AN INVESTIGATION OF CHALLENGES IN THE IMPLEMENTATION OF GRADE 9 MATHEMATICS CURRICULUM ASSESSMENT AND POLICY STATEMENTS IN THE TSHWANE SOUTH DISTRICT OF GAUTENG

by

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DEDICATION

This work will not have been possible without the motivation from my mother Patricia, my late father Tendai Gilbert Munjoma, my husband, Tendai and children Mitchelle, Victor, Victoria and Mikeyla. I dedicate this thesis to them, especially Victor being a type 1 diabetic at the age of 8 is not the end of the world. To them I say, “Through hard work you will reach the stars, I am proud of you”.

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ABSTRACT

The goal of this research was to explore how grade 9 Mathematics curriculum and Assessment Policy Statements (CAPS) changed classroom discourses in schools and classrooms. The research used a descriptive policy analysis technique to identify obstacles to curriculum implementation and provide suggestions that will enhance outcomes and curriculum deliverables. The study's goal was to investigate the difficulties encountered in implementing the Grade 9 Mathematics CAPS curriculum in Gauteng's Tshwane South District.

Investigating the impact of CAPS on learner performance in Mathematics grade 9 was done through an exploratory mixed methods design. This research drew on the advantages of both qualitative and quantitative research approaches, resulting in an improved overall knowledge of the study's subject matter Data collection research approaches such as semi-structured interviews, questionnaires, and documentary analysis were used to acquire information in order to answer the study questions. As part of the fieldwork, a questionnaire was provided to a randomly selected sample of 30 teachers teaching Grade 9 Mathematics, ten Mathematics department heads, and ten principals from schools in the Tshwane South District of Gauteng. The interviews were semi-structured, and they provided valuable supplementary information. To ensure that the interview questions were related to the study's objectives, they were asked in a predetermined sequence in each session. The researcher conducted interviews with ten heads of departments and principals from ten schools that were selected at random.

Pursuant to the findings, the vast majority of participants acknowledged that teaching Grade 9 Mathematics involves pedagogical and methodological challenges. Another noteworthy result was that the plurality of participants believed that improving material design and training teachers with pedagogical content knowledge (PCK) and skills may improve Mathematics teaching and learning in

general and Mathematics in particular. Also found by the research was that parental engagement is crucial in ensuring that children get high-quality Mathematics education and learn to solve problems. Increasing parental participation in their children's education is widely acknowledged, and research indicates that doing so may result in a variety of benefits, including increased arithmetic ability, improved attendance, and reducing the achievement gap. This study has produced many recommendations for the introduction of the Grade 9 Mathematics CAPS. Increased collaboration among stakeholders is essential; education should be used as a social instrument; and teachers ' conceptual grasp of mathematical topics must be strengthened in order for the curriculum to be implemented successfully.

KEY TERMS

Academic performance; constructivism, curriculum implementation, Grade 9 Mathematics Curriculum and Assessment Policy Statements; Mathematics achievement.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS AND ACRONYMS

ANA	Annual National Assessments
C2005	Curriculum 2005
CAPS	Curriculum Assessment Policy Statement
CDE	Centre for Development and Enterprise
COVID-19	Corona virus disease 2019
DBE	Department of Basic Education
DoE	Department of Education
EFA	Education for All
HoD	Head of Department
LTSM	Learning and teaching support materials
MDGS	Millennium Development Goals
NCS	National Curriculum Statement
NDP	National Development Plan
OBE	Outcomes-Based Education
OECD	Organisation for Economic Cooperation and Development
PISA	Programme for International Learner Assessment
RNCS	Revised National Curriculum Statement
SDG	Sustainable Development Goals
SES	Social Economic Status
STEM	Science Technology Engineering and Mathematics
TIMSS	Trends in International Mathematics and Science Study
UNESCO	United Nations Educational Scientific and Cultural Organisation
UNISA	University of South Africa

CHAPTER 1: GENERAL ORIENTATION

1. INTRODUCTION

This chapter introduces the inquiry and gives a summary of its results. It gives an overview of the study's origins and goals. The research problem and research topic are then presented. It examines the technique and design of the study. Lastly, this chapter discusses the study's shortcomings and provides a high-level summary of its structure.

1.2 BACKGROUND TO THE STUDY

South African society and government place a high priority on education and envision it as a transformational tool for social change, as evidenced by significant expenditures dedicated to education since the demise of the apartheid government system in 1994. As a developing country, South Africa rates Mathematics and science education more highly than other disciplines as they are vehicles through which society may obtain technical and scientific abilities that boost national growth. Because of the public perspective on education, particularly in Mathematics and science, the education system requires a curriculum and education system that produces competent learning results. Finally, learner evaluations and the results of educational system performance are of national and social importance to all stakeholders because they indicate the performance and efficacy of curricular policy implementation. The Department of Basic Education (DBE) (2014) aims at, “improving learner achievement ranks as the greatest priority in the mission of education and training”.

The study examined in depth how the Curriculum and Assessment Policy Statements (CAPS) in Grade 9 Mathematics influences classroom discourses in schools and classrooms.

The research uses evaluative, descriptive policy analysis (Patton, Sawicki & Clark 2019) to identify impediments to curriculum implementation and to provide suggestions that might lead to better results and improved curriculum outputs. According to Gumede and Dipholo (2014), “policy implementation is a product of monitoring, assessment and offering early interventions to achieve excellent implementation outcomes”.

Mathematics is a major pillar of the disciplines taught from the Foundation Phase (Grades 0–3) to the Further Education and Training (FET) phase. According to the DBE (2011), “Mathematics in Grade 9 is required as the cornerstone of critical thinking and problem-solving abilities”. According to Motshekga (2011), “Mathematics is a form of communication that uses signs and figures to represent numerical, geometrical and pictorial connections”. Data processing, measurement, geometry, patterns and functions, algebra and numbers, operations and relations are the six topics covered in Grade 9.

The outlined topics are weighted in terms of percentages of total content for Grade 9 Mathematics as 10%, 10%, 30%, 35% and 15% respectively. Even though Mathematics is the epicentre and a gateway subject into technological and engineering sectors, learners underperform mostly owing to lack of facilities, insufficient resources, inadequate teacher development, learners with behaviour problems and overcrowding in classes (Centre for Development and Enterprise [CDE] 2014).

South Africa has modified its curriculum to embody its philosophy, vision and tries to react to the issues that resulted in educational underperformance, driven by the current political, social, economic, and technical circumstances, as well as the state education foresight.

The most recent reform, known as CAPS, is a component of the National Curriculum Statement (NCS) that focuses on policy and assessment. "CAPS is not a freshly constructed curriculum," Le Grange (2013:472) said, "but it is a component of the NCS, a new permutation of the curriculum with a single complete regulatory framework for content and assessment." As a result, the research provides an in-depth exploration of the constraints and problems in applying the Mathematics CAPS curriculum in Grade 9, as well as a recommendation for an interventional curricular strategy to address the barriers that obstruct successful classroom discussions.

Figure 1.1 summarises the pedagogical approaches that underpin instruction and schooling of Mathematics within the CAPS curriculum.

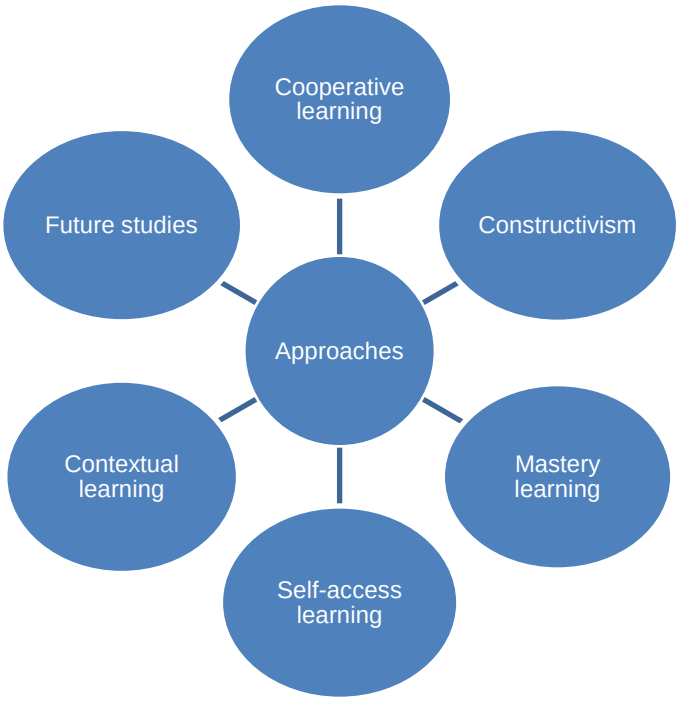

Figure 1.1: CAPS Mathematics teaching model.

Figure 1.1 summarises the pedagogical approaches that underpin teaching and learning of mathematics within the CAPS curriculum. Cooperative learning, constructivism, mastery learning, self-access learning, contextual learning and future studies are all approaches that can be collaborated to teach CAPS mathematics grade 9.

Constructivism

Constructivism way of teaching is progressive, learners are actively involved rather than passive learners. Naidoo and Mabaso (2023) states that, “The constructivist theory posits that meaningful learning occurs when learners actively create foundational knowledge through investigation and reflection.” This implies that learners make meaning of mathematical concepts by associating with their peers and teachers. Moreover, the constructivism approach of teaching actively involves learners in the learning process, interpretation of subject matter using their experiences. The teachers’ role is to understand how the learners grasp the content, intervene to guide, support, correct any misconception and improve knowledge quality (Tukur, Olaoye and Audu, 2023). Additionally, constructivist theory of learning also explains that learners have freedom to shape their knowledge through interactions (Hasibuan and Nugraha, 2023) thereby identifying and solving mathematical problems using critical, creative thinking.

Cooperative learning

According to Rosfiani et al 2024 cooperative learning as a pedagogical approach that underpins teaching and learning of mathematics within the CAPS curriculum “is a learning approach where learners work in small groups of 4-6 learners collaboratively stimulating learners to be more passionate about learning.” As a result, learners are confident, competent to deal with any mathematical situation without being hindered by a fear of mathematics, appreciate the elegance of mathematics, a spirit of curiosity and a love for mathematics (Department of Basic Education, 2011).

Mastery learning

Winget and Persky (2022) state that, “mastery learning, introduced in the 1960s, was developed to ensure all learners reach a desired level of mastery or competency, learners acquire knowledge and then complete an assessment.” However, when learners achieve the desired level, they can proceed to enrichment activities and learners who do not meet the desired level of mastery proceed through corrective activities and retesting. Therefore, when teaching mathematics CAPS, mastery learning may result in better performance due to aspects of motivation, testing, and feedback. In the same way, Kruckenberg (2024) suggests that, the mastery learning approach in education focuses on frequent monitoring throughout learning to provide feedback, feedback helps inform the teacher of how the learners are learning, informs adjustment of lesson plans and activities, also informs the learners performance in the class and provides the learners with the opportunity to practice and learn from mistakes. Likewise, mastery learning prepares learners to investigate, analyse, represent and interpret information and solve mathematical problems without the fear of making mistakes.

Self-access learning

According to Tassinari and Ramos (2020) self-access learning provides a valuable alternative to classroom-based approaches and enables learners to familiarize themselves with strategies suitable for their needs thereby enriching learning. However, research has documented that self-access learning demonstrate how learners are able to overcome challenges and enhance or sustain their own motivation for learning (Shen and Bai, 2024). Self-access learning is very significant in teaching and learning of CAPS mathematics grade 9 because learners need self-driven motivation to understand deep mathematical concepts and make sense of Mathematics.

Contextual learning

Contexual learning is explained by Heald *et al* (2023) as learning from a learner's point of view who is influenced by the features of the environment. This is significant because when teaching and learning mathematics the environment plays a pivotal role. Consequently, learning mathematics using effective contextual learning approach helps in terms of learning mastery, creating learning activities and teacher's ability to manage learning. Teachers play an active role in the learning process, this is important to effective learning. Pedagogic and social competence of a teacher must be reliable in the learning process, including specifying the learning approach that is appropriate to the material (Saragih and Surya, 2017). In addition, Ekowati *et al* (2015) state that contextual learning approach is a concept which helps teachers to associate the content-learn with the real-world situations of learners, motivate learners to make connections between the knowledge taught and application in their lives as members of communities.

Learning must be relevant to the life of learners, learners are expected after learning mathematics to solve the problem in real life. Selvianiresa and Prabawanto (2017) goes further and explain that contextual learning approach develops mathematical competence and provides a notion that mathematics really can be applied beneficially to the life of a learner thereby creating critical awareness of how mathematical relationships are used. Learning with the CTL approach gives students the opportunity to place the material learned as part of or related to students' daily activities. Students feel learning activities as part of the construction of their experiences so students feel the need to involve themselves in these experiences and try to understand what they are learning Velani and Retnawati (2020). Finally, application of contextual teaching and learning approach improves mathematics interest and learning achievement results among learners.

Future studies

Future studies in mathematics as researched by Mohamed, Khalil, and Awaji, (2023) identifies areas to support high quality mathematics teaching and learning approach for future professional development by examining mathematics teachers' awareness of effective practices. Future studies in Mathematics allows teachers and learners to adopt teaching approach that is relevant. Englebrecht et al (2023) stated that mathematics education is changing rapidly because of educational innovation. Innovation provides opportunity for learners to identify new strategies to allow real time adaption. Lastly future research in teaching and learning mathematics is fundamental and ongoing to enable and teachers and learners to achieve better results.

1.2.1 State of Instructing and Studying Mathematics Globally

Globally, the teaching and study of Mathematics has had different results, with some nations faring remarkably well while others performed shamefully poorly. Two examples of top performers are the Singaporean and Republic of China Mathematics performance.

Singapore's education system, as well as its mathematical instruction, has evolved throughout time (Kaur, 2014:1). The greatest definition of a contemporary school Mathematics curriculum is one that fits the demands of each learner in the classroom. It is acquired from a paradigm that prioritises mathematical critical thinking. Over the period 1946 to 2012, the trends that influenced Singapore's elementary school Mathematics curriculum were undoubtedly a consequence of advancements in the Singapore Learning System that took place over the course of the comparable time span. The curriculum, teachers, learners, and the learning environment all have a role in Singapore's achievement in international benchmark research including the Trends in International Mathematics and Science Study (TIMSS) and the Programme for International Learner Assessment (PISA).

Figure 1.2 depicts the reform that led to today's state of Mathematics, which was influenced by problem-solving pedagogical techniques that accommodate to all learners, are in line with international best practices, are related to the economy, include context-based content, and are beneficial to state development.

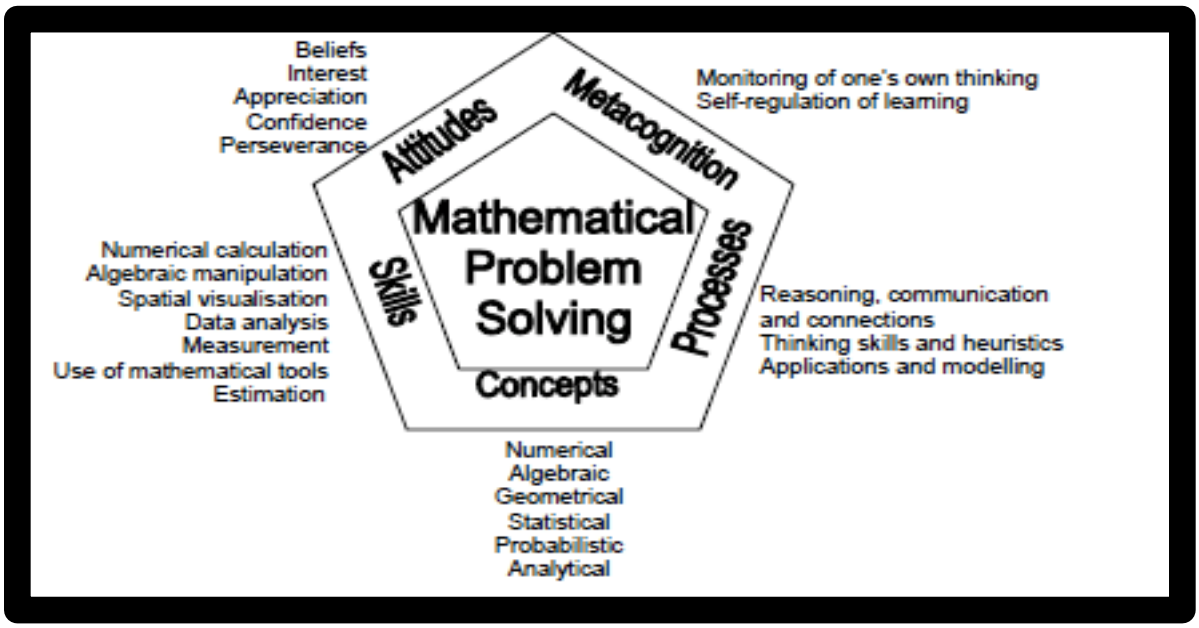

Figure 1.2: Singapore's Mathematics Framework

Source: (Singapore Ministry of Education, 2006)

Another outstanding performer is the Republic of China, which is classified among the prestigious ten best performers in Mathematics in the globe. According to Chou and Spangler (2016), during the past two decades, the focus of international Mathematics education academics has shifted to East Asian nations since their pupils excel in global Mathematics and scientific discipline (Karp, 2016). Worldwide, studies of learner achievement in Mathematics, such as the TIMSS and the PISA (Mullis, Martin, Foy & Arora, 2012), show that East Asian learners in Grades 4 and 8 persistently surpass their peers in other countries.

Scholars studying the differences and similarities between East Asian and other countries concluded that they all shared the Confucian culture, prompting them to wonder why Confucian-based cultures have produced such efficient methods of

mathematical education (Clements, 2013). They discovered that East Asian Mathematics teachers ' extensive mastery of mathematical knowledge, creative interpretation of approach, combined effort, and the teachers' teaching, learning and thinking are some of the reasons why East Asian learners consistently outperform their counterparts (Cai, et al. 2016).

Many techniques of mathematical instruction have also been explored by researchers. They discovered that Chinese and American teachers had different approaches to teaching (Hiebert, Stigler & Manaster, 1999). Cui, et al. (2018), for example, conducted research on contrasting nations' viewpoints on good Mathematics education. As per the data, US math teachers place a greater emphasis on learner understanding while using actual examples, but Chinese math teachers place a greater emphasis on critical thinking after using solid examples. Chinese teachers place a high importance on Mathematics subject matter, technique, and learner learning while preparing lessons (Li, Chen & An, 2009). The indicated results elevate an important inquiry: in their classes, what attitudes and behaviours do Chinese Mathematics teachers regard highly? Some math teachers believe that Chinese learners are taught through "rote learning" or "repetition" (Wong 2006). Furthermore, Leung (2001) examined the features and underlying values of East Asian Mathematics education and concluded that it differs from Western perspectives in seven areas. They include: result vs method; routine vs. purposeful learning; difficult vs. fun learning; external vs. inherent motivation; whole class teaching vs. tailored learning; and teacher knowledge: content vs. didactics.
The goals, vision and philosophy of education in the United States (US) are continually evolving. In general, large teacher and user system readiness projects precede educational revolution and reform. The curriculum revolution, according to Hall and Hord (2014), has increased the necessity for teachers to recognise the challenges they face in administering courses internationally.

1.2.2 Mathematics Teaching in South Africa

South Africa's democratic transition in 1994 ushered in a fresh surge of passion for redressing the injustices established by successive apartheid administrations that treated blacks, who form the majority of the population, as second-class citizens. Therefore, education became the vehicle for addressing society's social, economic and cultural issues, resulting in change and progress. In line with political ideological developments, South Africa's national curricula have changed from Christian National Education curriculum used during the apartheid years to the present unified National Senior Certificate (NSC) curriculum, the latest version of which is the CAPS. Le Grange (2013) asserts that curriculum has changed from post-1994 outcomes-based education (OBE) encapsulated in Curriculum 2005 proposed in 1998 (but never implemented), the National Curriculum Statement (NCS) of 2003, the Revised National Curriculum Statement (RNCS) of 2009, and CAPS which was introduced in 2011. Du Preez (2014) asserts that South Africa's curriculum reform has occurred in five distinct cycles:

Cycle 1 – Intended to address the inequalities and discrimination that characterised the then apartheid system of education where two separate and unequal education systems existed concurrently.

Cycle 2 – An expressive and results-based education system fronted by Curriculum 2005 intended to provide social justice and participative processes in education.

Cycle 3 – Preceded by a critical review of Curriculum 2005, an activity-based curriculum that had little focus on content. This gave birth to the NCS in 2003.

Cycle 4 – A product of a 2009 interface and in-depth discussions by curriculum and economic and policy experts who gave a critical review of NCS and recommended the Revised National Curriculum Statement (RNCS).

Cycle 5 – When that proved contentious, the CAPS curriculum replaced it. The curriculum was repackaged to address content and assessment gaps that were

evident in the RNCS. CAPS was implemented with execution dates were as follows: Grades 1–3 and Grade 10 (2012), Grades 4-9 and Grade 11(2013), and Grade 12 (2014).

The CAPS curriculum is grade and subject-specific and provides specific assessment and content guidelines per subject (DBE, 2011d). Hoadley and Jansen (2012) posit that CAPS curriculum has subject-organised content, separate policy documents with assessment guidelines for each phase and grade, time-framed content coverage and topics coverage per week. In addition, scripted lessons have been introduced (Shalem, Steinberg, Koornhof, & De Clercq, 2017). These changes were aimed at:

- Reducing teachers' work allocation and administration;
- Organising policies of assessment and content into a single CAPS document;
- Clarifying the role of subject advisors in curriculum support;
- Quality assuring and cataloguing establishment of textbooks and other learning and teaching materials; and
- Training teachers in supporting curriculum implementation.

Curriculum reform was critical to mitigating the country's low educational achievements, inadequate access to education, high dropout rates, and overall low learner performance in relation to other nations (Reddy, Prinsloo, Arends, Visser, et al., 2012).

However, the highly anticipated improvements in performance did not materialise. Perpetual and unparalleled Mathematics underperformance in South Africa is a key source of national anguish for the post-1994 administration despite massive financial and material investment in education and the pursuit of the late first black President, Nelson Mandela's social development programme. Spaull (2015) found that South Africa made fewer substantial gains in learner success on international benchmark examinations in the TIMSS assessments from 1995, 1999, 2002, and 2011.

As per Reddy, Prinsloo, Arends, et al. (2012:4), “in 2011, 32% of South African Grade 9 pupils earned inadequate grades in Mathematics and 76% lacked a working knowledge of whole number operations and relationships.”

Additionally, in a comparison review of TIMSS findings conducted by Hungi, Makuwa, Ross Saito, Dolata and Van Capelle (2011) suggest that just 32% of South African Grade 6 teachers demonstrated adequate mastery of subject matter, contrasted to 90% in Kenya, 76% in Zimbabwe, and 55% in Swaziland. Notably, the aforementioned capacities of learners and teachers hint at weaknesses in classroom discourse, low teacher quality and weak support structures for curriculum implementation in Mathematics education. South Africa’s comparative performance in TIMSS benchmarks is displayed in Figure 1.3.

