THE ROLE OF HEADS OF DEPARTMENTS IN THE TEACHING OF MATHEMATICS IN PRIMARY SCHOOLS OF THE EASTERN CAPE PROVINCE

by

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DECLARATION

I declare that “The role of heads of departments in the teaching of mathematics in primary schools of the Eastern Cape Province” is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

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SIGNATURE DATE

(Mr. Nkosinati Kennedy Zide)

DEDICATION

This study is dedicated to my late son Lunathi Zide, who died in 2014 due to cancer. He was so passionate about his schoolwork, and to my late Grandmother No-Iron Zide, my late mother, Nowetu Z Zide, and my late father, J.K. Zide for preparing me to be the author of this dissertation.

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ENKOSI

ABSTRACT

The study sought to investigate the role of Heads of Departments (HoDs) in the teaching of mathematics in primary schools of the Eastern Cape Province in the OR Tambo Inland District using a qualitative approach and a case study design in particular. Data was collected using both semi-structured and focus group interviews with eight purposively selected heads of departments in the district in six schools. Data was analysed using Colaizzi's method of data analysis from which three themes emerged.

The first one was that the current performance management system interfered with the roles and responsibilities of the HoDs in schools in their daily activities and in the organisation of their work. Second, the barriers in achieving learners' good performance in mathematics interfered with the HoDs' responsibilities to achieve good learner performance in the subject. Third, a weak support system and inadequate resources interfered with the learners' performance in the subject.

The results here indicate that HoDs for mathematics experience various obstacles, which affect subject teachers' implementation to yield positive results, ultimately leading to poor teaching and learning of the subject. These include the admission of learners without the necessary foundations in mathematics which was viewed as an obstacle to learner performance. The study further suggested that the HoDs of mathematics should be capacitated on use of teaching aids, management and administration to improve learner performance in the subject.

KEY TERMS: general education and training band; heads of department; mathematics; development appraisal system; Integrated Quality Management System; Personnel Administrative Measures

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS AND ABBREVIATIONS

ANA	Annual National Assessment
B. ED	Bachelor of Education
CAPS	Curriculum Assessment Policy Statements
DAS	Development Appraisal System
DBE	Department of Basic Education
DoE	Department of Education
ELRC	Education Labour Relations Council
ETDP SETA	Education Training and Development Practices Sector and Training Authority
FET	Further Education and Training
GET	General Education and Training
HESA-EDF	Higher Education South Africa Education Deans' Forum
HoD	Head of Department
I & FGD	Interviews and Focus Group Discussion
IQMS	Integrated Quality Management Systems
JSS	Junior Secondary School
KZN	KwaZulu-Natal
LOLT	Language of Learning and Teaching
LP	Learning Programme
NAPTOSA	National Professional Teachers' Organisation of South Africa
NATU	National Teachers Union
NCTM	National Council of Teachers of Mathematics
NECT	National Education Collaboration Trust
NGOs	Non-Governmental Organisations
NQF	National Qualifications Framework
NRC	National Research Counsellor
PAM	Personnel Administrative Measures
PEU	Professional Educators Union
PGCE	Post Graduate Certificate of Education
SA	South Africa
SACE	South African Council of Educators
SADTU	South African Democratic Teachers' Union

SAOU/SATU	Suid-Afrikaanse Onderwysunie/ South African Teachers' Union
SDP	Skills Development Plan
SGB	School Governing Body
SMT	School Management Team
TIMSS	Trends in International Mathematics and Science Study
US	United States
WSE	Whole School Evaluation

CHAPTER 1:

INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

The quality of the South African education is generally weak and wasteful as indicated by poor educational outcomes particularly in mathematics (Ngema & Lekhetho, 2019:758). Some of the factors that cause learners' poor performance in mathematics include negative attitudes towards the subject, lack of suitably qualified and skilled teachers of mathematics, increased teacher workload, and poor working conditions. From a rigorous analysis of the regional Southern and East Africa Consortium for Monitoring Educational Quality assessments, Spaull (2013:27) concluded that some mathematics teachers experience a mathematics content gap and are then also found to be unable to teach at the required standard. The present study on the role of Heads of Department (HoDs) in the teaching and learning of mathematics was largely motivated by my twelve years' hands-on experience as a teacher, teaching mathematics and my recent involvement in school management as an HoD for more than a year. During this period, I observed consistent poor performance of learners in the subject that merited further investigation.

The dismal situation highlighted above prompted me to undertake this research focusing on the role of HoDs in addressing the problem of learners' poor performance in mathematics using a qualitative approach. The findings generated from this study could enable school managers and teachers to plan and develop strategies that can improve working conditions in their schools. The study also aimed at developing a model that could help principals to manage the teaching and learning of mathematics effectively in order to improve learner achievement in the subject and adopt some best practices in this regard. This chapter covers all the key elements of the study, that is, background to the study, statement of the problem, purpose and significance of the study, among others.

