitno, I. (2017). Cognitive Strategies Use in Reading Comprehension and Its Contributions to Students' Achievement. IAFOR Journal of Education, 5(3), 107-121.

Syahabuddin, K., Fhonna, R., & Maghfirah, U. (2020). Teacher-student relationships: An influence on the English teaching-learning process. *Studies in English Language and Education, 7*(2), 393-406.

Syukriani, A., Juniati, D., & Siswono, T. Y. E. (2017, August). Investigating adaptive reasoning and strategic competence: Difference male and female. *In AIP Conference Proceedings (Vol. 1867, No. 1, p. 020033). AIP Publishing LLC.*

Tobin, G. A., & Begley, C. M. (2004). Methodological rigour within a qualitative framework. Journal of Advanced Nursing, 48(4), 388-396.

Thamara, S., & Narayana, T. (2015). Significance of various Strategies for Teaching and Learning English. International journal on Studies in English language and Literature

Taiwo, E., & James, A. (2015). Teacher Variables and School Effectiveness in Ekiti State, Nigeria. International Journal of Humanities and Social Science, 5(7)75-101.

Tam, M. (2000). Constructivism, instructional design, and technology: Implications for transforming distance learning. Journal of Educational Technology & Society, 3(2), 50- 60.

Tasoglu, A. K., & Bakaç, M. (2010). The effects of problem based learning and traditional teaching methods on students' academic achievements, conceptual developments and scientific process skills according to their graduated high school types. Procedia-Social and Behavioral Sciences, 2(2), 2409-2413.

Tavoosy, Y., & Jelveh, R. (2019). Language teaching strategies and techniques used to support students learning in a language other than their mother tongue. International Journal of Learning and Teaching, 11(2), 77-88.

Taylor, N., & Moyane, J. (2004). Khanyisa Education Support Programme: Baseline Study Part 1: Communities, Schools and classrooms' Memorandum, 38-41.

Timperley, H., Wilson, A., Barrar, H., & Fung, I. (2008). Teacher professional learning and development (Vol. 18). International Academy of Education.

Tombak, B. & Altun, S. (2016). The effect of cooperative learning: University example. Eurasian Journal of Educational Research, 64, 173-196.

Turkan, S., & de Jong, E. J. (2018). An exploration of pre-service teachers' reasoning about teaching mathematics to English language learners. Teacher Education Quarterly, 45(2), 37-60.

UNICEF. (2018). Learning through play: Strengthening learning through play in early childhood education programmes. Lego foundation.

Usiskin, Z. (2004). A significant amount of Algebra. NAW, 5(5): 147 – 151

Ventkat, H. & Spaull, N. (2015). What do we know about primary teachers' mathematical content knowledge in South Africa? An analysis of SACMEQ 2007, International Journal of Educational Development, 41, 121-130.

Voltz, A. Sims, M. & Nelson, B. (2010). Connecting Teachers, Students and Standards; Teaching in Diverse, Standards based Classroom.

Vygotsky, L. (1978). Mind in society. Cambridge, MA: Pearson Education Ltd

Vygotsky, L. S. (1978). Socio-cultural theory. Mind in society, 6(3), 23-43

Waec, (2007). Chief examiners' report. Lagos.

Wallace, B. (2020). The Instructional Impact of Teacher Absenteeism in Rural Arkansas Public School Districts: The Perceptions of Elementary Principals. Arkansas State University.

Wang, M. (2017). The impact of teacher-student classroom interactions in primary school environment on children's engagement in classroom: A systematic literature review.

Weinberger, B. (2017). Does It Really Matter What I Ask? How teacher questioning influences the learning of mathematics.

Witherspoon, M., Sykes, G., & Bell, C. (2016). Leading a Classroom Discussion: Definition, Supportive Evidence, and Measurement of the, National Observational Teaching Examination (NOTE) Assessment Series. *Research Memorandum No. RM-16-09. Educational Testing Service.*

Willemse, K., Venketsamy, T., & Swanepoel, n. (2022). Support Teachers Need To Assist Learners Experiencing Mathematical Learning Difficulties. Book Of Proceedings–Long Papers, 179.

Wilson, S., M., & Peterson, P., L. (2006). Theories of Learning and Teaching: What Do they mean for educators?

Willis, J. (2021). A framework for task-based learning. Intrinsic Books Ltd.

Wojcik, A. J. (2017). Developing Conceptual understanding and procedural fluency in Algebra for high school students with intellectual disability.

Yang, D. C., & Sianturi, I. A. J. (2019). Assessing students' conceptual understanding using an online three-tier diagnostic test. Journal of Computer Assisted Learning, 35(5), 678-689.