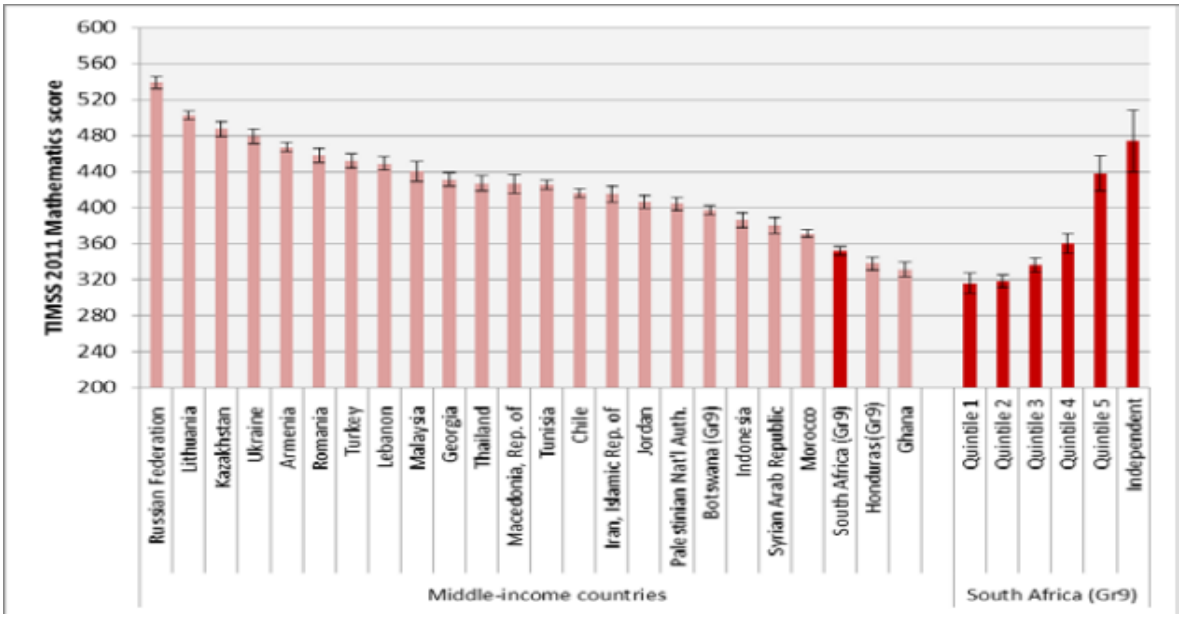

Figure 1.3: South Africa comparative performance in TIMSS (2011)

Source: Spaull 2013, report for CDE, *South Africa’s Education Crisis The quality of education in South Africa 1994-2011.*

The CAPS curriculum changes in Grade 9 Mathematics began in 2013 in response to South Africa's underperformance at global, regional and local levels. As previously stated, successful Mathematics teaching and learning face a slew of obstacles, including pedagogical methods (Karp, 2017), teacher credentials, inadequate curricular coverage (Taylor & Reddy, 2013), and teachers' lack of subject matter competence (Spaull, 2013).

As a result of this investigation, the researcher was capable of getting a comprehensive understanding of the procedures required in the introduction of the CAPS Mathematics curriculum, the pre-implementation stages and the actual implementation challenges.

1.3 PROBLEM STATEMENT

The study was prompted by the challenges experienced in the implementation of grade 9 Mathematics CAPS curriculum in Tshwane South District of Gauteng Province that lead to learner unsatisfactory Mathematics performance.

In Grade 9 Mathematics, the CAPS curriculum shift, as outlined in CAPS has 'worsened classroom and social challenges linked with education,' culminating in high proportions of learner attrition and low morale among teachers. According to (Kgopane 2021), "South African Grade 9 learners persistently perform poorly in Mathematics against top world statistical rankings of pass rates", regardless of the department's efforts to improve and enhance the teaching skills, modernizing the learning environment through the use of technology and equipping the learners with the required learning resources. The national percentages on the Grade 12 matriculation test provide an indication of South Africa's Mathematics achievement in this subject revealing the shocking truth that in 2021, only a quarter of learners archived above 50% in maths TIMMS 2019. "A summary of Mathematics average percentage marks for Grade 9 learners in 2012 to 2014, according to the last Annual National Assessment report reveals performances in geometry to be 13%, 14% and

11% respectively. This is while the percentage of learners achieving 50% or more in Mathematics is poignantly low (2%:2012; 2%:2013; and 3% in 2014)" concurs (Kgopane 2021:10).

Manamela, (2023) shared the same views and supports that South African learners persistently perform poorly in mathematics against top world statistical rankings of pass rate.

In the Daily Maverick article by Cosser dated 23 January 2023, titled "Daring solutions are needed to solve South Africa's mathematics crisis". details the dire state of the South African school's mathematics result figures. The author goes on to highlight the ripple effect this poor performance has on the country's economy Cosser, Daily Maverick 2023. As quoted by the author, the National average grade performance in mathematics grade 9 was 30.8% in 2016, 35.7% in 2017 and 36.4% in 2018 according to the DBE. This highlights an alarming fact, that the average pass rate in grade 9 mathematics was well below 40% in those 3 years (Cosser, Daily Maverick 2023). The author writes "it would not be overstating the case to say that those figures represent a national disaster-" (Cosser, Daily Maverick, 2023).

Additionally, according to the TIMMS (Trends in International Mathematics and Science Study) 2019, South Africa ranks number 389 out of 500 TIMMS scale centre point. That is 111 points below the international standard
In view of the topic at hand, the following research questions have been formulated:

1.3.1 Research Question

What are the challenges in the implementation of Grade 9 Mathematics CAPS curriculum in Tshwane South District of Gauteng Province?

1.3.2 Research Sub- Questions

- What are the challenges that teachers have experienced in the implementing the Mathematics CAPS Curriculum in grade 9?
- To what extend do the challenges affect learner's performance in the formal and non-formal assessment?
- To what extend do the challenges affect teachers' abilities in teaching Mathematics?
- How do curriculum implementation challenges affect teachers from effectively implementing the Mathematics CAPS Curriculum in grade 9?
- What recommendations maybe suggested to alleviate the curriculum challenges faced in the implementation of the grade 9 Mathematics CAPS curriculum?

1.4 AIM AND OBJECTIVES

The aim of the research was to identify the challenges faced in the implementation of Grade 9 Mathematics CAPS curriculum in Tshwane South District of Gauteng Province.

In contemplation of achieving the said aim, the following objectives were proposed:

- To identify challenges that teachers have experienced in the implementing the grade 9 Mathematics CAPS curriculum in Tshwane South District of Gauteng.
- To determine to what extend do the challenges affect learner's performance in the formal and non-formal assessment?
- To determine how the Mathematics grade 9 CAPS curriculum implementation challenges, affect the teacher's abilities in teaching Mathematics. (To determine how the challenges, affect teachers' abilities in teaching.

- To determine how the challenges, affect teachers from effectively implementing the grade 9 Mathematics CAPS curriculum.
- To recommend ways of improving curriculum challenges faced in the implementation of the grade 9 Mathematics CAPS curriculum.

1.5 THEORETICAL FRAMEWORK

Social constructivism, a theory of learning proposed by Vygotsky (1962), holds that knowledge is actively formed within an environment by social interaction between and among social actors. In this case, the social players are learners and teachers in a Mathematics classroom. The last curricular strategy is CAPS, which is designed to provide learners the opportunity to develop autonomous knowledge by allowing them to engage in instructional experiences through their own speed rather of being pushed into doing so by the teacher.

1.6 RESEARCH DESIGN AND METHODS

1.6.1 Research design

A research design is explained by Van Wyk & Taole, (2015) as “a detailed plan of how a researcher is going to conduct a research.” Study strategies, which guide the collection, presentation, and interpretation of research data, are essential components of every particular research. According to Panneerserlvam (2004), research methodology is a collection of frameworks, processes, and techniques that are utilised to identify the results of a certain research issue. There are three broad types of research tactics that are employed: qualitative, quantitative, and mixed-methods studies.

1.6.1.1 Qualitative research methodology

People's experiences are emphasised in quality research methodologies, while simultaneously recognising their individuality is emphasised. Qualitative research may also be described as a study that examines how people see and comprehend their own situations in the context of the environment in which they live (Holloway & Wheeler, 2013). Or to put it differently, qualitative research is mostly used to explore people's behaviours, opinions, experiences, and feelings, with an emphasis on emphasising the knowledge of these characteristics as well. An individual and humanistic paradigm is used to analyse human perceptions and experiences, rather than concentrating on certain notions or theories, in the course of the research process.

1.6.1.2 Quantitative research methodology

Statistical methods are used to demonstrate cause-and-effect correlations between or among variables in quantitative research methodology, which is based on positivism. During their ground-breaking study, Burns and Grove (2005) define quantitative research approach as a verified, impartial and systematic strategy that utilises numerical data to analyse phenomena in the actual world, and they were absolutely correct. In quantitative research, quantitative data are used to explain cause-and-effect problems. Additionally, the technique is well-planned and organised, with minimal influence from social or environmental factors.

1.6.1.3 Mixed methods research methodology

The most accepted meaning of a mixed research methodology, according to Smajic et al (2022), is ‘a research in which the researcher incorporates components of a qualitative and quantitative approach to research, understand and support research in one single study.’

The purpose of using mixed research methodology is to obtain valid answers to research questions and to strengthen the research study and its conclusions. Dawadi et al. (2021) explain that quantitative approach helps the researcher to collect the data from a large number of participants; thereby, increasing the possibility of generalising the findings to a wider population and qualitative approach. On the other hand, it provides a deeper understanding of the issue being investigated. Similarly, Hou (2021) also claims that by integrating both qualitative and quantitative procedures, mixed methods research offers the power of numbers and stories for research investigations. Kimmons (2022) notes that recently, researchers and funding agencies have increasingly utilised and encouraged mixed methods approaches because educational problems can be solved in more authentic ways and can provide evidence that appeals to a wide variety of stakeholders.

1.6.1.4 Chosen research approach

In an effort to explore the influence of CAPS implementation on teaching and learning of Mathematics in Grade 9, a mixed methods approach was followed. Mixed methods research is described as "research in which the researcher collects and examines data, incorporates the results, and draws conclusions in a single study employing both qualitative and quantitative strategies" (Tashakkori and Creswell, 2007:4). As claimed by Hennick, Hutter, and Bailey (2011), the qualitative method employs a variety of data gathering methods such as interviews, conversations, observations, content analysis, and case studies. The data collection methods in quantitative research are; self-reports, interviews, scales, questionnaires and observational methods are based on a structured plan which guides the researcher. The data collection method differs along the four important dimensions: structure, quantifiability, researcher obtrusiveness, and objectivity (Sadan, 2017).

Pluye et al (2018) assert that “questionnaires can be used in qualitative research, incorporates closed questions and open-ended questions that can be seen as qualitative or quantitative method depending on how they are designed and used’’. In a mixed-method approach interviews can be used as a data collection method to get a comprehensive view on a particular phenomenon, in-depth understanding, developing a survey and identifying key findings of the study **(**Kajamaa, Mattick and De la Croix, 2020).

In this research, quantitative data were collected using questionnaire forms completed by 30 Grade 9 Mathematics teachers. Interviews, questionnaires, and data analysis were used as data gathering methods for this research. Qualitative data were collected using semi-structured interviews were conducted with 10 Heads of Mathematics Departments and 10 Principals in Tshwane South District of Gauteng interviews, questionnaires and data analysis were used as data gathering methods for this research. Interviews were beneficial because they allowed respondents to share their thoughts and ideas.

1.6.2 Population and sampling

Depending on the features they hold and how they might be applied to answer the research questions, research studies target various groups of people and communities. A total of 30 Mathematics teachers for Grade 9, ten Heads of Department (HODs), and ten school principals were included in this study’s target group. As defined by Burns and Grove (2011:213), a population is “all of the components that fulfil the eligibility requirements for inclusion in research”. As a result, teachers in Mathematics classes were the primary sources of data for this research. To further explain the qualifying criteria, Burns and Grove (2011:234) described them as “a collection of traits that are necessary for participation in the target population”.

Teachers who teach Mathematics in Grade 9 at high schools in the Tshwane South District fulfilled the eligibility prerequisites for this study since they are currently employed in such institutions.

1.6.2.1 Sampling

Sampling is a strategy used to determine the characteristics of a population by selecting a small group; sampling is either purposive or random (Brynard et al., 2014:56). A limited number of research subjects should be chosen to reflect the target population since the research needs to be done within the confines of university timetables, financial resources and completion standards. The sample for this investigation was recruited from Mathematics principals, HODs, and teachers. Generally, the characteristics of a sample should be similar to those of the population it constitutes. In spite of the fact that there are guidelines for what a typical sample ought to appear like, there is no guarantee that any sample will be perfectly representational of the population from which it is taken in any particular scenario.

The following factors were contemplated when determining the sample for this study: In this section, we will discuss the following topics: purpose of the study, description of the demographic, characteristics of the population, resource availability, factors for research design, ethical implications, and statutory provisions.

A number of different types of sample selection techniques are available. Owing to Saunders, Lewis and Thornhill (2009), sampling could well be either random (probability) or non-random, dependent on the context and the data being collected (non-probability). Additionally, sampling techniques, such as non-random sampling, are susceptible to interpretation and are often arbitrary. Random sampling techniques such as simple random sampling, stratified random, cluster, and multi-stage are examples of random sampling techniques whereas non-random sample

selection techniques such as quota, purposeful, snowball, and convenience sampling are examples of non-random sample selection techniques.

As per the writers of Holloway and Wheeler (2013), each kind of sampling approach has benefits and downsides, which are briefly explored in the following sections. When picking a methodology for a research project, it is important to assess the methodology's applicability for the subject and the difficulties that will be addressed.

1.6.2.2 Sampling techniques: advantages and disadvantages

- Simple random – The fact that this is an ideal approach that is very representative of all subject participants is that it requires a comprehensive list of population members, that it is extremely uneconomical to obtain, and that it takes an extremely long time to finish.
- Stratified – A certain group's representation is ensured, and this is a comfort. The drawback is that it is more sophisticated and time-consuming than simple random sampling, and hence requires more effort.
- Cluster – Even if there is no comprehensive list of the population, it is extremely simple to conduct a random selection. The sole drawback is that it is necessary to guarantee that clusters within a level are similar. As per Barreiro and Albandoz (2001:9), "if the clusters are not homogenous, the final sample may not be representative of the population."
- Stage sampling – The advantage of this strategy is that it is feasible to randomly choose a sample population group that is restricted to a certain geographical area. Since it incorporates both cluster and stratified random sampling, it is, on the other hand, quite difficult.
- Purposive sampling – The technique recommended guarantees that a manageable number of participants with the required characteristics may be identified and chosen. Because of the researcher's probable subjectivity, such samples will, in the vast majority of circumstances, not be generalizable.

- Quota – Although a sufficient number of participants with relevant features are selected, it is very difficult to determine whether or not the sample is representative of the targeted population in question.
- Snowball – Members of groups who would ordinarily be excluded from consideration for inclusion may be considered when no lists or recognised clusters exist. It may be difficult to tell if a sample is representative of the whole population.

The researcher utilised a purposive sampling strategy in this study. This is a type of non-probability sampling in which selections regarding the individuals to be included in the sample are made by the researcher based on several criteria, such as expert knowledge of the study topic or the capacity and willingness to participate in the research (Jupp, 2006: 244). Purposive sampling is based on the researcher's judgment and focuses on the features of a sample.

1.6.2.3 Sampling size

Thirty Mathematics teachers were sampled from fifty teachers, ten Mathematics and science HODs, and ten principals from the selected schools were recruited to take part in this survey, which resulted in a total of 50 respondents. According to Holloway and Wheeler (2013:128), "the dimensions of the sample has no consequence on the significance or quality of the research." A lower sample size is justified in this case since detailed information would be gathered from the smaller sample and utilised to address the research questions.

1.6.3 Instrumentation and Data Collection Techniques

In pursuance of achieving the intended objectives, the study employed semi-structured interviews, questionnaire and document analysis as research instruments of the study.

1.6.3.1 Semi-structured interviews

Unstructured or semi-structured interviews may be conducted in a variety of ways, depending on the context (Maree, 2007). Using semi-structured interviews, the researcher hoped to get a better understanding of the participants ' thoughts, ideas and attitudes. A significant contribution of this study's semi-structured interviews is that they provide information regarding interventions in a Mathematics classroom. As Gall, Gall and Borg (2006) point out, a semi-structured interviewer may extract information from an interviewee that the subject would not otherwise be able to divulge under regular conditions. This can only be accomplished via deliberate motivation of the interviewee and the maintenance of an excellent rapport.

While managing semi-structured interviews, researchers have the chance to observe and record the gestures and facial expressions that correlate to the verbal communication that takes place during the interview. Semi-structured interviews, according to Kallio, et, al. (2016), have the advantage of consisting of a list of interview questions, but they also have the advantage of being able to allow the creation of new questions that may arise during the conversation. Annisa (2019:111) suggests that this provides the person being interviewed with the chance to contribute a great more helpful information while making the whole process seems more like a normal discussion rather than a question-and-answer session. Furthermore, although the overall structure of questions stays the same across all respondents, the researcher has the ability to adjust queries to individual scenarios especially important when doing qualitative interviews (Lichtman, 2013). In this research, the semi-structured interview is appropriate since the intention of the investigation is to focus on the challenges in the implementation of the Grade 9 CAPS Mathematics curriculum.

1.6.3.2 Questionnaire

Data for this study were collected using questionnaires. Yaddanapudi and Yaddanapudi (2019) maintain that a questionnaire is a plain list of questions but the language, type and order in which they are arranged determines the results of the study. Aithal and Aithal (2020) points out that questions are developed with an aim at collecting different types of data related to demographic information, personal opinions, facts and attitudes from respondents using a scale. However, it is the language of the questions, the type of questions used and the order in which they are arranged that all impact the results of the survey. Therefore, it is important that the questionnaire is designed and validated carefully. In the same vein, Petkov, (2022) notes that the questionnaire as a method of collecting data is the crucial part of the study, more over designing a well-structured, unbiased and productive questionnaire is not easy. A questionnaire that comprised open-ended and closed-ended questions based on a Likert-scale which determined the respondents' level of agreement or disagreement with a statement, was used as a research instrument for the study to collect data.

1.6.3.3 Document analysis

Document analysis is defined as "a systematic procedure for reviewing, evaluating and interpreting documents to give voice around the research topic" (Bowen, 2009). Document analysis has variety of purposes that includes providing information and ideas on the background of study, tracking changes contained in different versions and can be used as a way to verify findings from other research work (Kumah et al., 2021). Documents can be used to spark ideas in research, by observing the ways those who will use the research speak to and communicate ideas with one another and can also be used during data collection and analysis to help answer research questions, Dalglish, Khalid and McMahon (2020).

However, documents can be tampered with; they can include mistakes, omissions and distortion; and they might be more or less typical of their kind. In addition, it is often useful to complement documents with interviews, surveys, participant

observation, or other methods depending on the research questions to improve authenticity of research (Karppinen and Moe, 2019).

1.6.3.4 Data analysis

It is critical that analysis of the data be implemented correctly and thoroughly to enable the researcher to answer the question of the study (s). Data analysis, according to Gay, Mills, and Airasian (2009:26–37), is the systematic organisation and synthesis of data using one or more statistical methodologies. According to Save the Children International (2009), qualitative data analysis is a method that seeks to reduce and make sense of massive amounts of data, sometimes from divergent sources, in order to develop perspectives that throw light on a study subject. It is a technique for explaining or interpreting descriptive content. As a consequence, data analysis aids in the interpretation of acquired data and gives the researcher with tools to answer the study question (s).

In order to analyse qualitative data, thematic analysis was performed. All obtained data were classified into topics for thematic analyses, which would be analysed to provide meaning and information to meet the particular study objectives. Therefore, data analysis provides meaning to the acquired data and provides the researcher with tools to solve the study question (s).

This study employed an integrated theme-content analysis technique to analyse its data, was done during the interpretation and analysis phase. As previously said, it was carried out utilising a qualitative technique design. A qualitative analysis technique based on De Vos et al. (2011) tries to discover underlying consistencies and meanings of acquired data by searching for patterns and repeating behaviours of collected data.

1.7 SIGNIFICANCE OF THE STUDY

Societal advancement is a primary goal of academic and research investigations that are conducted. This study will be of importance to the following audiences:

- Educational Researchers: The study will motivate and promote countless studies in more effective and prolonged methods that may be utilised to efficiently implement new Mathematics curriculum.
- National Education Policy-makers: The study's findings will enlighten public education policymakers about the discrepancies in pedagogical techniques and curriculum implementation strategies utilised in South Africa and throughout the world.
- School Managers: The research will inform and assess the supervisory and management mechanisms in Mathematics curriculum implementation, as well as how teachers are prepared to meet the aims and aspirations of public Mathematics education.
- Mathematics education teachers: Teachers are the assault weapons in curriculum implementation; therefore, the research would empower them by identifying gaps in pedagogical techniques and successful teaching of Grade 9 Mathematics education in schools.

1.8 DEFINITION OF TERMS

In view of the complexity and nature of the subject under discussion, the following terms shall be defined:

1.8.1 Learner Performance

Wesslén and Fernandez (2005:27) define learner performance as the ability of the learner to show or display knowledge and competence through participation in class, extra and homework activities as defined by the set standards of attainment in a

discipline. Therefore, in the study, learner performance was perceived as the demonstrated competence of learners in set tasks and assessments and homework inclusive of class attendance and motivation to learn.

1.8.2 Learning

De Houwer (2009:20) concurs that learning is a constant procedure of transmitting data and experience into skills, behaviours and attitudes that that can be done through groups, presentation and acting out on a given concept.

1.8.3 Teaching

Kauchak and Eggen (1993) define teaching as professional support and guidance given to a learner in a classroom setup in pursuit of attaining a learning goal. In this study, teaching is viewed as a professional activity used by the teacher to direct, mentor and assist a learner who is undertaking learning.

1.8.4 Curriculum

Various academics have defined curriculum in different ways; Graham-Jolly (2002) defined it as a formal academic plan of action supplied by a school, as stated on the timetable, or a syllabus. In agreement with Schwab (1969), it is what teachers successfully communicate to various learners utilising a variety of resources and skills. According to the foregoing, a curriculum is broadly described as information given in schools that has been studied and none has been reviewed, skills and attitudes, as well as values, that the school system effects on learners via teachers and their peers.

1.8.5 Curriculum Assessment and Policy Statements (CAPS)

CAPS entail NCS curriculum improvements that try to condense previously separate policy papers into a single, comprehensive document. As defined by the Department of Education (DBE) (2011c), CAPS is a consolidated, detailed and concise policy document that supersedes the National Curriculum Standards for Grades R–12 and

was developed by professionals to raise the overall level of teaching and learning in schools. A policy framework, CAPS, is a well-organised and polished document that specifies how each topic will be taught and tested at each grade level in the school. It was decided to implement CAPS in order to raise the level of teaching and learning and to close the policy vacuum by resolving teachers' complaints about the implementation of the fragmented NCS curriculum policy (Mbatha, 2016). This was to usher in a new era of education by, among other things, reducing the workloads of teachers, delineating subject advisor responsibilities, enhancing the reliability of learning and teaching support materials (LTSM) through centralised catalogues, and allowing more hours for classroom instruction.

Curriculum implementation requires a planned and organised procedure that considers continuity and the avoidance of disarray. Therefore, prior to the introduction of CAPS, National Minister of Education Mrs Angie Motshekga said that, in 2011 that OBE was dead, only to later gazette CAPS as an educational policy in 2012 (DBE, 2011c). According to the DBE (2011a:05), the NCS was changed and replaced by CAPS, for which execution dates were as follows: Grades 1–3 and Grade 10(2012), Grades 4-9 and Grade 11(2013), and Grade 12 (2014). The aforementioned phased strategy enabled the sector to withstand shocks and adjust to planned adjustments, minimising the impact of significant same-time modifications on the whole education system.

1.9 STUDY OUTLINE

The research project was organised into five chapters.

- Chapter 1: Orientation: Introduction and background for the study, the research aim, a synopsis of the issue under consideration, and the goals, significance, and structure of the study will all be included in this chapter.
- Chapter 2: Literature Review: Chapter will discuss the literature review related to the study.

- Chapter 3: Research Methodology and Design: This chapter will cover the following topics: the nature of the research field, study methodology, data collecting methods, sample design and participant analysis, ethical considerations, and data analysis procedures, among other things.
- Chapter 4: Data Presentation and analysis: Chapter will provide the major findings of the study with a discussion of the findings.
- Chapter 5: Recommendations and Conclusions of the study: The conclusions and results of the research will be discussed in detail in this chapter.

1.10 RESEARCH TIMING AND FINANCIAL IMPLICATIONS

The proposed allocated time and budget for the research is shown in Table 1.1:

MONTH	**ACTIVITY**	**FINANCES**
April- August 2019	Drafting and consolidation of research proposal	R4 000- UNISA
September 2019	Final draft, submission	R500
November 2019	Outcome of the Proposal	R500
January - March 2020	Registration and Chapter 1 draft	R14 000- UNISA
May - June 2020	Chapter 1- draft	R500- printing
July - September	Chapter 2- draft	R1 000- printing
August - December 2020	Chapter 3- draft	R2 000- data collection
January - March 2021	Registration	R15 000- UNISA

April- August 2021	Chapter 4- draft	R2 000- data collection
September- November 2021	Chapter 5	R500- print and copy
January- February 2022	Turn it in	R1 000- print, copy and internet
February 2022	Submission for marking	R500- printing
June 2022	Results released	R200- print, copy and internet
July 2022	Registration	R16 000- UNISA
August- October 2022	Revised Chapter 1- 5 Corrections	R2 000- print, copy and internet
November 2022	Language editing and Turn it in	R7 000

It is apparent from this table that the study was indeed time-consuming owing to the fact that the COVID-19 pandemic made restriction of lockdown during parts of 2020 and 2021 so data collection was a challenge but all in all the researcher managed to carry out the study. During 2020 and 2021, the researcher received bursary funding from UNISA lessening the burden of payments, but nothing was received in 2022 because the results were released in June and bursary applications were closed.