1.2 BACKGROUND TO THE STUDY

As part of the national reforms that were launched after 1994 in South Africa, significantly more authority and responsibility for decision-making have been devolved to schools than was the case previously (Chapman, Muijs, Reynolds, Sammons & Teddlie, 2015:4). In terms of this approach, schools have to self-manage or govern themselves, and assume a high degree of autonomy in managing their own affairs (Chapman et al., 2015:149). In

spite of this, schools still receive support from the provincial and national departments of education, and to this end, they have to follow the established guidelines and policies. Principals hold the sole responsibility of managing and leading what happens within their schools. Moreover, the South African Schools Act (SASA) (department of Education [DoE], 1996) includes parents in school governance matters and giving them an opportunity to transform schools in order to become more self-reliant and efficient (Chapman et al., 2015:150).

Furthermore, Alsharif and Alamri (2020:140-141) emphasised that good management is vital in education, but its key goal is to promote effective teaching and learning in schools. The management structures of schools in South Africa have a major role to play in any curriculum development efforts intended for the child, as well as many other aspects the child may face in life. The school management structure known as School Management Team (SMT), consists of the principal (school manager), deputy principal (deputy manager) and HoDs. The SMT is responsible for effective teaching and developing a culture of learning by ensuring a sound school culture in a dynamic and supportive manner (Darling-Hammond, Flook, Cook-Harvey, Barron & Osher, 2019:3). Normally, there is only one principal per school whereas the number of deputy principals and HoDs varies for each school determined by the learner enrolment numbers.

The school principal is required to play a key role on the SMT; i.e., to cultivate a success-oriented school culture; forge cooperation among staff; and promote academic excellence in order to improve the educational outcomes of the school. The SASA (DoE, 1996: section 16(2)) stipulates that the principal must undertake the professional management of a public school in order to carry out the expected duties, which include, but are not limited to the implementation of all the educational programmes and curriculum activities; the management of all teachers and support staff; the management of the use of learning support material and other equipment; the performance of functions delegated to him or her by the District HoD in terms of the Act; the safekeeping of all school records; and the implementation of policy and legislation.

The principal's duties as stipulated in the Employment of Educators Act 76 of 1998 underscore the need for the distribution of responsibilities in instructional management. The deputy principal is expected to carry out some of the delegated duties of the principal and assist in the daily running of the school. According to Lumadi (2017:1), the main

function of the deputy principal is to assist the principal to manage the school properly and promote the learners' education at all times in order to achieve the goal of producing good results.

The HoDs on the SMT are tasked with the implementation and monitoring of curriculum in schools (George, Shava & Heystek, 2019: 63). They are responsible for ensuring that all development and transformation policies that govern the prescribed curriculum are implemented effectively. Mestry (2017:2) further stated that they are expected to give advice to principals concerning the sharing of responsibilities among the staff in the department. They are also required to teach, as stipulated in the Education Labour Relations Council Act 76 of 1998: section 4.4(iii). This study, therefore, sought to explore the role played by HoDs in primary schools with specific reference to mathematics. One of the main reasons for this is that the Department of Basic Education (DBE) is in crisis, particularly with regard to the serious underperformance of learners in mathematics mostly in public schools (Makofane & Maile, 2019:37-38).

The National Department of Education and Training has attempted to address the situation by introducing a programme of delivering workbooks to schools and setting national examinations (the Annual National Assessments (ANA)) to tackle this problem (McKay, 2018:98). As a mathematics teacher by profession, I have witnessed the struggles encountered by teachers and learners on a daily basis concerning the teaching and learning of this subject. Despite improvements in other subjects and the concerted efforts and initiatives to improve the learners' performance in mathematics, most of them continue to fail in their endeavours. Admittedly, all the stakeholders in the schooling system, particularly the SMT, often make different interventions to ameliorate the dismal achievement of learners in the subject; however, the situation does not seem to change. An HoD is a curriculum manager in a school, and thus, they should help in any strategy designed to tackle the problem of learner underachievement.

Mathematics is regarded as an important subject in the life of an individual. Dan'inna (2017:2) contended that inadequate skills and knowledge of the subject impacts negatively on the individual's ability to make vital educational, life and career judgements. Mathematics is widely regarded as a 'gatekeeper' of learners' success or failure, school graduation and career success (Sherman, Richardson & Yard, 2019:4-5), partly because it influences performance in other subjects. In spite of this, studies have shown that a

large number of children leave school lacking both competence and interest in mathematics (Banerjee, 2016:2). This study, therefore, aimed to investigate the role that the HoDs play to ensure effective teaching and learning of the subject. A focus on the HoDs is informed by the notion that distributed leadership recognises that there are multiple leaders in schools and that leadership responsibilities should be shared within and between institutions (Singh, 2014:13). Therefore, in this sense, there is a need for the SMT to share responsibilities in order to tackle poor learner performance in mathematics.