Yamauchi, L. A.., Ponte, E., Katherine, T., Ratliffe, & Traynor, K. (2017). Theoretical and Conceptual Frameworks Used in Research on Family–School Partnerships. School Community Journal, 27(2).

Yemi, T. M., Azid, N. B. H., & bin Md Ali, M. R. (2018). Cooperative Learning: An Approach for Teaching Mathematics In Public School. European Journal of Social Sciences Studies.

Yerushalmy, M., & Chazan, D. (2008). Technology and curriculum design: The ordering of discontinuities in school algebra. In L. D. English (Ed.), Handbook of international research in mathematics education (2nd ed., pp. 806–837). New York, NY: Routledge.

Yılmaz, I. (2020). Semiotic procedural knowledge model on solution of problems and problem-solving analysis. International Journal of Educational Administration and Policy Studies, 12(2), 101-111.37-60.

Yıldız, P., & Ozdemir, İ. E. Y. (2021). Teacher subject matter knowledge for the meaningful transition from arithmetic to algebra. Journal of Pedagogical Research, 5(4), 172-188.

Yuksel, P., & Yildirim, S. (2015). Theoretical Frameworks, Methods, and Procedures for Conducting Phenomenological Studies in Educational Settings. Turkish Online Journal of Qualitative Inquiry, 6(1).

Zainal, Z., (2007). Case Study as a Research Methods: Faculty of Management and Human Resource Development

Zano, K. (2022). A Multilingual Turn: Trans-language by Design Activity In An Efl Context. *Journal Of Languages And Language Teaching*, *10*(2), 199-210.

Zulnaidi, H., & Zamri, S. N. A. S. (2017). The effectiveness of the GeoGebra software: The intermediary role of procedural knowledge on students' conceptual knowledge and their achievement in mathematics. *Eurasia Journal of Mathematics, Science and Technology Education*, *13*(6), 2155-2180.

Zulkarnain, I., Kusumawati, E., & Mawaddah, S. (2021). Mathematical communication skills of students in mathematics learning using discovery learning model. *In Journal of Physics: Conference Series (Vol. 1760, No. 1, p. 012045). IOP Publishing.*

Zuma, T. H. (2015). The exploration of teaching strategies for Grade 5 mathematics CAPS in *three primary schools at KwaNdengezi Circuit in Pinetown District (Doctoral dissertation).*

Appendix A

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

10 November 2020

Mr Remigius Nnadozie Amaefule (212558040)
School Of Education
Edgewood Campus

Dear Mr Amaefule,

Protocol reference number: HSSREC/00002013/2020
Project title: Grade 10 learners experiences of the teaching strategies in Algebra used by their mathematics teachers: A case study of two schools in the Pinetown district.
Degree: Masters

Approval Notification – Expedited Application

This letter serves to notify you that your application received on 09 October 2020 in connection with the above, was reviewed by the Humanities and Social Sciences Research Ethics Committee (HSSREC) and the protocol has been granted **FULL APPROVAL** on the following condition:

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

This approval is valid until 10 November 2021.
To ensure uninterrupted approval of this study beyond the approval expiry date, a progress report must be submitted to the Research Office on the appropriate form 2 - 3 months before the expiry date. A close-out report to be submitted when study is finished.

All research conducted during the COVID-19 period must adhere to the national and UKZN guidelines.

HSSREC is registered with the South African National Research Ethics Council (REC-040414-040).

Yours sincerely,

[redacted]

_____
Professor Dipane Hlalele (Chair)

/dd

Humanities and Social Sciences Research Ethics Committee
Postal Address: Private Bag X54001, Durban, 4000, South Africa
Telephone: +27 (0)31 260 8350/4557/3587 **Email:** hssrec@ukzn.ac.za **Website:** http://research.ukzn.ac.za/Research-Ethics
Founding Campuses: Edgewood Howard College Medical School Pietermaritzburg Westville

Appendix B

OFFICE OF THE HEAD OF DEPARTMENT

Private Bag X9137, PIETERMARITZBURG, 3200
Anton Lembede Building, 247 Burger Street, Pietermaritzburg, 3201 **Email**: Phindile.duma@kzndoe.gov.za
Tel: 033 3921062 / 033-3921051
Buyi.ntuli@kzndoe.gov.za

Enquiries: Phindile Duma/Buyi Ntuli **Ref.**:2/4/8/4190

Mr Remigius Nnadozie Amaefule
P.O. Box 10498
ASHWOOD
DURBAN
3605

Dear Mr Amaefule

PERMISSION TO CONDUCT RESEARCH IN THE KZN DoE INSTITUTIONS

Your application to conduct research entitled: **"GRADE 10 LEARNERS' EXPERIENCES OF THE TEACHING STRATEGIES IN ALGEBRA USED BY THEIR MATHEMATICS TEACHERS: A CASE STUDY OF TWO SCHOOLS IN THE PINETOWN DISTRICT:,** in the KwaZulu-Natal Department of Education Institutions has been approved. The conditions of the approval are as follows:

1. The researcher will make all the arrangements concerning the research and interviews.
2. The researcher must ensure that Educator and learning programmes are not interrupted.
3. Interviews are not conducted during the time of writing examinations in schools.
4. Learners, Educators, Schools and Institutions are not identifiable in any way from the results of the research.
5. A copy of this letter is submitted to District Managers, Principals and Heads of Institutions where the Intended research and interviews are to be conducted.
6. The period of investigation is limited to the period from 11 August 2020 to 10 January 2022.
7. Your research and interviews will be limited to the schools you have proposed and approved by the Head of Department. Please note that Principals, Educators, Departmental Officials and Learners are under no obligation to participate or assist you in your investigation.
8. Should you wish to extend the period of your survey at the school(s), please contact Miss Phindile Duma/Mrs Buyi Ntuli at the contact numbers above.
9. Upon completion of the research, a brief summary of the findings, recommendations or a full report/dissertation/thesis must be submitted to the research office of the Department. Please address it to The Office of the HOD, Private Bag X9137, Pietermaritzburg, 3200.

10. Please note that your research and interviews will be limited to schools and institutions in KwaZulu-Natal Department of Education.

Dr. EV Nzama
Head of Department: Education
Date: 11 August 2020

APPENDIX C

Gatekeeper Permission Letter to School Principals' of the study site schools

School of Education, Edgewood Campus
College of Humanities
University of KwaZulu-Natal

18th September 2020

The Principal
Nteh High School
Kwandegezi

Dear Principal,

REQUEST FOR PERMISSION TO CONDUCT A RESEARCH STUDY IN YOUR SCHOOL

I wish to request for your permission to conduct a research study in Nteh High school. This study forms part of my postgraduate Master of Education research degree at the School of Education, University of KwaZulu-Natal. The title of the study is: **Grade 10 learners' experiences of the teaching strategies in Algebra used by their mathematics teachers: A case study of two schools in the Pinetown district.**

This study will involve teachers and the Grade 10 learners as participants in your school. The participants will be required to answer research interview questionnaires comprised of semi-structured open-ended questions. In view of the current pall the COVID-19 has cast on school activities and the attendant precautions that are necessary to maintain safety of learners and school personnel, there will be no physical contact involved in conducting this study in your school. The questionnaire instruments will be handed over to your school administrators with your permission and approval and will be collected back together with the signed consent form from them upon completion by the participants. Similarly, with your permission, I will be happy for your school administrators to communicate the request for participation to both the students

and grade ten mathematics teachers in your school and to issue the letter of consent as well as the questionnaires to the participants who volunteered and consented to participate in the study.

However, I would also be happy, with your permission and approval and in complete compliance with the stipulated safety measures in your school, to do the request for participation from teacher and students in grade ten, as well as, issue them the consent forms and questionnaires by myself, that is, if your administrators will not be permitted to do same. I will be happy also to return back at an agreed date and time, and in full compliance with the stipulated safety measures, to collect all items back from participants.

Furthermore, in carrying out the study in your school, I will meticulously comply with the stated ethics stipulated by The Department of Basic Education for conducting such study.

It is anticipated that this study will contribute to Grade 10 Mathematics Teacher's knowledge of strategies to teach Algebra in schools and their effectiveness.

For further information regarding the study, please contact my supervisor - Ms Busi Goba with the following contact information below:

Busi Goba
School of Mathematics Education
Edgewood Campus, University of KwaZulu-Natal
Tel: 0312607607
E-mail: Gobab@ukzn.ac.za

You may also wish to contact the University Research Office:

The UKZN Research Ethics Office
Govan Mbeki Building
Westville Campus
Tel: 0312604557
Email: hssrec@ukzn.ac.za

I am grateful for an opportunity and permission to conduct this study in your school.

Yours faithfully

Remigius Nnadozie Amaefule

Student number 212558040
Tel: 0784486589
E-mail: 212558040@stu.ukzn.ac.za

Declaration,

I, *Remigius Nnadozie Amaefule* Principal hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to my school's participating in the research project.
Signature of the Principal.

APPENDIX D

School of Education, College of Humanities,
University of KwaZulu-
Natal, Edgewood Campus,
Durban,
South Africa
18/09/2020

Dear Participant

Informed consent letter

My name is Remigius Nnadozie Amaefule. I am a Masters student studying at the University of KwaZulu-Natal, Edgewood campus, South Africa.

My research seeks to understand the 'Grade 10 learners' Experiences of the teaching strategies in Algebra used by their Mathematics Teachers: A case study of two Schools in the Pinetown District'. However, you will be required to answer few questions in the form of Semi-structured questionnaire.