1.11 CHAPTER SUMMARY

The chapter summarised the research's historical background and discussed why the inquiry was needed and how it will help resolve the identified problem. The research themes, aims, techniques, population and sample, as well as the study's

limitations, were also explored. A quick analysis of the literature was carried out, and the holes that the study would fill were found. The timing for the research and its financial implications were also highlighted. The study's literature review is discussed in the next chapter.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

The preceding chapter provided an overview of the study's backdrop. It is addressed in this chapter how to do a literature review and how to offer constructivist theory, which provides theoretical framework for the research. The first section explains curriculum from an international perspective followed by a brief discussion about curriculum changes in South Africa and theoretical frameworks of the study. Drawing closer to the research topic, an overview of Mathematics education in South Africa is explained, the state of Grade 9 Mathematics teaching and learning, implementation of CAPS curriculum and challenges in implementation. Finally, a discussion on recommendations for best practices in the implementation of Grade 9 CAPS curriculum ensued.

2.2 CURRICULUM IN OTHER COUNTRIES

Each nation may have distinct reasons for reforming its curriculum. According to Knight (2001) and Prideaux (2007), curriculum is a continual complicated process that is produced and mediated by interaction between teachers, learners, the external environment and knowledge. Guro and Weber (2010) characterised curriculum implementation as a continually arranged, contentious and variable approach characterised by system modifications that result in unanticipated consequences. A substantial collection of empirical data indicates that curriculum reform has been a point of contention for years worldwide (Du Plessis, 2013). In a similar vein, Fullan (2009), in his article "Large-scale reform matures," identified significant change in Finland, Singapore, Alberta, Canada, Hong Kong, and South Korea between 2003 and 2009, as well as in other countries. Despite the fact that curriculum reform began in the 1990s with a strong transnational constituent, it was accomplished in 2014 to integrate with educational priorities for 21st-century areas of expertise, which are characterised as the assimilation of knowledge, abilities, perceptions, and principles that young people of today are anticipated to possess

(Wang & Lavonen, 2018). A new Mathematics curriculum was implemented in 2016, which connects pedagogy with assessment as well as an evidence-based approach to teaching. The new curriculum requires learners to participate actively not just in assessment but also in the creation of learning activities (Sivesind et al., 2016).

In Australia, the education curriculum has been altered to enhance learners' and teachers' expectations of the level of learning that can be attained to foster the development of relevant skills for the 21st century, and to foster multicultural understanding (Griffin, Care & McGaw, 2012). It was the goal to enhance the competitiveness of the English education policy that drove the most recent reforms of the English National curriculum in the United Kingdom. Education Secretary Michael Gove had hoped to put in place an excellent curriculum that released teachers from restraints forced by the old version. Gove has succeeded in his goal (Herold, 2020). As opposed to previous curricula that provided comprehensive guidelines on how learning should be aided or organised, the new curriculum focuses more emphasis on topic knowledge and substance. Ultimately, the idea is to lessen the precise and prescriptive structure of the curriculum while giving schools and teachers more authority over their activities.

Similarly, China's national curriculum is rewritten every ten years; the last version was issued in 2001 and amended in 2011, but fresh modifications began in 2016 with the goal of integrating new core skills into other topics (Wang & Lavonen, 2018). Additionally, in 2010, the Chinese Ministry of Education released the Outline of the National Medium and Long-Term Programme for Education Reform and Development (2010), which is consistent with the national policy initiative of prioritising education development and developing a country with skilled human resources (Cui, Lei & Zhou, 2018). The main goals are to reform and reinvent education, emphasise development, promote equity and enhance the quality of the educational system (Ministry of Education China, 2010).

In 1967, Kenya adopted a curriculum of education to supplant or remove the distinctions linking the old African, Asian and European systems (Otiende & Sifuna, 1994). The educational objective was to foster peaceful coexistence among Kenyans, foster mental, social, moral, physical and spiritual development, and foster understanding, critical thinking and respect for all individuals (Kagema, 2018). Since then, Kenya's government has implemented several educational reforms aimed at achieving the overall objectives of the country's Economic Recovery Plan, which comprise the Millennium Development Goals (MDGs), Education for All (EFA), and Vision 2036.

In Zimbabwe, the educational curriculum was modified after independence, since the colonial education system was colonised, modelled after the British system, and organised along racial lines. In the post-independence educational system, a new national curriculum and the abolition of racial segregation were implemented (Zvobgo, 2004).

To summarise, Czerniawski, Guberman and MacPhail (2017) argue that education reform is commonly motivated by perceived competitive pressures in the global economic market, where worldwide comparisons of educational accomplishment may be key motivators for change.

2.3 CURRICULUM CHANGES IN SOUTH AFRICA

2.3.1 Outcomes-Based Education

New democratic rule in 1994 led to the South African government reorganising education in order to better serve its citizens' social, economic and cultural interests. The entire effectiveness of education for all South African learners was improved by using a variety of curriculum (Ramatlapana & Makonye, 2012).

Before 1994, the curriculum in South Africa was dictated by Christian National Education policy which promoted rote learning and teaching via the use of the drill technique, which inhibits higher-order thinking (Khoza, 2015).

Immediately after apartheid in 1995, the current democratic government performed a state-wide audit of education, which revealed a number of irregularities and challenges in the system. In 1997, the Department of Education (DoE) introduced its new curriculum strategy, Curriculum 2005. The new curriculum strategy was founded on the OBE philosophy, which was derived from models used in highly developed nations, making the South African curriculum among the most innovative on the world stage (Du Plessis, 2013). Additionally, according to Chisholm (2005), OBE was a widely adopted kind of standards-based curriculum that emphasised formative and ongoing evaluation above summative assessment.

It also promoted professional autonomy, forced teachers to have more competence in their fields, pushed teachers to use technology in their classrooms, and had an impact on substantial demographic, cultural and linguistic shifts in the classroom, among other things. Several additional components were included into the National Curriculum in 2005 (Taole, 2015). OBE urged teachers to forgo the traditional teacher-centred strategy in favour of a learner-centred approach to attain greater results. In the words of Gouws (2007), teachers were faced with the problem of accommodating individual variances while still contributing to the overall aim of establishing a high level of knowledge and abilities for each and every participant.

Plethora of impediments, including infrastructural backlogs, a paucity of learning materials and the absence of an internationally recognised national standard of learning and evaluation, found it challenging to implement C2005 (Chisholm, 2005). This curriculum became a source of contention in South Africa's educational system, causing the government to undertake an investigation into the matter.

2.3.2 The National Curriculum Statement and the Revised National Curriculum Statement

Following the establishment of a Curriculum Review Committee by the Minister of Education, Kader Asmal, in 2000, a modification of Curriculum 2005, known as the

NCS, was introduced in 2003. In the opinion of Taole (2015), the NCS' difficulties in implementation led to the RNCS' adoption of a more ‘streamlined approach' to its own implementation in response (DBE, 2012). The introduction of outcomes and assessment criteria, which showed the talents and knowledge necessary, were the most significant modifications in the RNCS system. The RNCS was based on the following principles:

- Learning outcomes-based education;
- Clear and accessible; Progression and integration;
- A high level of skills and knowledge for everyone; and
- Social justice, healthy environments, human rights, and inclusion.

In the RNC, learners were instructed to extract distinct ideas from different areas of study using 'programme organizers,' with the goal of teaching them how to combine their daily lives with their academic knowledge (Taylor et al., 2003). The teachers were given complete autonomy and were allowed to teach the material in whichever way they thought suitable. Learners continued to perform badly in national school assessments, as well as in international comparison tests such as TIMSS (Howie, 2001), as well as those administered by the Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ) (Howie, 2001; Moloi, 2005). The underwhelming performance received significant condemnation (Taylor, Muller & Vinjevold, 2003). To the contrary, the RNCS was worsening disparities in educational results rather than addressing them (Ramatlapana & Makonye, 2012). Such issues, among others, demonstrated that the curriculum was failing underprivileged learners, who, in turn, were subjected to continuing implementation problems. The RNCS was evaluated in 2009, and the CAPS took over as the primary system from 2010 onwards (DBE, 2011).

The RNCS was re-evaluated in 2009 when difficulties were discovered during the installation process. CAPS for each NCS topic featured in Grades R–12 were proposed by the task team in its "Report of the task team to examine the

implementation of the NCS" (DBE, 2000), among other suggestions. No, CAPS is not the creation of a completely new curriculum, but rather an upgrade to the NCS (Pinnock, 2011). As defined by Themane and Mamabolo (2011), a curriculum that aims to educate materials and information in a methodical way in order to achieve the curriculum's specific goals is defined as follows: In contrast to traditional educational models, the CAPS curriculum is organised on content rather than outcomes, and each subject has its own comprehensive national CAPS. Additional changes include topic-based packaging of the CAPS curriculum, with each grade level now having a single comprehensive booklet that gives teachers with information on the subject and what to assess (DBE, 2011). Additionally, Hoadley and Jansen (2012) assert that the CAPS were developed with stakeholder involvement and have the features discussed in the next section.

2.3.3 Curriculum and Assessment Policy Statement

The main characteristic of the CAPS is that content is organised into different separate subjects.

- Every subject has a unique comprehensive document providing details of what to teach and assess.
- Content is based on specific, prescribed content time-framed for coverage.
- Topics are broken down into teaching weeks.

As an NCS innovation, the CAPS curriculum only addressed gaps in design, implementation and evaluation. The DBE (2011b) compared the continuous evaluations in CAPS to the end-of-year weighting. The CAPS curriculum underscores the importance of elements that influence successful curriculum implementation, particularly teachers, textbooks, and learners. According to DBE (2009), the Ministerial Committee on Education nominated the following to enhance CAPS effective implementation:

- Reducing teachers’ work allocation and administration;
- Organising policies of assessment and content into a single CAPS document;

- Clarifying the role of subject advisors in curriculum support;
- Quality control and database creation for textbooks and other educational products; and
- Training teachers in supporting curriculum implementation.

As per the preceding description, CAPS curriculum designers recognised that effective implementation is guided by the standard of teachers and teaching, the accessibility of learning materials, and the transformation of what occurs in the classroom. In Shalem's (2010) view, a teacher's interpretation of the curriculum in the classroom is mostly dependent on how well-trained and experienced they are. Moreover, teachers are the driving force behind the implementation of a high-quality curriculum, and they must be well-versed in the subject matter they teach. Teachers face a challenging position as a result of multiple curriculum modifications, which impose extra demands on them (Taole 2015). CAPS was developed to make the lives of teachers easier by reducing the amount of time spent on administrative tasks, clarifying language and removing red tape. Considering failure to plan and execute change would lead to poor implementation of new subjects, Ramnarain and Fortus (2013) suggest that teachers ' content expertise on new topics, as well as how they reorganise and rebuild this knowledge must be reviewed. This demonstrates that teachers who are simultaneously well-trained and highly motivated are required to administer the Mathematics CAPS Grade 9 curriculum successfully.

2.3.4 CAPS Amendments

In November 2019 Minister of Basic Education Angelina Motshekga said that the abridged version of Section 4 of the CAPS for Grades R-12 would be revised (DBE, 2019). The problems in administering the CAPS curriculum across the grades drove the adjustments, which were spurred by many teachers, subject specialists, parents, and other education stakeholders.

The following issues were identified:

- curriculum overload and insufficient coverage;
- poor quality of assessment tasks;
- a lack of guidance on the use of cognitive levels;
- omissions regarding assessment forms and weighting in terms of time and marks;
- the importance of allocating time for teaching and formative assessment;
- the necessity of allocating time for teaching and formative assessment;
- the number of tasks based on the need to make valid and reliable judgments about learning outcomes; and
- the number of tasks based on the need to make valid and reliable judgments about learning.

There is a trend away from unconnected assessments to credible assessment tasks, as well as a reduction in domination by any particular form or style of assessment, for example, exams.

The DBE maintains that the curriculum review process was extensive and included stringent procedures to offer teachers with temporary reprieve while ensuring that the curriculum was implemented effectively. As a result, the DBE created a condensed version of Section 4 of the CAPS, focused primarily on the elimination of formal assessment activities across most courses. Additionally, the improvements were meant to alleviate teachers of the stress of assessment work overload, giving teachers more time to focus on teaching and learning.

2.4 THEORETICAL FRAMEWORKS

A theoretical framework, according to Eisenhart (1991), is a structure that uses a theory to guide research. As a result, the theoretical framework consists of the selected theory that guides your thinking about how you comprehend and intend to perform the study, as well as the theory's ideas and definitions that are significant

(Grant & Osanloo, 2014). Constructivism is the philosophy that underpinned this research.

2.4.1 Constructivism

Developments in the curriculum were put forward by the shift in the learning paradigm in the 21st century. The old paradigm of teacher-centred and textbook education, as per Chen (2012), is less applicable in the 21st century. Pursuant to Harris and Rooks (2010), the learner-centred approach encourages teachers to help learners in acquiring their knowledge and ability in identifying and connecting new ideas in discoveries or activities. Constructivism, according to Creswell (2014), is a process in which learners comprehend different participant meanings, theory creation and social and historical construction. Furthermore, the instructor does not act as a transmitter, but rather attentively monitors learners and creates an atmosphere conducive to learning.

With regard to curriculum implementation, the education system in South Africa has several challenges. Regardless of whether their knowledge is true or incorrect, Mathematics teachers apply policies in the manner they understand them using their own understanding. The CAPS curriculum promotes a learner-centred approach in which learners take on active roles as the instructor guides them. Traditionally, constructivism has been built on the ideas of scholars, namely, Vygotsky, Piaget, and Jerome Bruner, who advocated for a cognitive constructivist approach to education, which postulates that education should give learners the structure to work out new concepts for themselves while also improving what they already know (Hershberg, 2014). The constructivist approach, according to Slavin (2003), has learners continually assessing new knowledge against all norms when they no longer work. Instead of lecturing and regulating all activities, the teacher in a learner-centred classroom becomes a guide, rather than the "sage on the stage," assisting learners in discovering their own meaning.

The constructivist approach to Mathematics emphasises starting with real-world issues for learners to solve intuitively and allowing learners to solve problems in whatever manner they see fit (Goldman & Greeno, 1998).

2.4.2 Social Constructivism

The current study is underpinned by social constructivism, a theory of learning propounded by Vygotsky (1962), who contends that learners bring their experiences into the classroom and construct knowledge through social interaction. In addition, Lohmeier (2018) highlights that social constructivism is the epistemological idea where one constructs knowledge from what they already know, building new knowledge from previous knowledge. Learning is meaningful when learners participate in discursive meaning-making and the building of knowledge (Harfitt & Chan, 2019). Instead of just absorbing information, learners create new knowledge as they explore their surroundings. According to social constructivists, people attempt to understand the world in which they live or work and produce personal perceptions for their experiences (Creswell, 2014). The instructor is not a transmitter; instead, he or she attentively watches learners and creates an atmosphere conducive to learning. Social constructivists, according to Eggen and Kauchak (2010), believe that knowledge is created collaboratively in a socio-cultural environment and that learning is facilitated by information exchange, negotiation and debate. The learning environment, according to social constructivists, must allow for interaction and coordination with others (Amineh & Asal, 2015).

While social constructivism is a theory conceptualised by Vygotsky that emphasises the interaction between the learner and others, Pritchard (2009) argues that the teacher's responsibility is to stimulate discussion and keep it going. He further contends that children learn by being active; that learning is socially mediated; that the teacher's position as a 'scaffolder' is emphasised; and that the teacher is a facilitator who gives the difficulties that the learner needs in order to achieve more. Helping learners at precisely the correct moment and complexity level to meet their

specific needs is known as scaffolding. Speaking, working in pairs, or small groups are all viable methods of expressing one's creativity. Wray and Lewis (1997) outline four features of constructivist learning theory, which includes the following:

- Learning is an active process in which what is known and what is learned interact.
- Learning is a social process.
- Learning is a situated process.
- Learning is a metacognitive process.

Constructivism underscores the importance of knowledge creation rather than replication (Jonassen, Dreck & Wilson 1999). In addition, several tools in the classroom, such as first-hand experience, interactive materials, conversation, and independent study, may help learners develop critical thinking abilities.

In the Zone of Proximal Development (ZPD), collaboration fosters development. The ZPD, according to Pritchard (2009), is a theoretical region of knowledge into which a learner will go next. Within the zone, the learner is able to function successfully, but only with assistance. As a result, while designing work for children, a teacher must consider the learners' present level of comprehension and prepare properly and appropriately. The ZPD is a tool for learning about children's skills and the types of teaching they need to reach their full potential (Greenes, 2008).

It is not necessary to wait until all brain processes needed for autonomous performance are completely formed before beginning to teach. Social constructivists, on the contrary, think that knowledge is the outcome of collaborative creation in a socio-cultural environment, and that learning is facilitated by information sharing, debate and negotiation (Eggen & Kuchak, 2010).

Even though Vygotsky wrote extensively about how collaboration and assistance can help children improve their mental functioning, he overlooked the fact that a learner's abilities level of fully operational capacity limits the kind of behaviours that

are possible and affects how the learner interprets what the teacher's or peer's assistance means to them. Lohmeier (2018) defines 21st century constructivism as presenting learners' real-world problems to solve and requiring them to develop connections from their previous experience, interpretations of new ideas and experiences, help from teachers, hands-on active learning and a dynamic learning process. It is built on the development of problem-solving skills and reasoning skills as part of newly acquired knowledge (Lohmeier, 2018).

This research focused on the effect of obstacles teachers have in adopting CAPS in Grade 9 in their daily work environment. It also focused on the impact of obstacles or difficulties on learner accomplishment in official and informal mathematical evaluations, as well as teacher competency in Mathematics instruction. Therefore, according social constructivist theory, learner-centred instruction may assist learners in constructing and comprehending mathematical knowledge. Mathematical comprehension will ultimately lead to greater performance in mathematical exercises. Furthermore, Wray and Lewis (1997) emphasise that the most significant effect on constructivist approaches in Mathematics education characterise constructivism as a cognitive viewpoint and acknowledge that social interaction and knowledge are self-organised cognitive processes.

2.5 AN OVERVIEW OF MATHEMATICS EDUCATION IN SOUTH AFRICA

Owing to substandard achievement in global comparability exams, such as the TIMSS findings from 1999 to 2011, South Africa's Mathematics education has come under local and international criticism. South Africa has the largest achievement disparities in Mathematics and science education, according to the findings (Reddy et al., 2016). Numerous researches concentrating on curriculum and pedagogy have been conducted to enhance Mathematics achievement in schools (Shalem, Sapire & Sorto, 2014).

Academic publications, teachers' journals and media have all reported the current crisis in South African Mathematics education, with appalling numbers of low academic achievement, undertrained teachers and teacher absenteeism (Metcalfe, Orkin & Jenny 2012). The intricacy of courses and grade-related tasks overwhelms many pupils (Wilmot & Merino 2015).

Based on previous study results, the Mathematics curriculum in South Africa has altered since 1994 as a result of a variety of curricular reforms, including Curriculum 2005, the NCS (2003), the RNCS (2009), and the CAPS (2011). As per Graven (2016), modern Mathematics is divided into three categories: Mathematics, Mathematical Literacy and Mathematical Sciences, and the curriculum is based on constructivism, a learner-centred and integrated approach based on a competency-based paradigm. This means that the Mathematics curriculum in South Africa is meant to help pupils build their knowledge and apply it in real-life situations.

Despite the well-structured curriculum, the DBE's comprehensive review of its own Annual National Assessments revealed that learners had a backlog in mathematical knowledge. According to research, most pupils are two classes below projected levels of mathematical competency by Grade 4 (age 9–10 years) (Spaull & Kotze, 2015). This disparity was widened by Grade 9 (ages 14–15 years), as shown by a national average of just 11% on national benchmark examinations for Mathematics, which examine predicted learning results for this grade (DBE, 2014).

Graven (2016:14) compared disregarding gaps in learners' core mathematical knowledge to requiring builders to place additional layers of bricks on a structurally unsafe substratum: by the ninth layer of bricks, the whole edifice has totally imploded (as indicated by the Grade 9 average of an 11 percent pass rate).The foregoing discussion portrays a cloudy impression on the foundation and strengths of Mathematics performance in the country as most learners are incompetent to master the content for the grades that they are officially placed into. The problem starts in the early years of education and grows worse in the higher grades.

The DBE (2013) reported that schools have a major lack of trained and competent teachers in related research on formative assessment of curriculum implementation of the CAPS curriculum. As a consequence, there is a need for a systematic programme to enhance teachers ' material and pedagogical ability in order for them to effectively teach the curriculum. Teachers also said in the same survey that subject advisers entrusted with inducting them are inept in terms of topic information and pedagogical techniques, resulting in implementation inadequacies and inadequate teaching and learning in the classroom.

Research conducted by Carnoy et al. (2012) in the North West Province found that teachers of sixth-grade Mathematics got an average score of 40% on a test consisting of sixth-grade curricular elements. South Africa's poor math performance may be linked to a lack of curriculum implementation and teacher readiness (Feza, 2014). Teachers' classroom approaches remain consistent, despite the fact that the present set curriculum specifies the specific information that must be delivered to learners at various levels. Poor performance by math teachers may have a negative impact on curriculum implementation according to these variables.

Maddock and Maroun (2018) discovered that around 20% of Grades 10–12 Mathematics teachers are professionally untrained, and just 21% of those who are certified have some university level courses in related research on the quality of Mathematics teachers. In South Africa, the distribution of math teachers is skewed, and this has a negative impact on the effectiveness of math education and learning. Data show that qualified math teachers in South Africa are either not teaching or are not teaching math at the level they are prepared to teach, meaning that quality math education is still not achieved. Based on Zenda (2016), effective teachers have a positive attitude, establish a pleasant classroom environment, have high expectations of what pupils can achieve, manage time well, utilise a variety of teaching methods, and incorporate learner recommendations to improve learner performance.

Several studies have been conducted on South Africa's Mathematics performance and status in contrast to regional and educationally competitive nations throughout the globe. According to Spaull (2013), the quality of Mathematics teachers in South Africa is so low that their numeracy and mathematical content competence levels cannot be compared to those in eastern nations like China and Singapore, or even in the rest of Africa.

2.6 STATE OF GRADE 9 MATHEMATICS TEACHING AND LEARNING

To provide a solid foundation for FET Mathematics, it is critical that the Grade 9 math curriculum be implemented flawlessly from the beginning of the academic year. TIMSS findings for the 2015 Grade 9 benchmarking exam indicated that South African math and science performance scores have improved from a ‘very low' (1995, 1999, 2003) to a "low" (2011, 2015) national average. Despite this, South Africa is still ranked as one of the worst nations in the world for math and science by TIMSS.

However, there is a glimmer of hope. With regard to math (90 points) and science (87 points), this is a two-grade level improvement in achievement over the course of a decade. In the public education system and in historically impoverished regions, average performance has improved significantly, according to the TIMSS global perspective. Nevertheless, most Grade 9 learners have yet to obtain a minimum level of competency in Mathematics and science. Grade 9 Mathematics performance is still below global minimum standards, indicating that South African learners are failing to perform satisfactorily. Furthermore, Hungi et al. (2011) revealed that just 32% of South African Grade 6 teachers had excellent understanding levels of Mathematics content compared to their counterparts in Kenya (90%), Zimbabwe (76%), and Swaziland (55%) accordingly in a comparative examination of TIMSS findings.

The learners' and teachers ' abilities, in particular, indicate to flaws in classroom discourse, low teacher quality, and lack of support structures for curriculum implementation in Mathematics education.

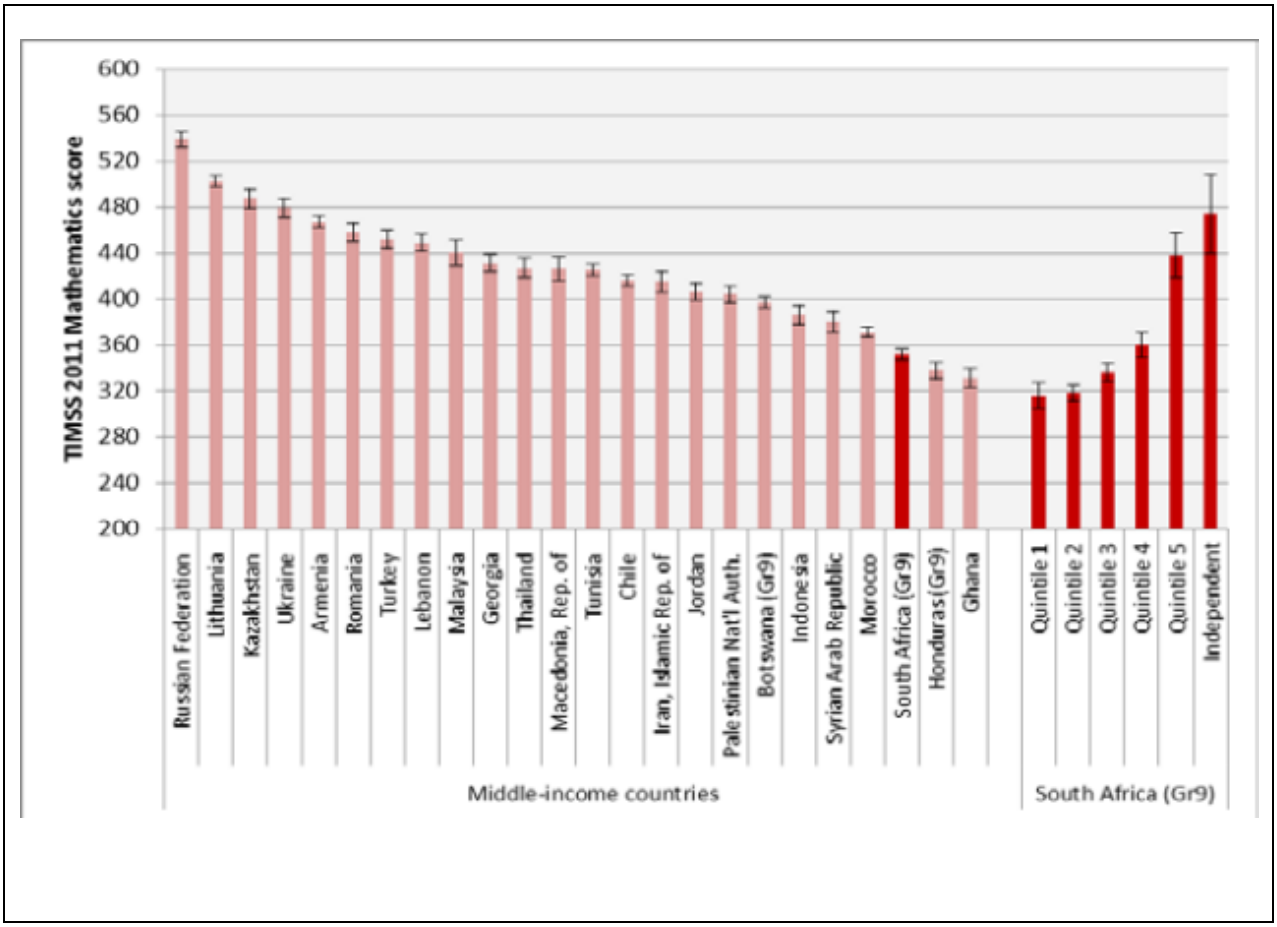

Figure 2.1: South Africa's comparative performance in TIMSS (2011)

Source: (Spaull, 2013)

As per figure 1.3 the distribution of Mathematics and science performance for all participating middle-income countries, and for South Africa, different quintiles and independent schools. In the graph, the y-axis increases in 40-point intervals, representing one grade-level of learning. What is interesting in this graph is that South Africa performs at the bottom of the middle-income country distribution, and secondly that the internal distribution of performance in South Africa is highly

unequal, as learners from independent schools perform better than learners in public schools.

Many countries, especially top-performing Asian countries like Malaysia or Singapore, show a strong association between attitudes and achievement when it comes to the trend in Grade 9 Mathematics performance (Thien & Ong, 2015). Juan, Reddy, Zuze, Wakadala, and Hannan (2016) found that learners with positive attitudes toward Mathematics and science had better average test performance even when other criteria such as gender and socioeconomic status (SES) were considered. Positivity and negativity may coexist in the world of attitudes and achievements. Those who have a more optimistic outlook on life may find it simpler to learn and succeed. Those who perform well may also have a more optimistic outlook on the subject matter (Foley, Herts, Borgonovi, et al., 2017).

This implies that learners who are serious about mastering Mathematics must have a positive outlook on the subject. It was a move in the correct way to perform nationwide tests called Annual National Assessments (ANA) to enhance math instruction, despite their short-lived existence. Simkins (2013) carried out an analysis of the 2012 ANA results for Grade 9 and found the following trend as presented Table 2.1.

Table 2.1: ANA Results 2012

RANGE	**PERCENTAGE OF SCORE**
LESS 30%	91.9
30-39	3.8
40-49	2.1
50-59	1.1
60-69	0.6
70-79	0.3
80 and above	0.2

TOTAL	100

Source: Simkins (2013)

Pursuant to Mtshali (2012:25), prior ANA literacy rankings for South African learners were based on smaller samples of youngsters. This changed when 9 million learners in grades 2 to 9 took exams to assess their abilities to write, read and count throughout all nine provinces. The evaluations were designed to inform the DBE and the education sector about whether or not the learners have the abilities they required to have gained in earlier grades. The outcomes were dreadful. The average score across the board was 30%. Math and language scores fell much worse across the board in all grades. The ANA examinations revealed the widest gaps in learners' knowledge and ability in mathematical topics, as well as the educational system's failure.

In a study conducted in North West Province, low curriculum coverage by Mathematics teachers was one of the negative reasons militating against better performance (Carnoy, Chisholm & Chilisa, 2012). Mathematical underachievement is linked to the monitoring and control of teaching and learning processes. The goal of this research is to learn how math teachers teach the topic, what degree of competence they have, and how these two criteria affect subject performance.

Curriculum shifts are taking place all around the globe in response to the cultural, political, economic, and educational demands of the macro environment. DBE (2010) argues that CAPS reinforces the NCS to improve teaching and learning outcomes while releasing CAPS as an innovation. The focus is on the content to be covered and the number of tests to be completed each term. There were five main areas of focus for the CAPS Mathematics curriculum and assessment (Motshekga, 2011). These areas included geometry and data processing as well as patterns, functions and algebra. The math CAPS curriculum documents suggest that each term will be ten weeks long, with 4.5 hours of teaching per week, for a total of 180 hours per year.

This is in addition to content. A variety of assessment types, including baseline, diagnostic, formative and summative, are all feasible options to consider (Motshekga, 2011).

As stated by Mandukwini (2016), "mathematical modelling offers learners with the skills to analyse and represent their environment mathematically, allowing learners to increase their comprehension of Mathematics while also adding to their mathematical tools for addressing real-world situations." The creators of the curriculum go to great lengths to make certain that the mathematical concepts follow the general outline of the course. For this model technique to be effective, the following traits must be present: Mathematics as a subject, as a method of problem resolution and knowledge transmission. A functional method to teaching and learning is used by learners in Grade 9 to educate and apply arithmetic concepts to real-world situations.

When it comes to effective implementation, it is vital to have the right implementation settings, well-trained human resources, sufficient material resources and good learners' attitudes toward Mathematics.

2.7 CHALLENGES IN IMPLEMENTATION OF MATHEMATICS GRADE 9 CAPS CURRICULUM

Curriculum implementation has barriers or impediments that make effective delivery unattainable and may result in educational failure. These barriers impede effective implementation of the CAPS curriculum and result in underperformance in schools and individual subjects. A detailed discussion on the barriers is provided in the following sections.

2.7.1 Inadequate Pre- Implementation Training of Teachers

Before implementing a new curriculum, teachers who will be engaged in its implementation should be retrained. Du Plessis (2013) emphasises that teachers

must be trained to execute change effectively and meaningfully. Repeating what has been said, DBE (2011c) pledged increased support for teacher training and preparation for the implementation of CAPS, as well as a specific focus on principals in low-performing schools. The DBE began the implementation of CAPS by educating teachers in the workshop approach of curricular delivery. However, quality of training was impeded by the following:

- Insufficient human and training materials to implement curriculum changes;
- Time constraints as most workshops were held during teaching and learning period of the term; and
- Financial constraints as teachers were required to travel long distances at their own expense to training centres (Badugela, 2012).

As demonstrated by the results of Reddy's (2017) latest assessment study, the country's skill set can be improved only via high-quality early childhood development, great basic education and higher education (National Planning Commission, 2013). The National Development Plan (NDP) aims for basic education include enhancing human capacity, improving school administration and district aid, improving infrastructure, and establishing results-oriented shared responsibility between schools and communities. UN Sustainable Development Goals (SDG) have been approved by South Africa as a worldwide effort (United Nations, 2017). There have been a variety of efforts to integrate SDG4, which aims to ensure that all people have access to excellent education, with the education goals of the NDP. Teachers in reality, however, continue to face implementation issues, and they are unsatisfied with the quality and amount of professional development they get from their schools and from the DBE, according to recent research (Maepa, 2017).

Despite the fact that teachers play a significant role in the educational process, they have never had a say in curriculum revisions. In South Africa, as well as other regions of the globe, they are often ignored when it comes to their responsibilities, issues, personal stories, and perspectives (Ramberg, 2014).

Another study suggests that reformers prefer to push change on teachers rather than include them in the decision-making process (Park & Sung, 2013). Teachers must be prepared for the challenge of adopting a new curriculum that is based on a new philosophy and frame of reference in order to effectively embrace a curriculum. An educational programme may become just a piece of paper on a wall with no real-world applicability if it is not updated.

2.7.2 Insufficient Instructional Leadership in Implementation of the Mathematics Curriculum

Curriculum implementation is centred on schools as user systems, which should be directed by instructional leaders who are skilled and of high quality.

To promote learner learning, offer direction on curriculum, and inspire teachers, principals must take on and delegate duties of implementation to others, as well as encourage learner learning, provide direction on curriculum, and motivate teachers (Hoy & Miskel 2008). Coleman, Thurlow, Bush, and Thurlow (2003) assert that most principals in South African School's lack clarity regarding their duties and responsibilities in curriculum management, and as a result, they are ineffective in carrying out their curriculum management tasks and responsibilities. Coleman et al. (2003) found that most principals in South African Schools lack clarity regarding their duties and responsibilities in curriculum management. The unfortunate reality is that many principals in schools experiencing transformative change are suffering from burnout and have limited knowledge of the duties and obligations of instructional leadership in schools. According to this study, principals play a critical role in the implementation of Mathematics curriculum, and the success of curriculum implementation is influenced by their involvement.

An earlier study conducted by Mandukwini (2016) found that school administrators are critical in motivating teachers and learners to accept curriculum implementation efficiently in their respective classrooms.

The vision and goal of the school should be communicated to all learners and staff members so that they may all work together to achieve them. Having a common purpose and vision leads to the achievement of a common objective. The administrator must be patient and supportive for them to collaborate with teachers to achieve a common objective. The author further explains that some principals are hampered by their administrative and teaching workloads, but that, as is the case in most South African schools, they are also required to be class teachers. At times, they are required to teach more than one subject and at times, they are required to teach more than one grade. Another aspect that might make it difficult for principals to carry out their responsibilities is if they are having difficulty grasping the new curriculum.

This demonstrates the pressure of labour overload combined with a lack of knowledge of the content, instructional techniques and structure of the curriculum that has been put into practice.

Apart from principals, HODs also have a crucial role in curriculum implementation; they have dual roles of being subject teachers and managers in their departments (Tapala et al, 2021). According to Munje et al. (2020), HODs in science and Mathematics play the roles of instructional leaders; school-based subject and classroom specialists; and that they are accountable for learner performance in their departments. Owing to changes in the education system, HODs should encourage teachers to attend in-service training organised by education officers and engage in professional development to improve their professional knowledge (Buthelezi et al., 2021). For HODs as master teachers, accepting change, moving away from well-established practices, balancing between subject teaching and management may be difficult.

2.7.3 Failure by Teachers to use New Curriculum Pedagogy

Curriculum change is underpinned by reform in all respects including pedagogical approaches. The DBE (2011) outlines that the methodology for teaching and learning. Furthermore, CAPS for Mathematics is slightly inclined towards an enquiry-based approach aimed at maximising learners' activities and autonomy and minimising teacher domination in the learning process. The new methodology implies that teachers teaching Mathematics must be competent and flexible and adaptable to contextual changes in classrooms. Commenting on teacher quality, Malada (2010) decries the fact that high numbers of under-qualified teachers in the country present challenges in implementation as they are ill-prepared and inadequately trained. Olivier (2013) held the view that teachers were uncertain about how to implement the CAPS amendments in the classroom, and that insufficient time was spent during training to absorb new content information. The foregoing scenario paints a gloomy picture on the effectiveness of the implementation of the Mathematics curriculum. The study will analyse teacher qualifications and identify if they impact on learner performance in the teaching and learning of Mathematics.

Following up on an earlier study by Zulu (2018), it was discovered that teachers ' inability to execute policies might indicate their confusion about the consequences and their belief that new practices are not quite up to par with past practices. Teachers' motivation to implement the mandatory change reduces with time owing to the lack of assistance from local education authority. With everything that they had to deal with in their classrooms, teachers were still eager to apply language regulations because of the importance they put on the social and personal aspects of classroom instruction and their own personal aims and views. It is recommended by Zenda (2016) that good teachers foster a positive outlook, create a pleasant learning atmosphere, have high expectations for their learners' abilities, manage their time well, utilise a range of teaching techniques in the classroom, and include their learners' ideas. It is possible that some teachers may be unable to execute the Grade 9 Mathematics curriculum owing to a lack of clarification about the curriculum

philosophy, content and pedagogical techniques that will support the curriculum changes in the absence of clarity regarding the curriculum changes. In the implementation of the Grade 9 Mathematics curriculum, some teachers may have insufficient knowledge to implement the curriculum in the absence of clarity of curriculum philosophy, content and pedagogical approaches that underpin the curriculum changes.

2.7.4 Inadequate Instructional Facilities and Materials

Both Fuller (1987) and Innes (2012) concur that the availability of resources had an effect on learners' performance in the classroom. Research conducted in the United Kingdom (UK) by Weeden (2007) revealed the importance of textbooks, which assist to cover outstanding curricula to curriculum implementation in the UK. According to Van der Berg and Burger's (2003) study on arithmetic underperformance in the Western Cape, classes with a wide range of resources outperformed those with less resources.

Learners' interest in a subject is influenced by the availability of relevant resources such as labs and textbooks (Innes 2012).

When it comes to the supply of Mathematics textbooks and resources and the number of learners who use them, the present research recorded how this impacts the teaching and learning of the subject as well as the performance of learners.

2.7.5 Teachers' Work Experience

Teacher experience reflects the success required to increase learners' academic achievement (Akinsolu, 2010). The latter author argues that teachers ' job experience boosts their skills and level of motivation. To apply the curriculum, we must utilise highly adaptable and competent learners who are capable of adapting to curricular changes and material. Teachers are in limited supply in South Africa (Hanushek & Rivkin, 2012).

In other words, teachers must be well-versed in the subject matter if they are going to impart their pedagogical content knowledge (PCK). During the present study, researchers examined whether or not teachers' expertise in teaching Mathematics and their credentials and majoring in the subject affect their learners' performance.

2.8 RECOMMENDATIONS FOR BEST PRACTICES IN THE IMPLEMENTATION OF GRADE 9 CAPS MATHEMATICS CURRICULUM

Curriculum implementation requires a conducive user-friendly environment that promotes change. In a study conducted in South Africa, Badugela (2012) made the following recommendations:

- Curriculum content should be fairly emphasised and appropriately sequenced.
- There should be adequate human, material and financial resources to implement the new curriculum.
- Decision making in implementing a new curriculum must be participatory to avoid resistance and encourage sense of belonging and owning the change.
- Training of teachers for a new curriculum should be subject-specific and involve the instructional and supervisory managers in schools who are the principals and the school management teams.

Porter, Fusarelli and Fusarelli (2015) argue that policy interpretation and implementation take place at the administrative and personal teacher levels when it comes to successful curriculum implementation. The crucial thing is to establish agreement on what the policy entails at both levels. Curriculum reform measures, according to Karp (2016), should be focused on the reality on the ground rather than political objectives. They also advocated for a renewed focus on the practical aspects of system change, such as better coordinating development efforts with a focus on curriculum to increase efficiency, clearly defining institutional responsibilities, and improving cooperation and communication within and across existing institutions and departments.

This implies that when it comes to adopting a CAPS Mathematics curriculum, developers, disseminators, and implementers should work together at the user level. Contextual considerations should be included in a collaborative effort to execute the curriculum since they affect the reality of the implementation process.

2.9 CHAPTER SUMMARY

The chapter examined important literature on Mathematics education in South Africa in detail, with an emphasis on the Grade 9 CAPS Mathematics curriculum, current realities, implementation challenges, and best practices ideas. The chapter presented the literature review and how to offer constructivist theory, which provides theoretical framework for the research. The first section explained curriculum from an international perspective followed by a brief discussion about curriculum changes in South Africa and theoretical frameworks of the study.

Drawing closer to the research topic, an overview of Mathematics education in South Africa is explained, the state of Grade 9 Mathematics teaching and learning, implementation of CAPS curriculum and challenges in implementation. Finally, a discussion on recommendations for best practices in the implementation of Grade 9 CAPS curriculum was presented. The next chapter describes the research strategy, design, methodology, sampling tactics, and data processing procedures employed in this study.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 INTRODUCTION

The previous chapter provided a brief description of the difficulties in implementing Grade 9 Mathematics in Tshwane South District, which is located outside of Gauteng Province. The framework for analysis that was utilised in this research is elaborated in Chapter 3. This chapter begins with the description of the research design, research paradigm for the study, followed by a discussion of research approach and strategy before moving on to a discussion on data collection methods and instruments. This chapter looks further into the data analysis method, sampling, measures of trustworthiness limitations of research to solve the Grade 9 CAPS Mathematics curriculum implementation difficulties. The ethical considerations are summarised at the end of the chapter.

3.2 RESEARCH DESIGN

The research design is a strategy for gathering and analysing data that enables the researcher to answer the research questions posed (Ragin, 1994). Sileyew (2019) defines research strategy as "an acceptable framework for a study that dictates how relevant information for a study will be acquired and contains several linked choices." Research design may also be seen of as purposely constructed to improve our knowledge of the phenomena and share what we learn with the rest of the scientific community (Creswell & Creswell, 2017). A research strategy, according to Neumann (2006), is a way for exploring answers to questions.

Conducting a research study demands a framework within which it is carried and the procedures to be followed in the collection and processing of data to answer the research question. Panneerselvam (2004) explains research methodology as a system of models, procedures and techniques used to find the results of a research problem. There are two broad research paradigms, namely, qualitative and quantitative methodologies.

The study therefore sought to identify the barriers to curriculum implementation that results in poor performance and suggests strategies and recommendations for improvement. The study is intended to answer the main question**: What are the challenges in the implementation of Mathematics CAPS curriculum in Grade 9 and their implications for teaching and learning?** To achieve this, the chapter is guided by the fundamental research questions throughout this study which are:

Research Question

What are the challenges in the implementation of Mathematics CAPS curriculum in Grade 9?

Research sub- questions

The study sought to answer the main research question using the following sub-questions:

- What are the challenges that teachers have experienced in the implementing the Mathematics CAPS Curriculum in grade 9?
- To what extend do the challenges affect learner's performance in the formal and non-formal assessment?
- To what extend do the challenges affect teachers' abilities in teaching Mathematics?
- How do curriculum implementation challenges affect teachers from effectively implementing the Mathematics CAPS Curriculum in grade 9?
- What recommendations maybe suggested to alleviate the curriculum challenges faced in the implementation of the grade 9 Mathematics CAPS curriculum?

3.2.1 Research paradigm

The current study is underpinned by social constructivism, a theory of learning propounded by Vygotsky (1962). Social constructivism postulates that learners bring their experiences in the classroom and through social interaction they construct own meanings and knowledge. Amineh and Asal (2015) explain that learners do not passively receive information but instead actively construct knowledge as they make sense of their world. CAPS as a curriculum policy is designed to allow learners to construct their knowledge through engaging in activities during the teaching and learning in the classroom and on their own.

Social constructivism, a theory of learning proposed by Vygotsky (1962), postulates that knowledge is actively formed within a social environment by social interaction between and among social actors. In this case, the social players are learners and teachers in a Mathematics classroom. The study's goal was to investigate the teachers' challenges encountered in implementing the Grade 9 Mathematics CAPS curriculum in Gauteng's Tshwane South District. This framework will therefore assist the researcher to draw more information from the teachers' personal experiences, challenges and difficulties they are encountering in implementing Grade 9 Mathematics CAPS curriculum in teaching and learning.

3.2.2 Research approach

The study used a pragmatic research approach. A pragmatic approach explained by Kelly and Cordeiro (2020) is described "as a philosophical and epistemological framework for interrogating and evaluating ideas and beliefs in terms of their practical functioning." Pragmatism holds the value and meaning of opinions and 'facts' captured in research data are assessed through examination of their practical consequences.

According to Holtrop and Glasgow (2020), a pragmatic research approach is a planning and evaluation framework that helps researchers, program planners and evaluators to consider the types of outcomes important in producing population impact under real world conditions.

In this research, qualitative and quantitative data were collected using questionnaire forms send to 50 teachers completed by 30 Grade 9 Mathematics teachers and semi-structured interviews were conducted with 10 Heads of Mathematics Departments and 10 Principals in Tshwane South District of Gauteng. The interviewer compiled the interview questions based on the research objectives.

3.2.3 Research strategy

The research design is a strategy for gathering and analysing data that enables the researcher to answer the research questions posed (Ragin, 1994). The research type was an exploratory mixed methods design. Mixed methods research is described as "research in which the researcher collects and examines data, incorporates the results, and draws conclusions in a single study employing both qualitative and quantitative techniques and strategies" (Tashakkori and Creswell, 2007:4). The purpose of this research method was to investigate the subject matter from more than one point of view to give clearer and reliable results.

The study will use an exploratory approach imbedded in qualitative method, in investigating the impact of CAPS curriculum implementation on teaching and learning of Mathematics in Grade 9. Babbie (2008) explains that the exploratory descriptive approach uses interviews, its results can explain why, how and when something is generated. Interviews, questionnaires, and data analysis were used as data gathering methods for this research. Interviews were beneficial because they allowed respondents to share their thoughts and ideas. This suggests the present study's findings; the approach and design of the qualitative case study research enable participants to convey their views on challenges they are facing in implementing CAPS curriculum to teach Grade 9 Mathematics.

3.3 DATA COLLECTION METHOD

The process of acquiring research data on the study subject is known as data collection (Creswell, 2008). This is done in a methodical manner so that statistical analysis may be performed. The tools used to gather data for a research endeavour are known as research instruments (Krosnick, 2018). The sorts of data acquired for this investigation are discussed in this section. This part covers two categories of data: primary and secondary data, as well as a summary of the research instruments employed in the study.

This study used questionnaires, structured interview method and document analysis to collect data. The interview is a data collection method, information or opinion gathering that explicitly asks questions (Davies, 2010). The study has chosen a structured interview. This type of interview refers to an interview in which all the participants are asked the same questions in the same order by the interviewer (Cheung, 2021). More importantly, the structured interviews are chosen because the structured interview seeks to maintain high levels of reliability and repeatability (David & Sutton, 2004). These structured interviews will contribute to the trustworthiness of data since the teachers will be asked the same set of formally prepared questions. Their views will make the study to be focused than generalising. The participants will be asked the closed questions in chronological order as per interview schedule. The closed questions will make the participant's views to be sound focused on the given topic rather than being generalisations of facts.

The current study used qualitative research method and used the following tools to collect data:

- a questionnaire to be completed by the Mathematics teachers and HoDs (see Appendix E);

- semi-structured interviews to be conducted with the principals and HoDs (see Appendix D), and
- Document analysis done by analysing prescribed textbooks, curriculum guidelines, annual teaching plan, annual assessment plan, learner functional books and past examination papers (see appendix D).

3.4 DATA COLLECTION INSTRUMENTS

3.4.1 Questionnaires

Krosnick (2018) asserts that the layout of a questionnaire is essential; the questionnaire needs to look simple, striking and motivating. However, a compact layout is uninviting. The following aspects stipulated by Krosnick (2018) were considered by the researcher when designing the questionnaire (Appendix E):

- Covering letter: The interview was accompanied by a covering letter, which explained the purpose of the questionnaire and assured participants of their anonymity and confidentiality of their responses. Zikmund et al. (2010) assert that the messages contained in the covering letter accompanying a self-administrated questionnaire affect the response rate.