The objectives of this study include:

I. To identify the teaching strategies that the Grade 10 Mathematics teachers use in the teaching of Algebra in the two Schools in Pinetown.

II. To explore the Grade 10 learners' experiences of the teaching strategies of Algebra using the teaching strategies their mathematics teachers' use in the two Schools

Please note that:

- Your confidentiality is guaranteed as your inputs will not be attributed to you in person, but reported only as a population member opinion.
- Any information given by you will not be used against you, and the data collected will be used for the purpose of this study.
- Data collected for the purpose of this study will be safely stored with the School of Mathematics Education at Edgewood Campus for the stipulated period and in accordance with the ethical clearance, and will be subsequently properly destroyed as required.
- Your participation is voluntarily and you have the right to withdraw from this study at any time.

For further information regarding the study, please contact my supervisor - Ms Goba Busisiwe with the following contact information below:

Busi Goba
School of Mathematics Education
Edgewood Campus, University of KwaZulu-Natal
Tel: 0312607607
E-mail: Gobab@ukzn.ac.za

You may also wish to contact the University Research Office:

The UKZN Research Ethics Office
Govan Mbeki Building
Westville Campus
Tel: 0312604557
Email: hssrec@ukzn.ac.za

Thank you for your contribution to this research.

Yours faithfully

Remigius Nnadozie Amaefule
Student number 212558040
Tel: 0784486589
E-mail: 212558040@stu.ukzn.ac.za
Or amaefuler@yahoo.com

APPENDIX E

Informed Consent: Declaration

I…….....

(Full names of participant) hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to participating in the research project.

Signature:_____Date: _____

APPENDIX F

QUESTIONNAIRE FOR GRADE 10 TEACHERS TO ANSWER RESEARCH QUESTION 1. (Triangulate)

Please answer each of the following questions:

- Are there stipulated strategies for teaching the topic algebra Grade 10 in mathematics (in CAPS, in curriculum documents or syllabuses)? Explain.

- How do you understand these strategies, are they in your view, easy to implement in the classroom? Why? Why not?

- Do you use all these strategies in your Grade 10 mathematics classroom? Why, why not?

- Which among these strategies do you mostly use? Why, why not?

- What informs the decision for using one or the other of these strategies?

- Which of these strategies are you most adept in, and why do you think it is important for you to master it (them) very well?

- What are your perceptions or views of your grade 10 learners' experiences of learning Algebra in the classroom when you use this (these) strategies? Explain more with examples to illustrate your perceptions.

QUESTIONNAIRE FOR GRADE 10 TEACHERS TO ANSWER RESEARCH QUESTION 2

- Do you enjoy learning Algebra?
  (*Your experiences in learning Algebra)*
- What do you like most about your Grade 10 algebra lessons?

- Do you find your Grade 10 algebra easier or more fun than you did in grade 9 algebra?If it is difficult, or hard, what do you think has changed? Why do you think so?

- Do you like the way you are taught Algebra? (What don't you like, what do you like? Why and why not?

- In what ways do you think your teacher has made the learning of algebra a good or bad experience

- In what ways do you think your learning of algebra is difficult because of the way your teacher teaches it?

- What do you think you would like to change in the way you learn algebra in this Grade? Etc

APPENDIX G

Federal University of Technology
Owerri
P.M.B, 1526
Owerri, Nigeria

2th of July 2022

TO WHOM IT MAY CONCERN

I write to certify that I have proofread the Master' research work titled ***'Grade 10 Learners' Experiences Of The Teaching Strategies In Algebra Used By Their Mathematics Teachers: A Case Study Of Two Schools In The Pinetown District'***
authored by Remigius N. Amaefule (212558040).

I have made corrections to grammar, which I felt necessary.

Sincerely,
Anoma Ugochukwu

APPENDIX H

GRADE10 LEARNERS' EXPERIENCES OF THE TEACHING STRATEGIES IN ALGEBRA USED BY THEIR MATHEMATICS TEACHERS: A CASE STUDY OF TWO SCHOOLS IN THE PINETOWN DISTRICT

ORIGINALITYREPORT

%	5%	1%	1%
SIMILARITYINDEX	INTERNETSOURCES	PUBLICATIONS	STUDENTPAPERS

PRIMARYSOURCES

1	hdl.handle.net InternetSource	1%
2	researchspace.ukzn.ac.za InternetSource	<1%
3	docplayer.net InternetSource	<1%
4	SubmittedtoUniversityofKwaZulu-Natal StudentPaper	<1%
5	uir.unisa.ac.za InternetSource	<1%
6	ujcontent.uj.ac.za InternetSource	<1%

Uir.unisa.ac.za

InternetSource

saarmst

e.org

<1%

8 InternetSource

<1%