- Content: In the current study, the interview contained open-ended and closed-ended questions.

- The questionnaires were sent to 50 schools in Tshwane South District of Gauteng by emails. The teachers completed the questionnaire and emailed the researcher the response. About 30 teacher responses were purposefully selected from the schools to take part in the research.

According to Zikmund et al. (2012), two aspects are significant in the layout and design of the questionnaire: ease of use for the respondent and ease of use for data processing. The current study followed the layout as stipulated by Brace (2018):

- Questions were presented in a straightforward and orderly manner.
- Headings, fonts and the layout were simple.
- The response categories were associated with each question and coded for data analysis.

The sequence of questions followed Creswell and Clark's (2017) recommendation that questions which are straightforward and of a factual or biographical nature can be answered quickly and are therefore put at the beginning. The interview was sub-divided into two sections:

Section A dealt with biographical information of the participants. Information required in this section was the age of the respondent, gender, employment status, number of years' teaching, number of years' teaching at the present school, number of years' teaching Grade 9, highest educational qualification, and field of specialisation as a teacher.

For analysis, each of these biographical variables was categorised. A dichotomous categorisation was utilised; for example, in the case of gender, women were coded 2 and men 1. The dichotomising of the variables allowed the categorical and nominal variables to be treated as interval scales (Sekaran & Bougie, 2016). Multiple-choice questions were used for the other biographical variables such as employment status or qualifications, among others, as recommended by Creswell and Creswell (2017). These were coded according to the number of categories e.g. from agree to disagree.

Section B focused on the teaching of challenges confronting the implementation of Mathematics CAPS curriculum.

Section B sought information on:

- the teaching of Mathematics by the Grade 9 teachers;
- the various strategies they used to teach Mathematics;
- The resources that are available at their schools; and
- The difficulties encountered in curriculum implementation.

This section comprised both closed-ended questions based on a Likert-scale which determines the respondents' level of agreement or disagreement with a statement. However, Lee and Lings (2008) note that two types of questions may be used, namely, open-ended and closed-ended.

3.4.2 Semi - structured interviews

Interviewing varies from structured, semi-structured and unplanned (Maree, 2007). The researcher's purpose of using semi-structured interviews was based on the intention to explore participants' views, ideas, beliefs and attitudes. Semi-structured interviews in this study are relevant because they give information about interventions in a Mathematics classroom. Borg and Gall (2006) comment that the semi-structured interviewer can obtain information that the interviewee cannot reveal under normal circumstances. This can only be done through careful motivation of the interviewee and good rapport kept to a maximum.

Semi-structured interviews enable the researcher to observe gestures or facial expressions which coincide with verbal communication. Kallio, Pietilä, Johnson and Kangasniemi (2016) argue that semi-structured interviews have the advantage that they consist of a list of interview questions but can also accommodate the evolution of new questions that may be formed during the conversation. This gives the person being interviewed a chance to divulge more quality information, while making the entire process seem more like a normal conversation than a question (Saez, 2010).

Most importantly, in such interviews, the researcher varies the questions as the situation requires even though the structure of questions is the same for all interviewees (Lichtman, 2013).

The semi-structured interview is relevant to this study because the study aims at probing teachers about their experiences in applying intervention strategies in Mathematics in the classroom. The researcher communicated with ten schools from Tshwane South District of Gauteng telephonically and made arrangements of the interviews with the Mathematics HODs and the principals. The interviews were conducted in two ways; face-to-face with the researcher or telephonically because of adherence to COVID-19 regulations. During the interviews, only the relevant questions were asked. Where necessary, the researcher probed or asked follow-up questions to get the required information, but at the same time, the researcher made sure that she does not deviate from the original questions. The researcher audio-recorded the responses from the interviews and acted as a scribe, writing down all the responses.

As per Creswell and Clark's (2017) recommendation, data emerging from the interviews with principals and Mathematics HODs should be triangulated with data from the Mathematics teachers' questionnaires.

3.4.3 Document analysis

Document analysis is another data collection method which this research study employed because document analysis can be used with interviews as research methods to strengthen coexisting methods (Dalglish, et al. 2020). Subsequently, documents are produced by individuals and groups in the course of their everyday practice exclusively for their immediate practical needs (Grant, 2018). Furthermore, documents can be used to spark ideas in research, by observing the ways those who will use the research speak to and communicate ideas with one another and can also be used during data collection and analysis to help answer research questions (Dalglish, Khalid & McMahon, 2020).

Document analysis is a systematic procedure for reviewing or evaluating documents both printed and electronic material (Flick, 2020). Document analysis was chosen because it requires the data to be examined and interpreted in order to elicit meaning, gain understanding and develop empirical knowledge (Tight, 2021).

The CAPS document for Mathematics Grade 9 was used as the primary source of information because it discusses the field of Mathematics education curriculum holistically. The researcher focused on teaching and learning records to answer the research question: What are the challenges in the implementation of Grade 9 Mathematics CAPS curriculum in Tshwane South District of Gauteng Province? The researcher accessed documents from the school head and teachers in order to analyse the relevant documents as a form of triangulation that adds rigour to the research study (Cardno, 2018).

An application had to be submitted to the Gauteng Department of Education (GDE), in Tshwane South District and the school principal to get permission to conduct research at the ten sampled schools. The researcher approached the principal of the school and asked for the documents. Mathematics Learner's functional books, teachers' lesson plans, Annual Teaching Plan and Deputy Principal's supervision records on curriculum implementation, remediation records, controlled tests were focal documents. It is important to note that document analysis was used in conjunction with interviews so that issues or challenges in policy documents and implementation can be investigated, thereby assisting in answering the main research question.

3.5 DATA ANALYSIS METHOD

It is critical that analysis of the data be implemented correctly and thoroughly to enable the researcher to answer the question of the study (s). Data analysis, according to Gay, Mills, and Airasian (2009:26–37), is the systematic organisation and synthesis of data using one or more statistical methodologies.

Based on Save the Children International (2009), qualitative data analysis is a method that seeks to reduce and make sense of massive amounts of data, sometimes from divergent sources, in order to develop perspectives that throw light on a study subject. It is a technique for explaining or interpreting descriptive content. As a consequence, data analysis aids in the interpretation of acquired data and gives the researcher with tools to answer the study question (s).

Selvamuthu and Das (2018) assert that qualitative analysis is formulated in the sense of a specific empirical study pattern, in which researchers set up a dynamic and systematic structure by examining narratives to produce findings. Fowler (2013) points out that, although not involved in the occurrence or presence of individual behaviour, community, condition, qualitative researchers primarily concentrate on analysing qualities, attributes or features of such behaviours, individuals, situations and materials. The qualitative analysis, therefore, constitutes an exploratory method which emphasises the use of words in a verbal and written form instead of quantifying or analysing numerical data (Fowler, 2013).

Accordingly, the researcher used descriptive analysis as a selected method of data analysis. Leob et al. (2017) claim that descriptive analysis identifies the patterns in the data that answers the research the questions. This method is valuable in the education system to improve decision making. According to Atmowardoyo (2018), descriptive analysis involves analysis of teachers' written feedback, translation, transcription and coding. The coding method formed the core component of qualitative content analysis: the description of the examined document and the assignment of meaning (words, ideas, codes) to the specific sections (Charmaz, 2006). As Walliman (2001:259) said, the researcher should examine the thematic importance of the data when considering the relations between the themes. Graneheim, et al. (2017) note that a theme is remarked as a unifying main idea that runs across a number of categories bringing meaning to a topic and its numerous explanations. The following themes were identified from the questionnaires, interviews and documents in this research study:

- Demographical data;
- Personal and psychological data;
- Curriculum and assessment; and
- Recommendations and subject improvement strategies.

3.6 SAMPLING

Sampling is a strategy used to determine the characteristics of a population by selecting a small group; it is either purposive or random (Brynard et al., 2014:56). Purposive sampling is defined as the purposeful and subjective selection of a sample to fulfil a certain aim (Alvi, 2016:30). The researcher utilised a purposive sampling strategy. This is a type of non-probability sampling in which selections regarding the individuals to be included in the sample are made by the researcher based on several criteria, such as expert knowledge of the study topic or the capacity and willingness to engage in the research (Jupp, 2006: 244). Purposive sampling is based on the researcher's judgment and focuses on the features of a sample. Furthermore, the sample is selected based on the researcher's perception of typical units (Bless & Higson-Smith, 2000). Ten principals and ten heads of departments were deemed eligible in semi-structured interviews and 30 teachers out of 50 teachers answered the questionnaires. The study was limited to Grade 9 Mathematics teachers at secondary schools in the Tshwane South District of Gauteng Province. The researcher sampled respondents based on their Mathematics teaching experience, and experienced teachers with a minimum of five years of service in the education sector were purposefully sampled or consulted. Their capacity assisted in achieving accurate, valid and reliable results for this study.

The documents that were used to collect data were sampled based on the main theme of curriculum implementation. As stated in the foregoing arguments, the

Mathematics CAPS document was purposively sampled because it primarily comprised of Mathematics curriculum Grade 9 as well.

3.6.1 Qualitative Sample size

Sample size refers to the number of individual data sources in a study (Potochnik, Colombo, Wright, 2018). Qualitative research offers in-depth look into the matter being investigated and therefore gives an outstanding outcome to the research. That means the sample that the researcher uses should be able to give diverse challenges to the researcher helpful to the study and the researcher.

The study acquired data from the three sources sampled by experienced teaching Mathematics Grade 9, HODs in Mathematics and schools' principals. As it is mentioned above that the sample will be purposefully selected based on their teaching experience in Mathematics Grade 9, their views can contribute to this study as this will can be added to the recommendations for improvement of Grade 9 CAPS Mathematics curriculum implementation by teachers.

3.6.2 Target Population

Sampling means selecting individuals from a population (Burns & Grove, 2005:341). Muvirimi (2002:44) asserts that in science, a limited number of individuals may be selected to find information about the whole population. However, a study needs to focus on what is called a target population or a reference community (Khan, 2014:302) to which the results from the sample can be generalised (Burns & Grove, 2005:342). For example, the target population in this study was teachers in Tshwane South District of Gauteng, South Africa involved in the delivery of the Grade 9 CAPS Mathematics curriculum. In each school in the Tshwane South District of Gauteng Province, at least one Grade 9 Mathematics teacher was part of the study.

Therefore, a total of one Mathematics teacher per school N= 50. However, once the target population has been identified, the researcher compiles a sampling frame which is a list of all elements from which the sample can be derived (Neelankavil, 20015:40).

3.6.3 Sampling Frame and Sampling Method

Samples of potential participants represent the target population of interest, with the sampling frame comprising a full list of members of the population from which the sample is drawn (Morse, 1991). The sampling frame defines the criteria for selection of the sample as well as criteria for exclusion (Creswell & Creswell, 2017). For example, the criteria for inclusion in this study was that the participants needed to be Grade 9 Mathematics teachers – therefore, all teachers teaching Mathematics in other grades or teaching other subjects were excluded. The sampling frame in this research comprised 50 Grade 9 Mathematics teachers, ten HoDs and ten principals from schools in the Tshwane South District of Gauteng Province.

3.7 MEASURES OF TRUSTWORTHINESS

Trustworthiness in qualitative research needs to be evaluated (Elo, Kääriäinen, Kanste, Pölkki, Utriainen & Kyngäs, 2014). The TACT (Auditability (Au), Credibility (Cre), Transferability (Trf) framework was used to ensure trustworthiness. According to Daniel (2019), (Tr) trustworthiness is an essential concept in qualitative research methodology. The concept of ‘trustworthiness’ portrays quality in qualitative research and underpins confidence in the research outcome. To ensure quality of findings, the researcher acknowledged personal bias and that the outcomes of the research are subject to multiple realities.

To achieve trustworthiness, a systematic process was followed when collecting and analysing data. The researcher coded the data, identified themes, categorised themes and interpret the data. The qualitative data I gathered was analysed using the 6 steps of Thematic analysis as identified by Braun and Clarke (2016) namely:

- **Data familiarization**

In this step data gathered from interviews is separated into separate workable units. I organized the data to make sense. Furthermore, I categorized the interview responses to be compared and analysed at a later stage.

- **Data transcription**

I transcribed data collected during interviews into a format easy to analyse. The transcribed data was then converted into text for ease of analysis. According to De Vos (2011) using the recording while collecting data is a good approach for interpretation and analysis.

- **Code generation**

In this step I identified segments that divide the data set. I then analysed the small pieces of data (segments) to come up with codes so that each segment is labelled.

- **Defining and naming themes**

In this step I categorised collected data, this involved the breaking down of the data into manageable chunks, trends and relationships to critically analyse them.

Daniel (2019) further explained that Auditability (AU) as a systematic procedure for collecting, analysing, interpretation of data, “appropriateness” the tools, processes and data used in the study. Auditability was established in the research study by ensuring that notes are taken during the interviews with principals and HODs and the context of the study was explained. The notion of Credibility (Cre) in qualitative research refers to an approximation of the truth of the inferences, the researcher’s ability to clearly articulate the scope of the research, the context in which it is undertaken, including the choices the researcher makes during the process of data collection and analysis, and possible challenges they might have faced during the research (Daniel, 2019).

3.7.1 Validity

According to Van Zyl (2014), validity can be ascertained if the instrument measures what it was intended to measure and not obtain qualitative data. According to Walliman (2017), to achieve the requirements of validity, several procedures have to be carried out in the research. Following Knight’s recommendation, the researcher undertook an extensive review of the literature, which involved reviewing and investigating multiple sources of information to identify and discuss all aspects related to the research issue. The literature provided clear instructions on how to draft a questionnaire (see Sekaran & Bougie, 2016) which were used to enhance the validity. The data also cover the actual area of investigation which is Tshwane South District of Gauteng. In the current study, triangulation was used to enhance the internal validity of the study with the teaching of Mathematics at Grade 9 level, as argued by Creswell and Creswell (2017). Teachers’ practical knowledge about the implementation of the Grade 9 CAPS Mathematics curriculum required the use of two instruments for its exploration.

In the triangulation procedure, data collected by means of two instruments (interviews and questionnaires) were used and analysed (Creswell & Creswell, 2017). The triangulation procedure culminated in a comprehensive understanding

of the participating teachers' practical knowledge concerning the teaching and learning of Mathematics in Grade 9. Therefore, the data analysis focused on these aspects to obtain qualitative data to triangulate or consider the problem from various angles.

3.7.2 Reliability

A reliable questionnaire produces consistency in findings when measurements are recorded at two different points in time (Sekaran & Bougie, 2016). To test the internal reliability of questionnaire, Cronbach's alpha statistics is normally used in quantitative studies to measure the internal consistency/reliability of a questionnaire. (Singh, 2017). Moreover, Saunders, Lewis and Thornhill (2009) and McKinnon (1988) listed subject bias and observer-caused effects as some of the factors that are likely to threaten reliability.

Subject bias refers to the tendency of respondents to provide responses that differ from the facts because they are obliged to do so or owing to the firm's (in this case, the school's) policy, which restricts publishing sensitive or confidential information (Saunders et al., 2016). To overcome this, the researcher informed the respondents that data collected would be analysed with complete confidentiality and also guaranteed their anonymity. They were assured that only the researcher and her supervisor would have access to the information and that any form of identification would be removed before data were analysed. They were also made aware that the data collected would only be used for the current study.

Observer-caused effects are those effects, which result from the presence of the observer or researcher in the phenomenon under study and which are likely to influence the respondent's behaviour, conversation and data he or she provides (Brace, 2018). This type of threat occurs when the role attributed to the researcher by the respondents is such that it drives them to change their normal behaviour (McKinnon, 1988). To overcome this, the questionnaire was preceded by opening statements and clarification of the role of the researcher to build confidence and trust

between the researcher and the respondents (Saunders et al., 2016). Respondents completed the questionnaire without the researcher being present.

3.7.3 Trustworthiness

Lincoln and Guba (1985), as quoted in Nowell et al (2017;3) “refined the concept of trustworthiness by introducing the criteria for credibility, transferability, dependability and conformability to parallel the conventional assessment of validity and reliability”. Knygas et al (2020) also list credibility, transferability, dependability, conformability and authenticity as primary criteria of trustworthiness in the context of a qualitative research.

Conducting a trustworthy thematic analysis.

- **Credibility.**

Given (2012), defines credibility as being certain that the findings are true, that the data collected will be a true reflection of the challenges experienced in the implementation of grade 9 Mathematics CAPS. The selected participants are most pertinent, they have sufficient knowledge, exposure and experience in the educational sphere and specifically in Mathematics teaching making their responses valuable. The number of participants in this study was appropriate and sufficient enough to can benefit from. To strengthen the credibility of my study throughout, I was in constant engagements with fellow researchers, examining, evaluating and scrutinising the data. The work was reviewed by my supervisors who constantly provided feedback.

- **Transferability.**

Sinkovics et al (2018) describes the transferability criteria as, the extent to which research findings can be applied to other contexts similar to this study’s context. This follows that applied in any other district, the findings of this study should give

the same results. In the context of this study, I acknowledge that the outcome of the research is subject to multiple realities and might therefore not be transferrable.

- **Dependability.**

According to Khothari (2015), for data to be dependable it must show consistency and replicability if similar conditions applied. To enhance the dependability of this study, collected data from interviews and questionnaires we analysed and I analysed how the results answer the research questions. The data is a true reflection of the teacher's experiences.

- **Confirmability.**

According to Cooper & Chindler (2011), results of a study should not focus on the researcher's opinions, beliefs or thinking about the research phenomenon but rather on the collected data. To enhance confirmability, I conducted interviews and questionnaires, through conducting interviews and questionnaires I could capture the experiences of the participants accurately. The study's findings are therefore collaborated by the collected data and not based on any bias or interest.

- **Authenticity.**

To ensure authenticity of the study I used only those sources that can be verified, relevant to the study's topic. Furthermore, I ensured that there was correlation between the collected data and the findings of the study.

3.8 LIMITATIONS OF THE RESEARCH

The study was conducted in Tshwane South District of the Gauteng Province. Therefore, the findings from this study cannot be generalised to all schools in South Africa.

3.9 ETHICAL CONSIDERATIONS

According to the rules and regulations of the University of South Africa (Unisa) concerning conducting research using human subjects, the ethical considerations discussed next were considered during the research. These considerations applied to all the qualitative research sections of this study.

3.9.1 Informed Consent and Autonomy

Creswell (2014) asserts that research should highlight the voluntary aspect of involvement, and participants should be told that they have the right to withdraw their participation at any time. Kothari (2012) refers to a high degree of autonomy as 'independence.' Specifically, he maintains that in the context of research ethics, the term "autonomy" pertains to a participant's right as well as ability "to choose" whether or not to participate in the study, whether or not to continue in the study, and whether or not to opt out of the research process at any time if they choose to do so without any penalty.

In adhering to the above as a guideline, I obtained the necessary permission from the Tshwane South District of Gauteng (DBE) located in Pretoria and consent from all the individual participants of the study (HoD, teachers and Principals).

3.9.2 Ethics

Ethics is "the discipline dealing with 'what is good and bad' and with moral duty and obligation. Ethics is the embodiment of moral values, which describes what, is 'right' and what is 'wrong' in human behaviour and what 'ought to be' (Dewey & Tufts, 2019). Ethics is a set of normative standards formulated by people or associations that are eventually generally adopted, providing the most appropriate criteria and behaviour requirements for study participants and witnesses, supervisors, partners, other scholars, assistants and learners (Strydom, 2005). According to McMillan and Schumacher (2006:16) the researcher is ethically accountable for safeguarding all the participants' rights and wellbeing. To ensure that the study is ethically

accountable and conforms to acceptable norms and values, I/The researcher sought and obtained ethical clearance for the research from the University of South Africa (appendix A). Permission to conduct this study in Tshwane South District of Gauteng Province was obtained from the Gauteng DBE situated in Pretoria (Appendix B). Permission was also obtained from the principals at the sampled schools. Informed consent was obtained from teachers (Appendix F).

3.9.3 Confidentiality and Anonymity

Pertaining to confidentiality, subjects' disclosures are shielded from unwanted disclosure to third parties. This is a method of protecting people' privacy while also potentially increasing the quality of the information they supply (Brace, 2018). In addition, researchers, according to Saunders et al. (2016), have a dual responsibility: they must protect respondents from harm while they are in the research setting, and they must also protect respondents' confidentiality and anonymity when the thesis is eventually released to the general reading public.

Great care was taken in the present study to protect the confidentiality and identification of the research locations and respondents. Authorities in the research settings and respondents were guaranteed that their identities would not be revealed in the printed version of the study. To ensure that the respondents' identities were protected, names were withheld from them and pseudonyms were used throughout the thesis' composition.

For the present research, protocols for securing the data were established to ensure that confidentiality and anonymity were maintained. It was decided to use a coding scheme in which the names of the respondents were represented by a series of letters and numbers that made it difficult for anyone else to identify the individuals who had answered the questions. Neither the researcher nor her research supervisor had access to this information before to the study.

3.10 CHAPTER SUMMARY

The chapter provides an explanation and justification to the design, method and process of the data collection that was selected. It discusses specifics of the study designs and focuses on the sampling procedure, describes data gathering process, discusses the instruments used and explains the validity and reliability of the research. The chapter justifies the use of qualitative methods. The following data collections tools were used; a questionnaire to be completed by the Mathematics teachers (see Appendix E); and semi-structured interviews to be conducted with the principals and HODs (see Appendix D). The following chapter will deal with discussing and analysing the findings obtained in this research.

CHAPTER 4: DATA PRESENTATION, FINDINGS AND ANALYSIS

4.1 INTRODUCTION

The chapter analyses the data obtained from the questionnaires (online and print) and interviews. The sample consisted of 50 participants, 30 Grade 9 Mathematics teachers, ten principals and ten HODs. The main purpose of the study was **to determine the challenges in the implementation of Mathematics CAPS curriculum in Grade 9 and their implications for teaching and learning.** To identify difficulties faced by teachers in implementing a Grade 9 Mathematics CAPS curriculum in Tshwane South District of Gauteng, the objectives of the study were to:

- To determine the extent in which the challenges affect learner achievement in formal and non-formal assessment;
- To determine how the Mathematics Grade 9 CAPS curriculum implementation challenges, affect teacher competencies in teaching Mathematics;
- To determine how the challenges, impact the teachers in effective implementation of the Mathematics curriculum; and
- To make recommendations on how to tackle the challenges faced in implementation of Grade 9 Mathematics CAPS curriculum.

In this study, some data collection methods were continuous while others were momentarily on a stipulated schedule developed by the researcher. Examples of continuous data collection were implemented when dealing with document analysis. Momentarily data collection was used that is completed questionnaires by teachers and completed semi structured interviews for principals and HODs.

In response to identify challenges in the implementation of Mathematics CAPS curriculum in Grade 9. Sampled HODs and principals were asked the questions the questions on challenges they are experiencing in implementing CAPS Mathematics for Grade 9. The questions were audio-recorded and transcribed by the researcher

who familiarised himself with the data they contained then coded information into emerging themes and categories. The identified themes were accompanied by detailed interpretations followed by verbatim extracts from the interview transcripts (attached as annexures at the end of the thesis). The data from the research was organised into main recurrent themes that served as the basis for the study's conclusions. The following themes were identified:

- Demographical data;
- Qualitative data on strategies and implementation challenges;
- Curriculum and assessment data; and
- Recommendations and subject improvement strategies.

4.2 RESPONSE RATE

Most of the continuous data collection went on with few glitches as the study was conducted during the peak of COVID-19 pandemic and most schools were operating virtually. Data were collected via a variety of methods, including questionnaires for teachers. Questionnaires were sent to 50 Mathematics teachers in the Tshwane South District of Gauteng Province. In contrast, ten HODs, ten principals from ten schools were targeted to complete semi-structured interviews, the researcher interviewed one principal and one Mathematics HOD per school. The following documents were analysed, CAPS Mathematics curriculum guidelines for Grade 9, Annual Teaching Plan, and a performance analysis document in the schools.

Response rates for data collecting instruments were low owing to the impact of COVID-19 pandemic. The researcher emailed questionnaires to 50 schools in Tshwane South District of Gauteng and conducted semi-structured interviews, as well as reviewing and analysing the data collected from the documents. For document analysis there were no difficulties in obtaining CAPS Mathematics

curriculum guidelines for Grade 9, Annual Teaching Plan, and functional books, performance analysis document in the schools was a challenge.

4.3 DEMOGRAPHICAL DATA

4.3. Biographical Data of Respondents

The study had 50 respondents sampled to provide data to answer the research questions. The distribution comprised 30 teachers, ten HODs and ten principals of the sampled schools. Question 1 to 6 on the semi-structured interview schedule included demographic questions.

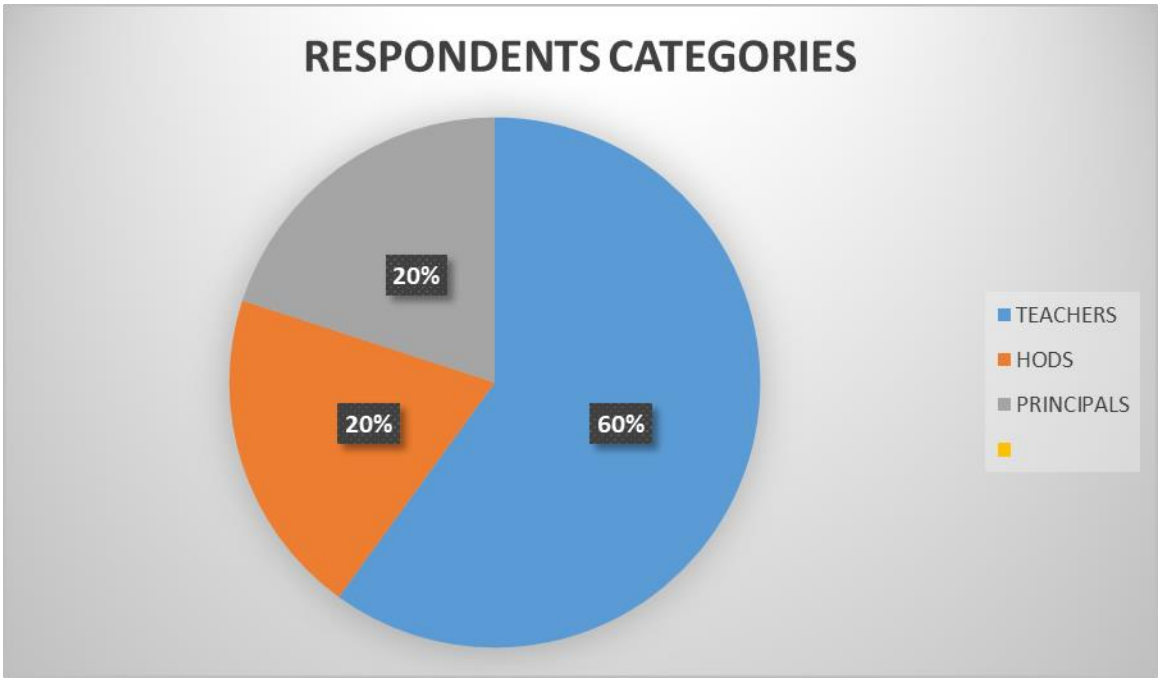

Figure 4.1: Demographic categories of respondents

The pie chart provides the breakdown of categories for research respondents which had 60% teachers, 20% Heads of Departments and 20% principals of the sampled schools. Gender composition of the respondents was also an important variable as set out in Table 4.2.

Table 4.2: Gender distribution of participants

GENDER	TEACHERS	%	PRINCIPALS	%	HODS	%
MALE	20	67	06	60	07	70
FEMALE	10	33	04	40	03	30
TOTALS	30	100	10	100	10	100

As presented in Table 4.2, 66% of respondents were men and 34% women. The male dominance in Mathematics teaching and supervisory staff is a common trend especially in subjects considered tough and traditionally male-dominated like Science, Technology, Engineering, Mathematics (STEM). Perhaps the dominance of male teachers in teaching Mathematics implies that girls may be demotivated and perform poorly, hence few females enter science and Mathematics careers. Equally related to gender were the ages of respondents which are shown in Table 4.3:

Table 4.3: Ages of respondents

AGE GROUP	FREQUENCY	%
21-30	20	40
31-40	15	30
41-50	10	20
51-60	05	10
TOTALS	50	100

Data obtained from the foregoing tables reflect that 34% were women while 66% were men. Participants' ages were dominated by 40% in the age group 21-30 while 10% were 50-60 years of age. From the summary, another variable emerged – that of dominance of science and Mathematics by men compared to females. An assumption from the above finding is that Mathematics is a male-dominated discipline implying that it is challenging for females.

Surveys such as that conducted by Simuchimba and Mbewe (2021) revealed that there are more male Mathematics teachers than female teachers because people believe that Mathematics is not for female learners. Furthermore, numerous studies have been conducted to explain the dominance in Mathematics by males. Burton (1990) examined the differences in participation and performance in Mathematics courses. He identified that boys and girls were treated differently in Mathematics lessons and boys interacted more frequently than girls with their teachers. Kaleva, Pursiainen, Hakola, Rusanen and Muukkonen (2019) investigated the reasons behind STEM choices and concluded that compared to males, females often reported lack of self-efficacy, ability and competence in Mathematics studies as reasons for not furthering studies in the Mathematics field. The above finding also confirms the experiences of the researcher, a female Mathematics teacher who is one of a minority of females that teach Mathematics in the research district. The study further observed the dominance of the 21-30 age group whose experience is less than ten years; hence, the teacher experience variable may be responsible for poor performance based on less experience in teaching the subject.

Teacher qualifications are a key variable in teaching and learning of sciences in schools, more so Mathematics. Teacher qualifications influence competency, experience and PCK among other factors which may determine learners' subject choices. Studies by Karp (2017) show that teacher qualifications (Ball et al., 2009), low curriculum coverage (Taylor & Reddy, 2013) and lack of mastery of subject matter by teachers (Spaull, 2013) influence learners' performance. Other studies by Carnoy, Chisholm and Chilisa (2012) in North West Province found that low curriculum coverage by Mathematics teachers was one of the negative factors contributing to poor results.

One implication of the study is that less curriculum coverage in Mathematics education may be responsible for underperformance in the subject coupled with the variable of lack of subject mastery in the phase. The researcher perceived the phenomenon as endemic. Hence, there is a need to conduct workshops and staff

development programmes to equip teachers with skills and competencies relevant to effectively teach Mathematics in Grade 9. The underperformance in Mathematics is related to monitoring and management of teaching and learning processes. Table 4.4 presents the teacher qualifications of the sample.

Table 4.4: Teachers' qualifications

QUALIFICATIONS	**FREQUENCY**	**%**
SECONDARY TEACHERS CERTIFICATE	15	30
DIPLOMA IN EDUCATION	05	10
B.ED	20	40
B.ED HONOURS	08	16
MASTERS & DOCTORATE	02	04
TOTAL	50	100

Table 4.4 presents the qualifications of respondents of whom 40% had a B.E.D qualification with 4% with master's and doctorates. All respondents were qualified teachers and should therefore be able to teach Grade 9 Mathematics properly. Experience of teachers was a significant variable that could determine the success or failure of the teaching and learning processes. Teaching experience could affect abilities and competencies of teachers and managers of schools and effective implementation of the Grade 9 Mathematics curriculum. Metcalfe (2008) points out that no education system is better than the quality of its teachers. As emphasised by Metcalfe (2008), the researcher holds the view that despite being trained and certified to teach high school Mathematics, teachers in South Africa (inclusive of the research district) are generally trained without specific phase skills and competencies; hence, they fail dismally to lay a firm foundation for Mathematics in the General Education Training phase as shown by learner underperformance. Therefore, teachers are critical resources for effective curriculum implementation;

without them, the education system fails. Teachers' experience is illustrated in Table 4.5:

Table 4.5: Teachers ' teaching experience

EXPERIENCE IN YEARS	FREQUENCY	%
0-5	10	20
6-10	20	40
11-15	10	20
16-20	05	10
20 AND ABOVE	05	10
TOTAL	50	100

As can be seen from Table 4.5, teachers have experience that ranges from 0 to above 20 years. Most of the sampled teachers (40%) had experience ranging from 6-10 years while the lowest percentage (10%) were those with 16- 20 years and above.

Table 4.6: Teachers' major subjects

Major subjects	Frequency	%
Mathematics	20	40
Physical Sciences and Life Sciences	18	36
Other subjects	10	20

In terms of subjects, 40% majored in Mathematics while 36% majored in physical sciences and life sciences. What is interesting in this data is that 20% of principals and HODs did not major in Mathematics and physical sciences. Teachers who have not majored in Mathematics may present deficiencies in the supervision and monitoring of the subject and the motivation for learners to do it.

4.4 QUALITATIVE DATA ON IMPEMENTATION CHALLENGES

4.4.1 Data from Principals and HODs interviews

Using the **data collected from semi-structured interviews** principals and HODs were asked semi-structured interviews to determine by means of semi-structured interviews, and document analysis how the challenges affect learner performances in formal and non-formal assessments and teacher competencies in teaching Mathematics, principals and HODs. The data were derived from the semi-structured interviews.

Using the interviews as a triangulation instrument, HODs and principals were asked the following from question number 6 to 16 on Appendix D that relate strategies and implementation, the following themes emerged:

Theme 1: Teaching mathematical concepts for understanding

In response, 100% cited that there are challenges in the implementation of the Grade 9 CAPS Mathematics curriculum which ranged from curriculum coverage, curriculum materials provision and pedagogical, supervisory as well as assessment challenges. Some of the captured responses were as follows:

> HOD 1: *"Eish, teaching Mathematics in Grade 9 is very challenging especially with the CAPS curriculum where most learners hardly understand what is taught in classrooms. The level of difficulty is glaringly related to pedagogical clarity implying that in as much as teachers understand the content, learners do not grasp the concepts as expected."*
>
> HOD 2: "*Teaching Mathematics to Grade 9 demands a strong foundation from Grade 7 and 8 which lays a foundation for Grade 9, a critical stage in teaching and learning of high school Mathematics. We do not have enough time to teach due to the COVID -19 Rotational Timetabling. Learners do not grasp the learning material they show some content gaps. Teachers who are*

allocated Grade 9 classes in Mathematics are usually new ones and those not performing best and as such the quality of instruction is poor and hence results are bad."

Teacher 1: *"Too many topics in one term. Learners do not grasp the main ideas of about a topic, we are chasing curriculum coverage. It's hard to move on when you know as a teacher that your learners did not understand a topic."*

HOD 4: *"Teachers do not know methods; they do not teach learners what to look for when dealing with mathematical concepts; for example, Pythagoras theorem. Techers do not know the concepts that they are teaching, don't understand why learners do not understand. Learners cannot use previous knowledge from Grade 8 because they are used to being fed with information that they cannot apply and see the reasoning behind the concepts."*

Theme 2: Supervision and support of teaching Mathematics

Supervision of teaching and learning of Mathematics in Grade 9 is done by the HODs in all the schools sampled. The challenge is that the HOD has to do book control, pre-moderate and post moderate test papers, class visit, control files and check curriculum coverage while he or she is also a teacher. Furthermore, HODs have a burden of workloads and they are not able to meet deadlines so sometimes they fail to execute their duties of supervision. Some of the captured responses were as follows:

HOD 5: "*We don't have enough time to supervise teaching and learning in our school; we only supervise we only do Quality and Management Systems (QMS) we are trying our best. We have book controls, class visits, pre-moderation and post moderation of marking and setting of tests. If you have hard working teachers who concentrate on their learners and intervention, you will have less expanded opportunities, adjusting marks and condonations*

at the end of the year. A team of committed teachers will make your work easy and manageable."

Principal 1*: "The HOD needs to supervise the Mathematics curriculum because he or she is a subject expect, they need to come up with a management plan to run their department and teaching and learning must be centred on learners and curriculum delivery. "*

Theme 3: Teaching Mathematics and content coverage in Grade 9

The results of the study indicate that, the concepts taught are too much, resulting in failure to meet the minimum requirements of content coverage.

HOD 6 indicated that, *"The content is good but the question is, is it relevant to the 21st century? The number of concepts must be reduced so that learners can be thoroughly prepared for the next grade."*

HOD 2 said that, "Content coverage is a challenge because paper work is too much, submissions all the time. We as teachers feel the pressure daily, we don't even achieve the intended goal of ATP coverage. Topics are changed around all the time. We don't have time to assist the struggling learners who need support. What is the point of just rushing to cover curriculum when in reality many learners are way behind in terms of comprehending the concepts? We have many drop outs because of this."

HOD 3 noted that, "Sometimes I cover all the topics on the Grade 9 ATP for that particular term but learners cannot do simple calculations like addition of fractions. A lot of topics for learners in a short space of time and the learners do not understand. Only learners who are gifted survive. The HODs concentrate on curriculum coverage, they just want marked classwork's, homework's and workbooks. They are not concerned whether the learners understood the content or not."

HOOD 4 explained that "HODs contribute to the challenges we face in curriculum coverage because they want formal assessments to be completed, marked and submitted two weeks before the end of a term. We end up setting assessments with topics that we did not teach so that we meet the requirements indicated on the ATP. Learners will not achieve the best."

HOD 7: *"The topics in the ATP are good for Grade 10 foundation if teaching is done properly concentrating on the learners not on the paced coverage of the ATP. Sometimes teachers discourage learners by telling them that if they cannot do a particular topic, for example, Trigonometry then they must not choose pure Mathematics in Grade 10. Learners are demotivated and the discipline is not good why do they need to listen if they are not picking pure Mathematics in Grade 10 when they select subjects for Further Education and Training (FET)."*

Theme 4: The advantages of the CAPS in Grade 9 Mathematics teaching

Another important finding is that although the teachers have challenges in implementing CAPS Mathematics in Grade 9, they remarked that the topics included in CAPS grade 9 links with previous knowledge that is Grade 8 and links with Grade 10 and clarification notes or teaching guidelines are included for each topic.

HOD 3 commented on the merit of CAPS and said, "*CAPS is clear on what must be taught, in which term and how long must you teach the topic."*

HOD 5 said*, "CAPS grade Mathematics is structured in a good way before a new topic is introduced there is always a clear explanation of what the learners know from the previous grade so that new knowledge is built from the previous grade. It is very straight forward; you know as a teacher what is expected of you. We need to compliment the CAPS document for that."*

HOD 9 noted that, *"CAPS gives teachers opportunities to meet as a group called Professional Learning Community (PLC group). PLCs present*

teachers with an opportunity to improve their level of competence by sharing inclusive practices. In a PLC, subject teachers, principals and subject advisors come together collectively to stimulate collaborative learning. The group meets up and set common papers that are quality assured and a good standard. Teachers are pleased to compare learners with the best schools in the area, determine common mathematical misconceptions among learners and come up with solutions as a group. Quality Mathematics common papers helps to assess teaching and learning and can be formatively used to improve teaching."

Principal 10 confirmed that, *"CAPS Mathematics grade 9 is one of the best education policies. The problem is that teachers are too afraid to work around the ATP or just want scripted lesson plans because they don't want to do the wrong thing. We have a country with many issues but we are trusted with learners, we can make a huge difference. Teachers are just so transparent when it comes to criticising CAPS and pointing out flaws in implementation but we need to take time and appreciate or education system. We have passionate teachers, integrity, appreciated, important and more than capable of making the change we need. As teachers we don't need to stick to the ATP, let the ATP guide you because the ATP is derived from the CAPS Policy document."*

Theme 5: Disadvantage (s) of the CAPS in Mathematics teaching

On the question of disadvantages of CAPS, this study found out that most learners struggle to master Mathematics language contained in the CAPS document. Teachers noted that learners have language barriers. It is a challenge for them to solve mathematical problems. Learning gaps in learners' knowledge are not addressed. Some of the captured responses were as follows:

Principal 2 noted that *"In secondary schools you can't apply various methods that promote 21st century skills such as critical skills by applying teaching*

methods such as problem-based learning, cooperative learning, inclusive learning. Teachers teach learners to memorize answering test questions then the system will name them as the best teachers irrespective of quality. On the other side teachers are drained by the administrative side and disciplinary part of the work. Grade 9s are a challenge discipline and behaviour is the worst among them."

HOD 8: *"To much content without understanding, knowledge gaps then progression. The department is interested in what is covered by teachers not the knowledge acquired by learners. Teachers are covering the curriculum but learners acquire nothing."*

HOD 9 responded, *"I need practical implementation strategies in Mathematics grade 9, I end up spending more time on a particular topic because learners do not understand on the go and at the end of term one I must have covered two huge topics, I am struggling. I have 40 grade 9 learners in one class, running after the ATP, giving feedback to all the learners both in the DBE workbook and functional book. This is not working, I feel drained every day, we are not coping."*

HOD 3 stated that, *"Truly speaking our education system designers lost it somewhere, it is more about the teachers than what should the learners know, you have to hurry to complete the ATP leaving the learners behind. We need policy makers who have once been teachers in their lives*."

Theme 6: Opinion regarding standards in the CAPS for Grade 9 Mathematics

The most important finding is that teachers indicated that the standard of some topics are too high for the level of learners, learners are being exposed to topics that they cannot deal with in Grade 9 for example factorising algebraic expressions.

HOD 8 reported that, *"The standards contained in the CAPS document are unrealistic, it is impossible to cover all the topics, learners do not understand. Teachers teach what is manageable and we know our learners, teachers don't have time to fix the lack of basic mathematical concepts. There are classes that are weak than others with those teachers can't cover all the CAPS standards that are ridiculously overloaded. When facilitators visit schools, they look for quantity not quality."*

Principal 4 indicated that, *"The learners cannot meet the standards of passing requirements. The system keeps progressing learner to grade 10 by adjusting marks in Mathematics or condonation because of this, learners are not making extra effort because they know that the system will definitely progress them to the next grade. I wish the system can let teachers do their job because as a teacher I will never let learners fail unless if I see a need for that learner to repeat a grade. The pressure the department is putting on teachers is overwhelming and now teachers focus on their school subject targets and forget about the learners' future as well as the next grade."*

HOD 6 anticipated that, *"The standards in the CAPS document are no achievable because teachers spend more time focusing on paper work than teaching, not having support for learners with barriers, no technology resources that could benefit learners. Learners are not motivated to study, schools no well-resourced, parents not interested in helping teachers, some parents fail to understand that their kids need to go to a special school and some of the learners are not disciplined, they lack respect and don't follow instructions."*

Theme 7: Teachers training in the CAPS for Grade 9 Mathematics

The study revealed that teachers are being trained occasionally these days through the use of Microsoft Teams meeting that are held quarterly as a way of supporting teachers with CAPS implementation. The teachers indicated that the trainings and workshops are what they call ‘one size fits all’ meaning that the facilitators’ address all the teachers as having the same challenges, curriculum implementation is not covered in great detail, more focus is on curriculum coverage and Mathematics performance results.

> HOD 8 commented that, “*regular training on CAPS Mathematics Grade 9 is good when teachers come together and share teaching methods and innovative ideas, but the challenge is that teachers are too busy to attend training, some of them cannot afford buying data for online meetings and some attend online meetings while they are busy with other administration duties so, they do not fully participate.”*
>
> HOD 9 said: *“During the workshops, facilitators have no idea of what is working in the classroom; it’s not helpful and it’s a waste of time. They need to identify well experienced teachers to teach other teachers. The identified teachers can present different methodologies because they are informed in teaching the topics. We need various methods, and the learners can choose methods they prefer and know what to look for when solving mathematical problems.”*
>
> Principal 1 said that, *“The department of education supports training of teachers offering training on different curriculum topics in conjunction with SCI- BONO Discovery centre. Teachers have to register and enrol for different training workshops at the Department of Basic Education website so that they can attend the meetings. The training normally takes place during the weekend, school holidays this is convenient for most of the teachers. During workshops teachers are given strategies to introduce new topics to learners that includes; baseline assessment on the new topic must be set to*

test the knowledge of the previous grade, proper lesson planning must be done, CAPS and ATP must be consulted in the lesson preparation process, class sizes must be considered in the lesson planning process and both learners who are facing learning difficulties and gifted learners must be catered for. The training workshops are very useful, a lot of consultation of resources must be made so that a good lesson preparation must be made by the teacher. The question is, do teachers have time to do all this?"

Theme 8: Mitigation of challenges faced by teachers to implement effective teaching and learning

The following are some of the responses by HODs and Principals:

HOD 10: *Mmmm…Mathematics teachers need each other to effectively improve the results in their schools especially now that we are under a pandemic. The starting point is making the trimmed Annual Teaching Plan Online Mediation workshops more robust and engaging where content is clearly explained and innovative strategies shared coupled with written subjects' improvement plans. Other strategies could include networking of teachers through sharing resources online such as tasks, test papers, guidelines and revision tasks. Teachers should also learn to team teach and peer teaching where they alternate and work together to teach each other topics they do not understand well. They can also visit each other on planned exchange programmes and teach each other classes on topics that one is not effective in. Teachers must teach for reasoning that is to help learners to identify differences and similarities in shapes and sizes as part of classroom Mathematics.*

Principal 3: *My school has programmes that help new teachers in Mathematics to be inducted into the subject through helping them to understand the pedagogical approaches that help learners to fully understand the concepts. Challenges in materials such as a variety of textbooks for*

learners and resource booklets to share with learners as support for blended learning. Further teachers do not effectively teach Mathematics for they must use previously learnt concepts to teach new concepts. Teachers ought to demonstrate clearly the new concepts to the learners, more use of chalkboard illustrations will help, and learners must be given opportunities to work out examples. Teachers must make Mathematics teaching and learning creative and interesting. Learners must be given opportunities that demand learners' creativity, thinking and resourcefulness.

The challenges in CAPS curriculum implementation can be mitigated in ways such as:

- Revisiting some of the topics contained in the CAPS document.
- Reducing the subject content taught each term.
- Age-appropriate topics and make teaching interesting.
- Allow innovations by teachers in terms of teaching methods and peer teaching.
- Accommodative of learners learning pace.
- Analysis of earners results regularly and offer remedial for the topics that are poorly achieved.
- Use a variety of textbooks when teaching.

Teachers indicated that identifying ways to mitigate challenges in CAPS Mathematics Grade 9 gives rise to recommendations and subject improvement plan, thereby assisting to answer research questions.

Theme 9: The role of the school management team (SMT)

It is interesting to note that CAPS Mathematics Grade 9 challenges are being addressed in a holistic manner. Team teaching is encouraged whereby teachers share topics, a teacher teaches a topic that they are good at and also earns from the other teacher, empowering one another. Departmental meetings are held

regularly to support teachers but sometimes teachers do not have time and teaching resources are also not readily available.

> HOD 3: "*QMS is an important tool to monitor curriculum implementation in the classroom. The SMT must be glued up with subject content, know the strengths and weaknesses of your teaching department, be informed about the performance of learners and develop teachers. The discipline is terrible, teachers come and go no support from parents*."

Theme 10: Resources necessary for implementing CAPS Grade 9 Mathematics

The results of this study show that teachers indicated that the following resources are necessary for curriculum implementation:

- Annual Teaching Plan (ATP)
- Lesson plans
- Teaching aids
- A variety of textbooks to consult from
- Technological devices like laptops, ipads or smart phones for learners and overhead projectors.

In this regard, the teachers emphasised that it is a challenge to implement CAPS without enough resources; there is a shortage of teaching resources in schools and limited technological resources.

> Principal 5 indicated that, *"CAPS is a good curriculum that was well planned but needs a lot of resources for implementation, we are in the 4th industrial revolution where learners need to learn and think outside the box alone using the vast technology available, but our schools do not have. Loadshedding is also a challenge, we cannot present lessons on PowerPoint."*

Theme 11: The prescriptiveness of CAPS Grade 9 Mathematics

Several teachers indicated that CAPS Grade 9 Mathematics is prescriptive because the textbooks used are prescribed and the ATP to be followed. This poses a challenge to the teachers because you have to follow the ATP and you are under pressure all the time to teach and move within the expected time of delivery. Teachers do not concentrate on assisting learners who struggle because they want to finish the topics contained in the ATP.

> HOD 4 claimed that, *"CAPS is prescriptive and does not consider learners' abilities, all learners must move at the same pace of learning according to the ATP we do not have enough time for remedial. New topics are taught every term that are built on previous knowledge but the challenge is that learners take time to grasp new topics and at the same time you need to teach according to the ATP so a lot of earners are left behind creating learning gaps. Time is not enough now with the COVID-19 pandemic taking away some learning time during lockdown is also a challenge, learners are not coping."*

> HOD 7 said that*, "CAPS Grade 9 Mathematics has good topics but some teachers are not well informed on teaching content; they concentrate on the topics that they are familiar with. Teachers need to balance the topics, check the allocated time per given topic on the ATP. Learners have a negative attitude towards Mathematics; they say that if they cannot do any sum they must not try wasting their time, they change their minds throughout the year."*

The responses from the HODs who are also teachers and principals interviewed showed that we have challenges in CAPS curriculum implementation in schools. These include monitoring, work overloading, limited resources, insufficient learning and teaching time, curriculum and assessment data. According to Vygotsky's social constructivism, learners bring their own experiences into the classroom and build knowledge through social interaction but because of all the challenges listed earlier, the teacher becomes the transmitter and cannot produce an environment conducive

to learning, teachers are concentrating more on the ATP not on the progress of the learners.

4.4.2 Data collected from document analysis

In analysing the CAPs Mathematics curriculum guidelines for grade 9, Annual Teaching Plan, and curriculum documents in the schools were analysed. The following gaps were identified as challenges affecting learner performances in formal and non-formal assessment and teachers' challenges in implementing Grade 9 Caps Mathematics curriculum (refer to Table 4.7.

Table 4.7: Document analysis for Grade 9 Mathematics

Type of document	Research challenge	Comments
• Prescribed textbook	• Is content specific? • Are activities enough? • Are examples clear? • Are illustrations age inclusive?	The content is specific in the textbook and the activities per topic are quite reasonable. The examples are not quite clear in the textbook however, the DBE workbook has clearer examples, but the challenge is that they are a number of mistakes.
• Curriculum guideline documents	• Are the documents clear and informative? • Are assessment and content identified?	Formative assessments clear and assessment content identified. Assessment does not cater for remedial but does cater for all levels of intelligence.
• Annual Teaching Plan (ATP)	• Is it easy to follow? • Is planned work coverable within the time planned	The ATP congested with many topics in one term, easy to follow but not coverable within time planned and keeps changing.
• Annual Assessment Plan	• Is it specific on content and dates?	Yes, very specific on content and dates but difficult to adhere to.
• Learner exercise books	• Are the books neatly covered? • Is work marked? • Is work done enough? • Are the illustrations used clear?	Books are covered, work marked by peers in grey pencil. Teacher controls books by stamping. Learners are given examples in each topic. Work done not enough due to time constraints.

• Remediation records	• Are there specific remedies identified?	No remedial classes offered only extra classes for learners who did not pass with minimum requirements.
• Past examination papers	• Are the papers in line with curriculum guidelines?	Test papers are in line with the curriculum guidelines are pre and post moderated. Teachers spend a lot of time setting the test papers adhering to the content topics that are always changing using the amended CAPS document.
• Other documents that support curriculum implementation	• What other documents are used?	Mostly textbooks and DBE workbooks are utilized some schools use Mathematics booklets and catch up program booklets from DBE after COVID-19.

The information indicated from the document analysis respond to the research question of investigating challenges in curriculum implementation. It is evident that the teachers, the school and the DBE are the paramount of curriculum implementation; they need to work together in policy implementation so that challenges are addressed. Therefore, improving subject performance in Grade 9 Mathematics is critical.

4.5 QUANTITATIVE DATA

The section presents data on the Mathematics curriculum, enrolments in classes, availability of resources and general performance in Grade 9 classes. Data for this section was collected using **questionnaires**.

Data from Teachers' Questionnaires

Teacher respondents were asked questions on their perceptions of the CAPS Mathematics curriculum, the nature of curriculum organisation, assessment, the nature of support provided by the DBE, the challenges teachers encounter and suggestions for addressing these challenges. The following are statements

regarding opinions on the challenges teachers have implementing the Grade 9 CAPS curriculum in Mathematics and the scales used in answering the questions.

SA = Strongly Agree **A = Agree**

D = Disagree **SD = Strongly Disagree**

Quizzed on key variables that impact on the implementation of the Grade 9 Mathematics curriculum the teachers responded as follows:

Table 4.8: Results on key variables

CURRICULUM IMPLEMENTATION VARIABLES	**RATING VARIABLES SCALES OF 1 TO 4**					
	%	SD	D	A	SA	TOTAL
• I perceive the timeframes for implementing the CAPS the curriculum in Grade 9 Math's realistic?	N	10	10	06	04	30
	%	33	33	20	13	100
• I have been supported by the implementation of the CAPS in Mathematics by the department through attending cluster meetings and workshops.	N	08	02	15	05	30
	%	27	07	50	17	100
• I received adequate training for teaching-learning pedagogics on the implementation of the CAPS in Mathematics.	N	04	06	15	05	30
	%	13	20	50	17	100
• I require professional development on how to Adapt to the change in the new curriculum to Implement the CAPS in Mathematics.	N	05	02	20	03	30
	%	17	07	67	10	100
• I have initiated steps to upgrade myself on the implementation of the CAPS in Grade 9 Mathematics.	N	02	03	20	05	30
	%	07	10	67	17	100
• I received teaching and learning support material to implement the CAPS in Grade 9 Mathematics teaching.	N	02	04	18	06	30
	%	07	13	60	20	100
	N	06	04	16	04	30

•	I am unhappy with the quality of the teaching and learning support material for implementing the CAPS Grade 9 Mathematics.	%	20	13	53	13	100
•	CAPS provide the best assessment policy that accommodates all types of learners in Grade 9.	N	04	06	14	06	30
		%	13	20	47	20	100
•	CAPS helps in planning and making teaching and learning manageable in Grade 9 Mathematics.	N	02	03	20	05	30
		%	07	10	67	17	100
•	The terminology used in Grade 9 Mathematics CAPS is simple and easy to understand.	N	10	07	12	01	30
		%	33	23	40	03	100
•	I am guided by CAPS philosophy in my everyday teaching routine.	N	15	05	10	05	30
		%	50	17	33	17	100
•	My confidence levels are in the implementation of CAPS are very high.	N	16	04	05	05	30
		%	53	13	17	17	100
•	Record keeping of learner performance in CAPS is negative and lacks detail.	N	07	03	15	05	30
		%	23	10	50	17	100
•	Assessment in CAPS is not clearly defined and has negative implications for evaluating the Mathematics Grade 9 curriculum.	N	10	05	05	10	30
		%	33	17	17	33	100
•	Lesson planning in CAPS is scanty and ineffective to assist teaching and learning.	N	06	07	07	10	30
		%	20	23	23	33	100
•	Pedagogical approaches are not well defined in CAPS and that impact on quality teaching and learning.	N	04	06	05	15	30
		%	13	20	17	50	100
•	I have challenges in identifying learning outcomes in CAPS Grade 9 Mathematics.	N	03	04	13	10	30
		%	10	13	43	33	100
•	Learners find it difficult to understand content all content planned for the term; it looks too much.	N	06	06	18	00	30
		%	20	20	60	00	100
•	I have difficulty integrating knowledge and skills from different learning areas when I implement the CAPS in Grade 9 Mathematics.	N	02	04	17	07	30
		%	07	13	57	23	100
		N	01	04	14	11	30

•	I hardly get time to plan and execute remedial programs for my grade 9 Mathematics curriculum.	%	03	13	47	33	100

The 20 questions above citing challenges in implementation of CAPS Grade 9 Mathematics curriculum are divided into five themes explained below:

4.5.1 Training, support and professional development

Question 1 to 5 refer to CAPS curriculum training support and professional development. The above statistics show that 33% of the respondents perceived the timeframes for CAPS Mathematics implementation as realistic implying that those teachers understood the nature of the curriculum they were implementing although 66% respondents disagreed. About 50% of the respondents agree that they have been supported by the department through attending meetings and workshops while 67% require professional development on how to adapt to change in the curriculum to implement CAPS. Question 5 indicates that 67% have initiated steps to upgrade on the implementation of CAPS in Grade 9 Mathematics. The responses from question 1 to 5 clearly indicate that the timeframes in CAPS are not achievable and teachers continuously need support, training and professional development to keep abreast with implementing CAPS Grade 9 Mathematics and mitigating challenges.

4.5.2 Resources and support materials

Question 6 and 7 refer to resources and support materials. About 60% agree that they received teaching and learning support material to implement CAPS and 53% are not happy with the quality of the teaching and learning support material for implementing the CAPS Grade 9 Mathematics. This suggests that there is a challenge of resources and curriculum support materials in schools.

4.5.3 Teaching and learning

Question 8 to 12 refer to challenges in implementation with regard to teaching and learning of CAPS. About 47% agree that CAPS provide the best assessment policy that accommodates all types of learners in Grade 9. In contrast, 67% indicate that CAPS help in planning and making teaching and learning manageable in Grade 9 Mathematics while 17% disagreed citing challenges in curriculum implementation. Furthermore, 40% expressed that the terminology used in Grade 9 Mathematics CAPS is simple and easy to understand while 33% indicated they are guided by CAPS philosophy in everyday teaching routine while 17% declared that confidence levels are very high in the implementation of CAPS Grade 9 Mathematics. The aforementioned results show that we have challenges of providing an assessment policy, a curriculum that is easy to understand, motivating CAPS philosophy teaching routine and boasting confidence levels in teachers.

4.5.4 Assessment data

Question 13 to 15 refer to challenges in implementation with regard to assessments of CAPS. About 50% agree that record keeping of learner performance in CAPS is negative and lacks detail on the other hand 17% agree that assessment in CAPS is not clearly defined and has negative implications for evaluating the Mathematics Grade 9 curriculum while 23 % agree that lesson planning in CAPS is scanty and ineffective to assist teaching and learning. The statistics show that they are challenges in implementing CAPS affect learner performance, record keeping, lesson planning and quality of assessments.

4.5.5 Teaching approaches

Question 16 to 20 refer to challenges in implementation with regard to teaching approaches of CAPS Mathematics Grade 9. Only 17% agree and 50% strongly agree that pedagogical approaches are not well defined in CAPS and that impacts on quality teaching and learning. In contrast 43% respondents mentioned that they

encountered challenges in identifying learning outcomes in CAPS Grade 9 Mathematics during their teaching and learning processes. Furthermore, 60% agree that learners find it difficult to understand all content planned for the term; it looks overwhelming. In contrast, 57% have difficulty integrating knowledge and skills from different learning areas when implementing the CAPS Grade 9 Mathematics. About 47% agree and 33% strongly agree that they hardly get time to plan and execute remedial programmes for Grade 9 Mathematics curriculum. The next section covers section B of the questionnaire.

4.6 RECOMMENDATIONS AND SUBJECT IMPROVEMENT STRATEGIES

Section A of the questionnaire covers the 20 questions explained above where the respondents filled in codes citing challenges in the implementation of Grade 9 CAPS Mathematics, section B had the following explanatory questions which gave rise to recommendations:

- Suggest how Grade 9 Mathematics CAPS content caters for learners who struggle with basic mathematical concepts?
- How can learners be motivated to enjoy learning Mathematics in secondary schools?
- What advice could you provide to Grade 9 Mathematics teachers to address the impact of CAPS on teaching and learning of Mathematics?

The issue of improving performance and throughput in teaching of Mathematics and science in schools has received considerable critical attention. Camasso and Jagannathan (2018) found that there were eight critical factors in science and Mathematics performance in schools. These include small class size, individual tutoring, high-quality instruction, after-school and vocational programmes aligned to the school curriculum, hands-on learning opportunities in natural sciences, high levels of learner attendance and participation, involved parents and intervention.

However, these factor components are hard to achieve because schools are overcrowded.

This analysis adds to the body of knowledge that shows that to improve educational outcomes, the policy should be to build foundational knowledge and skills in numeracy (Cai, Mok, Reddy & Stacey, 2016). According to the TIMSS, there is a correlation between Grade 8 Mathematics performance and Grade 12 examination Mathematics achievement. Grade 8 scores are a good indicator of who will pass the exit level examination. Teachers need to reinforce basic mathematical and scientific knowledge and skills by making sure that they re-teach concepts that were misunderstood, do question analysis after an assessment and address misconceptions, clarify the questions and give constructive feedback. Banerjee (2016) suggests that learners' perceptions of negative teacher feedback predicts poorer Mathematics test scores whereas teachers' expectations, support and motivation have progressive effects on learners. Teachers need to move away from pointing out flaws, let learners figure out and learn from their mistakes and identify strengths, weaknesses and areas for development. Feedback allows learners to feel valued and encourages them to strive for greater achievement.

The school climate has been shown to be related to learner achievement (Smith, 2008). The more rural a school is, the poorer the performance compared to an urban and suburban school. Furthermore, the school climate must be improved to introduce the 4th Industrial Revolution in schools through e-learning which should form part of a blended learning approach. Technologically advancing schools to improve performance in science and Mathematics can be a challenge because most of the teachers are computer illiterate. Therefore, short courses for integrating technology with teaching and learning can be introduced.

Firdaus (2017) maintains that to improve performance in Mathematics, learners' mathematical literacy needs to be developed using relevant teaching materials, laboratories, electronic libraries and problem-based learning, which leads to

acquisition of mathematical skills. Learners are highly motivated to learn, develop higher-level thinking skills and teamwork through group assessments. Clearly, using a variety of teaching strategies provides opportunities for learners to understand the relevance of mathematical and science concepts in everyday life. Alternatively, teachers can demonstrate, explain and reinforce abstract mathematical and scientific ideas using concrete objects, experiments, models, charts, graphs and pictures.

The importance of parental engagement in children's learning is widely acknowledged and the evidence suggests that it has many benefits such as improvements in Mathematics skills, better school attendance and closure of the achievement gap (Berry et al., 2019). Certainly, through blended learning, the home learning environment is a significant way in which parents can improve performance by supporting and assisting the learner. Parents need to foster education in their children through checking books and making sure that they do their homework.

4.7 CHAPTER SUMMARY

This chapter presented the process of analysis of data in a systematic, comprehensible and logical way. It shows what has been found from the process of data collection from various tools, namely, questionnaires, semi- structured interviews, and documents analysis, categorised into qualitative data. The next chapter presents the findings and conclusions, limitations, gaps in the current study and subsequent recommendations for future studies on the implementation of the Grade 9 CAPS Mathematics curriculum.

CHAPTER 5: SUMMARY, FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION AND SYNOPSIS

The aim of this current study was to investigate the difficulties encountered in implementing the Grade 9 CAPS Mathematics curriculum in the Tshwane South District of the Gauteng Province. This study was undertaken by means of literature study and a mixed methods research approach to identify the difficulties encountered in the implementation of the Grade 9 CAPS Mathematics curriculum and to determine best practices that would lead to an increase in learner performance. Owing to that, certain findings and recommendations were compelled taking into consideration the literature review, personal experience relating to challenges faced in the implementation of Grade 9 CAPS Mathematics and the empirical research findings.

The aim of the chapter is to:

- Summary of the chapters (5.2)
- Results and theoretical frameworks of the study (5.3)
- Discuss results in respect of the research questions and aims (5.4)
- Limitations of the research study (5.5)
- Make recommendations based on the research aims (5.6)
- Recommendations for future research (5.7)

This chapter discusses the most important findings on the difficulties teachers face while implementing the Mathematics curriculum in their classrooms. The chapter concludes with a discussion of the study's limitations, suggestions for further research, and a brief summary.

5.2 SUMMARY OF THE CHAPTERS

Chapter 1 summarised the research's historical background (*cf*.1.2) and discussed why the inquiry was needed and how it will help resolve the identified problem(*cf*.1.3). The research objectives and aims (*cf*.1.4) and the theoretical framework were discussed(*cf*.1.5). Research methodology techniques, population and sampling, as well as the study's limitations, were also explored (*cf*.1.6). A quick analysis of the literature was carried out, and the holes that the study would fill were found (*cf*.1.7). To give more clarity, a section of definition of terms that are relevant to the current study were given (*cf*.1.8). The study outline (*cf*.1.9) and the timing for the research and its financial implications were also highlighted (*cf*.1.10).

Chapter 2 concentrates on providing an overview of the study's backdrop. It is addressed in this chapter how to do a literature review. The first section explains curriculum from an international perspective that is curriculum in other countries (*cf*.2.2), followed by a brief discussion about curriculum changes in South Africa (*cf*.2.3) and how to offer constructivist theory, which provides theoretical framework for the research (*cf*.2.4). Drawing closer to the research topic, an overview of Mathematics education in South Africa is explained (*cf*.2.5) the state of Grade 9 Mathematics teaching and learning (*cf*.2.6) and implementation of CAPS curriculum and challenges in implementation (*cf*.2.7). Finally, a discussion on recommendations for best practices in the implementation of Grade 9 CAPS curriculum ensued (*cf*.2.8).

Chapter 3 begins with the description of the research design, research paradigm for the study, followed by a discussion of research approach and strategy (*cf*.3.2) before moving on to a discussion on data collection methods (*cf*.3.3) and data collection instruments (*cf*.3.4). This chapter looks further into the data analysis method (*cf*.3.5), sampling (*cf*.3.6), measures of trustworthiness (*cf*.3.7) and limitations of research (*cf*.3.8) to solve the Grade 9 CAPS Mathematics curriculum implementation difficulties faced by teachers. The ethical considerations are summarised at the end of the chapter (*cf*.3.10).

Chapter 4 presented the process of analysis of data in a systematic, comprehensible and logical way. The chapter shows what has been found from the process of data collection from various tools, namely, questionnaires grouped into quantitative data and semi- structured interviews, and documents analysis, categorised into qualitative data. Firstly, the chapter discusses the response rate of participants (*cf*.4.2) and demographical data of the respondents who took part in the study (*cf*.4.3). The next section discussed the qualitative data and strategies and implementation challenges faced by teachers (*cf*.4.4), data from principals and HODs interviews (*cf*.4.4.1) and data collected from document analysis (*cf*.4.4,2). The last section explains quantitative data that was collected from the questionnaires, themes emerged from the data. Training support and professional development (*cf*.4.5.1), resources and support materials (*cf*.4.5.2), teaching and learning (*cf*.4.5.3), assessment data (*cf*.4.5.4), teaching approaches (*cf*.4.5.5), recommendations and subject improvement strategies (*cf*.4.5.6) are the themes that emerged from the questionnaires on implementation challenges faced by teachers when implementing CAPS grade 9 Mathematics curriculum.

Chapter 5 presents the summary of all the chapters (*cf*.5.2), results and theoretical frameworks of the study (*cf*.5.3) that formed the foundations of the study. Additionally, the chapter discuss results in respect of the research questions and aims (*cf*.5.4) and limitations of the research study (*cf*.5.5). The next section suggests recommendations based on the research aims (*cf*.5.6) and recommendations for future research (*cf*.5.7) studies on the implementation of the Grade 9 CAPS Mathematics curriculum.

5.3 RESULTS AND THEORETICAL FRAMEWORKS OF THE STUDY

Social constructivism, a learning theory introduced by Vygotsky in 1962, was employed as a basis in the research investigation. According to social constructivism, knowledge is actively built within a social context by social interaction between the social participants. In this context, the social participants are the learners and teachers in a Mathematics classroom. Finally, CAPS is a curricular technique designed to allow learners to construct their own knowledge by engaging in learning activities at their own pace rather than being pushed to do so. The study's findings are compatible with constructivism in that they show that successful Mathematics teaching and learning rely on enabling learners to construct their mathematical knowledge with the help of teachers who scaffold it and support them in developing their mathematical talents. The study's findings show that teachers are the major drivers of curriculum implementation, and that the system would collapse if they were not there. According to Metcalfe (2008), no educational system can be deemed superior to the calibre of its teachers. Despite being trained and certified to teach Mathematics, the researcher believes that teachers in most South African schools (including the research district) are generally trained without specific phase skills and competencies, resulting in their failing miserably to lay a firm foundation for Mathematics during the General Education Training phase, as evidenced by learners' underperformance in Mathematics. In this light, teachers are critical resources in the proper implementation of the curriculum; without them, the educational system would collapse.

5.4 DISCUSSION OF RESULTS IN RESPECT OF RESEARCH AIM AND OBJECTIVES

To achieve its main purpose, a total of 30 Grade 9 Mathematics teachers were sampled from 50 teachers, ten HODs, and ten school principals were sampled in this study's target group. Since the study collected community viewpoints and they were included in the development of solutions to address the research problem, I

am certain that the study's purpose and aims were satisfied. The aim of the research is to identify the challenges faced in the implementation of Grade 9 Mathematics CAPS curriculum in Tshwane South District of Gauteng Province. To conclude and make recommendations on CAPS Grade 9 Mathematics implementation challenges, the findings will be grouped in terms of the objectives of study.

- To identify difficulties faced by teachers in implementing Grade 9 Mathematics CAPS curriculum in Tshwane South District of Gauteng;
- To determine the extent in which the challenges affect learner achievement in formal and non-formal assessment;
- To determine how the Mathematics Grade 9 CAPS curriculum implementation challenges, affect teacher competencies in teaching Mathematics;
- To determine how the challenges, impact the teachers in effective implementation of the Mathematics curriculum; and
- To make recommendations on how to tackle the challenges faced in implementation of Grade 9 Mathematics Caps curriculum.

5.4.1 Findings with regard to the first research question and aim of the study:
What are the difficulties that teachers are experiencing in implementing the Mathematics CAPS curriculum in Grade 9?
The study's first important conclusion was that the majority of participants conceded that Grade 9 Mathematics teaching has pedagogical and methodological challenges. A minority of respondents perceived the timeframes for implementation of the Grade 9 CAPS Mathematics curriculum as but most disagreed. 100% cited that there are challenges in the implementation of the Grade 9 CAPS Mathematics curriculum which ranged from curriculum coverage, curriculum materials provision and pedagogical, supervisory as well as assessment challenges. The results of the study also indicate that, the concepts taught are too much, resulting in failure to

meet the minimum requirements of content coverage. Moreover, content coverage is a challenge because paper work is too much, submissions all the time and teachers feel the pressure daily and cannot achieve the intended goal of ATP coverage. Teaching learners is a challenge because of learning gaps; learners cannot use previous knowledge from Grade 8 because they cannot apply and see the reasoning behind the concepts. Time factor is also a challenge; teachers do not have time to assist struggling learners who need support. Another interesting factor was that learners are way behind in terms of comprehending the concepts, you have to start teaching from a lower grade so that learners understand better. Another important finding was that HODs face challenges of a burden workloads that includes curriculum management duties and teaching at the same time. The researcher posits that they are challenges and difficulties faced by teachers in Grade 9 CAPS Mathematics curriculum implementation and we need to mitigate these challenges so that we have effective teaching and learning thereby producing competent learners. Pak, et al (2020) emphasise that curriculum implementation should integrate adaptive approaches to better support teachers of the demands of the ATP content in Mathematics, work with teachers on surfacing the root causes behind the challenges and provide opportunities for standards-based learning.

5.4.2 Findings with regard to the second research question and aim of the study:

To what extent do the challenges faced by teachers on the implementation of Mathematics CAPS curriculum in Grade 9 affect learner achievement in formal and non-formal assessment?

The second question revealed that the challenges faced by teachers affect learner achievement in both formal and non-formal assessment, learners are tested on topics that they did not have enough time to learn. Teachers concentrate on the ATP

coverage not on the pace of learners, this affects the performance of learners. The researcher concludes that the challenges faced by the teachers when implementing CAPS Grade 9 Mathematics affect performance of learners. The findings are of the current study are consistent with those of Jojo (2019) who states that a report from the Head of the Department of Basic Education's National Education Evaluation and Development Unit (NEEDU), argues that poor learner performance in most schools is largely due to the curriculum implementation challenges faced by teachers, especially in Mathematics. Mathematics and science instruction in schools has had more critical attention to improve performance. Camasso and Jagannathan (2018) found that small class size, individual tutoring, high-quality instruction, after-school and vocational programmes aligned to the school curriculum, hands-on learning opportunities in natural sciences, high levels of learner attendance and participation, involved parents, and intervention are eight critical factors in the literature of science and Mathematics performance in schools. However, these essential components are difficult to accomplish since schools are often overcrowded. Because during COVID-19 pandemic, schools were implementing COVID-19 rotational time-tabling to conform to the regulations and limits. This implies that schools are only running at half capacity and learners are not attending school on a regular basis to allow for social distancing. The number of learners per class is less, which allows for greater contact teaching, yet curriculum coverage is difficult owing to time constraints. This research contributes to the body of knowledge that suggests that to enhance educational results, policy should focus on developing core numeracy knowledge and abilities (Cai et al., 2016).

5.4.3 Findings with regard to the first research question and aim of the study:

To what extent do curriculum implementation challenges affect teacher competencies in teaching Mathematics?

The results of this study show that curriculum implementation challenges affect teacher competencies in teaching Mathematics in a huge extent. Teachers are not competent enough due to the challenges they face; the Mathematics content

knowledge gap, fast paced ATP which is always changing, too much paper work, overcrowding in classes can be mitigated by equipping teachers with the competencies of handling the subject. Nakidien, et al., (2021) states that teachers appear to have limited knowledge and experience in curriculum implementation for improving learning and teaching effectively so, improving teacher competence for learning is key to realising education quality in South Africa.

5.4.4 Findings with regard to the first research question and aim of the study:
How do curriculum implementation challenges affect teachers in effective implementation of Grade 9 Mathematics CAPS curriculum in Tshwane South District of Gauteng Province?

The results show that we have challenges of providing an assessment policy, a curriculum that is easy to understand, motivating CAPS philosophy teaching routine and boasting confidence levels in teachers, this affects the effectiveness of teachers. The concepts taught are too much, resulting in failure to meet the minimum requirements of content coverage, the teachers have to follow the ATP and are under pressure all the time to teach and move within the expected time of delivery. Teachers are struggling to cope in overcrowded classes, focus more on planning and completing lessons in the quickest way possible, which does not result in effective teaching. This finding corroborates the ideas of Tachie (2020), who suggest that curriculum implementation challenges that includes a lack of mathematical pedagogical knowledge, instructional practices, lack of support from the Department, little training, and the issue of redeployment affect teachers in effective implementation of CAPS.

5.4.5 Findings with regard to the first research question and aim of the study:
What recommendations maybe suggested to ameliorate the curriculum challenges faced in the implementation of the Grade 9 Mathematics CAPS curriculum in Tshwane South District of Gauteng Province?

Another significant conclusion was that the majority of participants agreed that Mathematics teaching and learning can be improved by providing adequate and appropriate learning materials and empowering teachers in PCK. The majority of respondents agreed that CAPS helps in planning and making teaching and learning manageable in Grade 9 Mathematics, while some cited challenges in curriculum implementation. Furthermore, teachers can demonstrate, explain and reinforce abstract mathematical and scientific ideas using concrete objects, experiments, models, charts, graphs and pictures. Firdus (2017) maintains that to improve performance in Mathematics, learners' mathematical literacy needs to be developed using relevant teaching materials, laboratories, electronic libraries and problem-based learning which leads to the acquisition of mathematical skills. When learners have resources, they approach the subject with more positive attitude, greater ease and thrive. Learners are highly motivated to learn, develop higher-level thinking skills and teamwork through group assessments. Using a variety of teaching strategies provides an opportunity for learners to understand the application of mathematical and science concepts in everyday life. A crucial conclusion of the research was that the parental role is fundamental in ensuring effective teaching and learning of Mathematics. The importance of parent engagement in children's learning is widely acknowledged and the evidence suggests that it has many benefits such as improvements in Mathematics skills, better school attendance and closure of the achievement gap (Berry et al., 2019). A conducive home learning environment is a significant way in which parents can improve performance by supporting and assisting the learner with homework and keeping themselves informed on what is going on at school.

5.5 LIMITATIONS OF THE RESEARCH STUDY

A wide range of constraints affect standard academic research initiatives, some of which may have a negative influence on the legitimacy and authenticity of the study's conclusions. The following constraints apply to this research:

- A methodological stumbling block was the preference for audio recordings over visual records. However, as previously said, interviews were not the only instruments used to collect data; additional instruments such as, questionnaires, document analysis were also employed to triangulate the outcomes of the data collection.

- The researcher created her own research instruments, which may have influenced the validity and reliability of the study data, as well as the conclusions and recommendations. Despite this, instrument triangulation and ethical guidelines for conducting research studies were used to ensure the quality of the data acquired, since the same participants were exposed to several instruments at various stages during the study. Because of the time and cost restrictions connected with part-time master's studies and having a full-time job, the researcher was unable to investigate a larger and more representative sample. The data collection was completed in a short amount of time given the diversity of instruments used to gather data. This may have jeopardised the quality of the data gathered and hence its usability in subsequent studies. The researcher therefore triangulated the data gathering equipment and the data processing mechanism to guarantee that the data obtained was genuine.

- Since the researcher interviewed some teachers and HODs that she was familiar with, there was a risk of bias in the data gathering process. Triangulation was used to decrease the possibility of any negative consequences for the study's findings.

Specifically, the research focused on a sample of a cluster of schools, with a total of 50 participants, including principals, HODs, and 30 Mathematics teachers who were sampled from the Tshwane South District. Because of the small sample size, it was impossible to extrapolate the results to other groups rural and urban areas, among other factors. To generalise the results, it may be essential to use a much larger sample of people that is demographically representative.

5.6 RECOMMENDATIONS

5.6.1 Expanded opportunities for collaboration among teachers and learners

Ways must be developed through consultative and meaningful engagements among key education players to better collaborate with a single vision of developing Mathematics teachers. This should result in improved Mathematics outcomes in secondary schools in South Africa, through consultative and meaningful engagements.

5.6.2 Elevation of education to be a social issue

As per the findings of the research, several teachers have said that the social situations in which they teach are unfriendly and do not encourage learners to achieve good Mathematics results. To education to be used as a social instrument to improve society, all stakeholders and the government must work together to elevate and prioritise the provision of high-quality learning and teaching settings. The provision of high-quality and up-to-date textbooks to teachers and learners is non-negotiable since it has an influence on the quality of Mathematics teaching and learning in secondary schools.

5.6.3 Need for further mathematical knowledge

Teachers have an important role in influencing learners' mathematical results. It is possible that teachers have obsolete subject matter knowledge that is neither relevant nor taught in the current curriculum, but nevertheless appears in textbooks.

Teachers must build a thorough conceptual knowledge of Mathematics to be able to align the material with the CAPS curriculum.

5.7 RECOMMENDATIONS FOR FUTURE RESEARCH

In light of the cyclical nature of educational and academic research, the researcher offers the following prospects for additional investigation and development of Mathematics teaching and learning in Grade 9:

Collaboration in the research was centred on teachers who represented a small proportion of the total number of stakeholders in the school. Because this excluded some stakeholders who have direct or indirect influence on learners' performance in Mathematics, additional research into the roles and responsibilities of other stakeholders such as parents/guardians, principals, teacher unions, department heads, and business people will be required before the anticipated outcomes on educational processes can be evaluated authentically.

5.8 CONCLUSION

Undertaking this research project has been an eye-opening and rewarding learning experience for me. A fundamental insight into the cyclical nature of study was how it could be both uncomfortable and repetitive at times, but also very gratifying and even exciting at others. Aside from that, this study produced some crucial and interesting insights that helped me think about my own professional principles and standards, which will influence how I do future research. Despite significant constraints in terms of time, resources, COVID-19 pandemic limitations, and financial resources, it was an honour to be able to contribute to the discovery of solutions to Mathematics performance.

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APPENDICES

APPENDIX A: ETHICS CERTIFICATE

UNISA

UNISA COLLEGE OF EDUCATION ETHICS REVIEW COMMITTEE

Ref: 2020/02/19/46607595/06/AM

Name: Mrs M Chakavarika

Learner No.: 46607595

Date: 2020/02/19

Dear Mrs M Chakavarika

Decision: Ethics Approval from

2020/02/19 to 2023/02/19

Researcher(s): Name: Mrs M Chakavarika

E-mail address: mobbiechaka@gmail.com Telephone: 082 292 8384

Supervisor(s): Name: Dr M Madiope

E-mail address: Marinkiemadiope@gmail.com

Telephone: 082 579 3767

Title of research:

An investigation of challenges in the implementation of grade 9 Mathematics curriculum assessment and Policy statements in Tshwane South District Gauteng

Qualification: MEd Curriculum Studies

Thank you for the application for research ethics clearance by the UNISA College of Education Ethics Review Committee for the above-mentioned research. Ethics approval is granted for the period 2020/02/19 to 2023/02/19.

The low risk application was reviewed by the Ethics Review Committee on 2020/02/19 in compliance with the UNISA Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.

The proposed research may now commence with the provisions that:

The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.

Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the

UNISA College of Education Ethics Review Committee.

The researcher(s) Will conduct the study according to the methods and procedures set out in the approved application.

Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing.

The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.

Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data requires additional ethics clearance.

No field work activities may continue after the expiry date 2023/02/19. Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:

The reference number 2020/02/ 19/46607595/06/ AM should be c/ear/y indicated on al/ forms of communication with the intended research participants, as we// as with the

Committee.

Kind regards,

Prof AT Motlhabane

CHAIRPERSON: CEDU ACTING EXECUTIVE DE DEAN

motlhat@unisa.ac.za Sebatpm@unisa.ac.za

Approved - decision template — updated 16 Feb 2017

vvvvw.umsa.ac.za

Prof PM Sebate
ACTING EXECUTIVE DEAN

Approved - decisic

University of South Africa
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APPENDIX B: DISTRICT APPROVAL LETTER

GAUTENG PROVINCE Enquiries: Lucky Rapudi

Tel: (012) 401 6330

Department. Education Fax: 0866 522 388

REPUBLIC OF SOUTH AFRICA Email: Luckv.Raoudiôaautena.aov.za

TO: The Principal

TS District Schools

FROM: Mrs. Paula Galego

District Director: Tshwane South

DATE: 20th April 2021

SUBJECT PERMISSION TO CONDUCT RESEARCH AT AN EDUCATION INSTITUTION

Dear Sir/ Madam

Permission is hereby granted to M. Chakavarika to conduct an academic research at your institution.

The researcher shall make arrangements for research with the school management. The school staff, learners and SGB are requested to co-operate with and give support to the researcher. Research findings and recommendations are critical for policy review in public education sector.

The researcher may however not disrupt the normal school programme in the course of research. The research may only take place between the months of February and

September. Attached are other conditions to be observed by the researcher. Covid-19 safety protocols must be strictly adhered to at all times.

The school may request for the research outcome presentation directly from the researcher or obtain research document from Research & Knowledge Management Directorate at GDE Head Office.

Mrs P. Gale	Go

Regards

District Director: Tshwane South

Date: 4/5/2021

Making education a societal priority

Office of the District Director: Tshwane South

(Mamelodi/Eersterust/Pretoria East/Pretona South/Atteridgeville/Laudium)

President Towers building, 265 Pretorius Street, Pretoria, 0002

Private Bag Pretoria, 0001 Tel s (012) 401 6317: Fax: (012) 401 6318

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APPENDIX C: INTERVIEW SCHEDULE

INTERVIEW SCHEDULE- TSHWANE SOUTH SECONDARY SCHOOLS

My name is Moreblessing Chakavarika and I am a Master's Degree learner with the University of South Africa. I am conducting a study in 10 Secondary Schools in Tshwane West District.

This interview guide forms part of my master's research entitled: "Investigation of challenges in the implementation of the Grade 9 Mathematics Curriculum and Assessment Policy Statements in Tshwane South District Gauteng." You have been selected by simple random sampling strategy from the population of 50. Hence I invite you to take part in this survey.

The aim of this study is to investigate the challenges faced in the implementation of Grade 9 Mathematics CAPS curriculum. The data gathered will help to improve guidance to the Department of Basic Education and your school in strengthening the implementation of Mathematical strategies to improve the teaching and learning of Mathematics . Your school has been selected to participate because of the work you are doing, thus your views are of great value. Please take note of the following:

1. This interview is intended to collect data on the challenges faced by teachers in the implementation of the Mathematics Grade 9 CAPS curriculum in Tshwane South district of Gauteng Province.

2. You are kindly cordially invited to respond to all the items in this interview, comprising one section as honestly and frankly as possible, according to your experience and personal views. No foreseeable risks are associated with the completion of the interview which is for research purposes only. The interview will take approximately ten minutes to complete.

3. Data collected from the study will be treated as absolutely confidential; thus you are requested not to append your name or that of your school. Indication of your age, gender, position will contribute to a more comprehensive analysis. All information obtained will be used for research purposes only, your participation in this survey is voluntary, and you have the right to omit any desired question or to withdraw from answering without penalty at any stage. After the completion of the study, an electronic summary will be available to you on request.

5. Permission to undertake this interview has been granted by the Department of Basic Education and the Ethics Committee of the College of Education UNISA. If you have any research related enquiries, they can be addressed directly to my supervisor. My contact details are: 082 292 8384, e-mail mobbiechaka@gmail.com and my supervisor can be reached at 012 429 6972 Department of Curriculum Transformation, College of Education UNISA, and e-mail Marinkiemadiope@gmail.com

Estimated time of interview: 30 minutes

Do you consent to participate in this survey?	YES		NO	
Name of institution:	Pretoria Secondary School			
Date:	20 August 2021			

Instruction: The principal and Mathematics HODs to answer ALL the Sections.

SECTION A: DEMOGRAPHIC DATA FOR PRINCIPALS and HODs

Is your school boarding or day school?

day school

What is your school's demography, is it rural or urban?

urban

How many learners learn Mathematics in your school?

160

What are the highest professional qualifications of your Mathematics teachers ?

Advanced Certificate in Teaching Mathematics

Educating experience: How long have you been in office as a HOD/ principal?

5 years

What are the challenges encountered in the implementation of CAPS Grade 9 Mathematics ?

A lot of teaching content and learners are not keen to learn.

How is teaching and learning of Mathematics in Grade 9 supervised in your school?

Every two-week cycle

What is your general view about the CAPS in Grade 9 Mathematics teaching?

The topics are too broad

What are the advantages or merits of the CAPS in Grade 9 Mathematics teaching?

The CAPS Curriculum shows progression in terms of skills and certain concepts and skills are similar with the previous grade.

Mention any disadvantages(s) of the CAPS in Mathematics teaching?

The teaching time is not enough and the topics are too many.

What is your opinion regarding standards in the CAPS for Grade 9 Mathematics ?

The standards are too high.

What is your view on teachers training in the CAPS for Grade 9 Mathematics ?

The department of Education tries very hard to train all teachers but sometimes teachers do not get time to attend and insufficient time is allocated.

Suggest how each of the challenges can be mitigated to result in effective teaching and learning of Grade 9 Mathematics .

We need to increase teaching time and make sure that learners have basic Mathematics concepts before they are promoted to the other grade. Content gaps are a challenge.

How are problems being addressed by school management (SMT)?

The SMT tries to monitor curriculum coverage weekly and makes sure that teachers support learners by giving them expanded opportunities.

What resources are necessary for implementing CAPS Grade 9 Mathematics ?

A variety of textbooks, Caps Document, Subject Policies

Do you think that CAPS Grade 9 Mathematics is prescriptive? What are your feelings on the curriculum?

It’s prescriptive you have to teach what is in the CAPS Curriculum you cannot teach outside the curriculum.

APPENDIX D: DOCUMENT ANALYSIS

Documents used in teaching and learning: GRADE 9 MATHEMATICS

TYPE OF DOCUMENT	RESEARCH ASPECT ANALYSED	COMMENTS
Prescribed textbook	Is content specific Are activities enough Are examples clear Are illustrations age inclusive	NO NO YES YES
Curriculum guideline documents	Are the documents clear and informative Are assessment and content identified	NO NO
Annual Teaching Plan (ATP)	Is it easy to follow Is planned work coverable within the time planned	YES NO
Annual Assessment Plan	Is it specific on content and dates	NO
Learner exercise books	Are the books neatly covered Is work marked Is work done enough Are the illustrations used clear	YES YES NO YES
Remediation records	Are there specific remedies identified	NO
Past examination papers	Are the papers in line with curriculum guidelines	YES
Other documents that support curriculum implementation	What other documents are used	None

THE END

THANK YOU SO MUCH FOR YOUR TIME AND SUPPORT

APPENDIX E: QUESTIONNAIRE

QUESTIONNAIRE: TSHWANE SOUTH DISTRICT SECONDARY SCHOOLS

This questionnaire forms part of my master's. My name is Moreblessing Chakavarika and I am a Master of Education (Curriculum Studies) degree candidate with the University of South Africa, Pretoria, South Africa. As part of the requirements of the degree programme, I am conducting research entitled "Investigation of challenges in the implementation of the Grade 9 CAPS curriculum in Mathematics ."

You have been selected by simple random sampling strategy from the population of 50. Hence I invite you to take part in this survey.

The aim of this study is to investigate the challenges faced in the implementation of Grade 9 Mathematics CAPS curriculum. The data gathered will help to improve guidance to the Department of Basic Education and your school in strengthening the implementation of Mathematical strategies to improve the teaching and learning of Mathematics . Your school has been selected to participate because of your work, thus your views are of great value. Please take note of the following:

This questionnaire is intended to collect data on the challenges faced by teachers in the implementation of the Grade 9 CAPS curriculum in Tshwane South district of Gauteng Province.

You are kindly invited to respond to all the items in this questionnaire, comprising two sections as honestly and frankly as possible, according to your experience and

personal views. No foreseeable risks are associated with the completion of the questionnaire which is for research purposes only. The questionnaire will take approximately ten minutes to complete.

The instructions about how to respond to each item accompany the questionnaire.

Data collected from the study will be treated as absolutely confidential; thus you are requested not to append your name or that of your school. Indication of your age, gender, position will contribute to a more comprehensive analysis. All information obtained will be used for research purposes only, your participation in this survey is voluntary, and you have the right to omit any desired question or to withdraw from answering without penalty at any stage. After the completion of the study, an electronic summary will be available to you on request.

Permission to undertake this survey has been granted by the Department of Basic Education and the Ethics Committee of the College of Education UNISA. If you have any research related enquiries, they can be addressed directly to my supervisor. My contact details are: 082 292 8384, e-mail mobbiechaka@gmail.com and my supervisor can be reached at 012 429 6972 Department of Curriculum Transformation, College of Education UNISA, e-mail Marinkiemadiope@gmail.com

By completing the questionnaire, you have agreed to participate in this research.

Please return the completed questionnaire to Moreblessing before 30 August 2021.

Your anticipated cooperation will be highly appreciated.

Thank you in advance

Estimated time of interview: 15 minutes

Do you consent to participate in this survey?	YES		NO	
Name of institution:	TSHWANE SECONDARY SCHOOL			
Date:	19 August 2021			

Instruction: The Grade 9 Mathematics teachers and HODs to answer ALL the Sections.

SECTION A

Please mark a cross(X) in the appropriate box.

Gender

1	2
Male	Female

Age in years

	1		2		3		4	5
25 or younger			26-35		36-45		45-55	56 or older
3.	Teaching experience							
	1		2		3		4	5

0-5 yrs		6-10 yrs		11-15 yrs		16-20 yrs			More than 20 yrs
4.	Highest Qualification								
	1	REQV 10 (Matric or below)							
	2	REQV 11 (M+1)							
	3	REQV 12 (M+2)							
	4	REQV 13 (M+3)							
	5	REQV 14 (M+4)							
	6	REQV 15 (M+5) or above							

SECTION B

Curriculum Assessment Policy Statements (CAPS)

Below are statements regarding your opinions on the challenges you encounter regarding the implementation of the Grade 9 CAPS curriculum in Mathematics .

SA = Strongly Agree		A = Agree			
D = Disagree		SD = Strongly Disagree			
1.	I perceive the timeframes for implementing the CAPS	SA	A	D	SD

	The curriculum in Grade 9 Math's realistic?		1	2	3	4
2.	I have been supported by the implementation of the		SA	A	D	SD
	CAPS in Mathematics by the department through		1	2	3	4
	Attending cluster meetings and workshops.					
3.	I received adequate training for teaching-learning		SA	A	D	SD
	pedagogics on the implementation of the CAPS in		1	2	3	4
	Mathematics .					
4.	I require professional development on how to		SA	A	D	SD
	Adapt to the change in the new curriculum to		1	2	3	4
	Implement the CAPS in Mathematics .					
5.	I have initiated steps to upgrade myself on the		SA	A	D	SD
	Implementation of the CAPS in Grade 9 Mathematics .		1	2	3	4
6.	I received teaching and learning support material to		SA	A	D	SD
	Implement the CAPS in Grade 9 Mathematics teaching.		1	2	3	4
7.	I am unhappy with the quality of the teaching and		SA	A	D	SD

	Learning support material for implementing the CAPS	1	2	3	4
	In Grade 9 Mathematics in my school.				
8.	CAPS provide the best assessment policy that accommodates all types of learners in Grade 9.	SA	A	D	SD
		1	2	3	4
9.	CAPS helps in planning and making teaching and learning manageable in Grade 9 Mathematics .	SA	A	D	SD
		1	2	3	4
10.	The terminology used in Grade 9 Mathematics CAPS is simple and easy to understand.	SA	A	D	SD
		1	2	3	4
11.	I am guided by CAPS philosophy in my everyday teaching routine.	SA	A	D	SD
		1	2	3	4
12.	My confidence levels in the implementation of CAPS are very high.	SA	A	D	SD
		1	2	3	4
13.	Record keeping of learner performance in CAPS is negative and lacks detail.	SA	A	D	SD

		1	2	3	4
14.	Assessment in CAPS is not clearly defined and has negative implications for evaluating the Mathematics Grade 9 curriculum.	SA	A	D	SD
		1	2	3	4
15.	Lesson planning in CAPS is scanty and ineffective to assist teaching and learning.	SA	A	D	SD
		1	2	3	4
16.	Pedagogical approaches are not well defined in CAPS and that impact on quality teaching and learning.	SA	A	D	SD
		1	2	3	4
17.	I have challenges in identifying learning outcomes in CAPS grade 9 Mathematics .	SA	A	D	SD
		1	2	3	4
18.	Learners find it difficult to understand content all content planned for the term, it looks too much.	SA	A	D	SD
		1	2	3	4
19.	I have difficulty integrating knowledge and skills from Different learning areas when I implement the CAPS in Grade 9 Mathematics	SA	A	D	SD

		1	2	3	4
20.	I hardly get time to plan and execute remedial programs for my grade 9 Mathematics curriculum.	SA	A	D	SD
		1	2	3	4

SECTION B: ANSWER ALL QUESTIONS

Suggest how Grade 9 Mathematics CAPS content caters for learners who struggle with basic Mathematical concepts?

The learning content shows progression of concepts and skills from the previous grades to Grade 9 but learners struggle in the basics taught in the previous grades which makes it difficult for them to learn new concepts. They are learning gaps between the grades. They is no remedial for learners that are struggling once the cannot cope with new learning material they will eventually drop out of school.

How can learners be motivated to enjoy learning Mathematics in secondary schools?

Learners must be taught the basics and more time is needed for them to learn new matter. Topics introduced in grade 8 and 7 must be introduced again so that learners understand better. Promote a culture of learning Mathematics in learner and removing the fear that they have and say that Mathematics is a difficult subject.

What advice could you provide to Grade 9 Mathematics teachers to address the impact of CAPS on teaching and learning of Mathematics ?

Teachers need to learn the topics more, research on different approaches that they can use to teach learners and allow the learners to develop their own methods when calculating. The teachers must be facilitators not the bearer of knowledge.

THE END

THANK YOU SO MUCH FOR YOUR TIME AND SUPPORT

APPENDIX F: CONSENT FORM

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APPENDIX F

CONSENT/ ASSENT TO PARTICIPATE IN THIS STUDY (Return slip)

I LINDA VAN DE WEIDE confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet.

I have had sufficient opportunity to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty.

I am aware that the findings of this study will be processed into a research report, journal publications and or conference proceedings, but that my participation will be kept confidential unless otherwise specified.

I agree to the recording of the interview.

I have received a signed copy of the informed consent agreement.

Participant Name & Surname (please print) LINDA VAN DE WEIDE

Participant Signature

08/04/2021
Date

Researcher's Name & Surname (please print) MOKEBLESSING CHAKAVARIKA

Researcher's signature

08-04/2021
Date

APPENDIX G: EDITING DECLARATION

EDITING AND PROOFREADING CERTIFICATE

7542 Galangal Street

Lotus Gardens

Pretoria

0008

28 November 2022

TO WHOM IT MAY CONCERN

This certificate serves to confirm that I have language edited B Chakavarika's dissertation entitled, **"AN INVESTIGATION OF CHALLENGES IN THE IMPLEMENTATION OF GRADE 9 MATHEMATICS CURRICULUM ASSESSMENT AND POLICY STATEMENTS IN THE TSHWANE SOUTH DISTRICT OF GAUTENG."**

I found the work easy and intriguing to read. Much of my editing basically dealt with obstructionist technical aspects of language, which could have otherwise compromised smooth reading as well as the sense of the information being conveyed. I hope that the work will be found to be of an acceptable standard. I am a member of Professional Editors' Guild.

Hereunder are my contact details:

Dr Jack Chokwe (PhD)

Contact numbers: 072 214 5489

jackchokwe@gmail.com

Professional EDITORS Guild

Jack Chokwe
Associate Member

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