Managing curriculum implementation is a key function of the HoDs. In this respect, Mahlangu (2016:36) observed that the HoDs are expected to help teachers understand and implement curriculum policies, such as the assessment policy, the learning area policy, and the language policy. He further explained that curriculum implementation, and effective teaching and learning depend on how the HoDs play their roles. As cited in the DBE (2016:7), the Personnel Administrative Measures (PAM) outline that, among other things, the curriculum managers in schools should coordinate evaluation/assessment, homework, written assignments, and other related curricular matters for various subjects as allocated and furnish guidance on the latest strategies on how to teach mathematics, including methods, techniques, evaluations, aids and so forth.

Each role player in the SMT has an essential role to play in improving the quality of performance across the curriculum of their school. However as indicated in the background to this study, the learners' poor performance in mathematics persists in spite of several mechanisms put in place to address this challenge. For example, the Developmental Appraisal (DA) model emphasises the following features: simplicity, feasibility, legitimacy and flexibility (Education Labour Relations Council, 1996: s1 [1.1] and [1.2]). It further advocates that development appraisal should facilitate personal and professional development of teachers in order to improve the quality of teaching and school management (ELRC, 1996: s2 [2.1]).

An HoD also has to effectively convey the principles and elements of the DA to the staff members concerned; and participate in a mutually agreed school/teacher appraisal process in order to review teachers' professional practice. The aim of this is to improve teaching, learning and management in a school.

After the introduction of a new schooling system in South Africa in 1994, policies and legislation redefined the concept of leadership, management and governance in schools as a way of making the school managers self-reliant and responsible for the management of their own affairs (DBE, 2016:9). In terms of SASA, more power has been given to the SMTs of schools to govern their schools in a more independent, accountable and transparent manner. By implication, as part of the SMT, the HoD can play a significant role, and institute programmes aimed at uplifting the standard of learners' academic performance and of the schools by extension.

The Human Resource Department of the University of Sheffield (2013: 1) explains that the term HoD applies to post holders who have been appointed to be responsible for either an academic department or school. The HOD is required to lead and manage the department effectively so that it can achieve the highest standards of excellence in all its activities and programmes. In the context of this study, an HoD can be understood to be someone who is in a position of curriculum leadership. In addition, curriculum leaders are usually expected to be at the cutting edge of content subject knowledge, teaching, evaluation and planning for about their subject area for learning. As heads of curricula, the HoDs are expected to be more knowledgeable about their fields or subjects than their subordinates. The depth of knowledge of the subject area opens doors for HoDs as departmental leaders to find ways that can achieve a high standard of teaching and learning.

In order for an HoD to become successful, they should perform the following functions:

- perform the tasks of a post level 1 teacher and head a department for a particular subject or group of subjects;
- actively assist the principal in assuring competent practice, standards, and expertise in teaching and learning of subjects through professional reflection and discussions with teachers;
- with the guidance of the relative Circuit Officer, nourish a rigorous process of reciprocal informal observation of class teaching practices;
- advise and contribute to curriculum development at school and system level under the direction and guidance of the respective Circuit Officer;
- coordinate the teaching and learning of the subject/s for which they are responsible;

- set examination papers, coordinate marking schemes and moderate examinations and assessment processes at one's school as well as in other schools;
- ensure timely and adequate provision of textbooks, materials, and equipment required for the effective teaching of the subject across schools in the College;
- ensure that the maintenance and upkeep of equipment related to the subject at school is regularly carried out;
- prepare specifications and budgets for the requirements of the subject specific teaching tools and equipment, including laboratory equipment;
- mentor other teachers in the subject/level of their specialisation;
- hold and lead regular departmental meetings and ensure the keeping of minutes;
- encourage participation in mathematics projects and other projects in accordance with the school development plan (SDP) targets as agreed with the SMT (DoE, 1996: s16).

Despite the abovementioned duties being clearly defined, the current situation in which the HoDs work is far from this ideal and makes it difficult to carry out the specific duties. In the Eastern Cape Province, there is a shortage of mathematics teachers which forces the HoDs to divert from their expected duties of management and administration as specified and focus more on the operational level, namely teaching learners (DBE, 2016: 36).

Several studies have been carried out around the world on the management of change in schools and have described the importance of principals and SMTs in improving schools (Benoliel, 2017:66). However, they note that little focus has been given to the roles of HoDs in managing change as they are also leaders and managers of their respective departments. Against this background, this study aims at investigating the role of the HoDs in the teaching and learning of mathematics in primary schools of the Eastern Cape Province.

1.3 PROBLEM STATEMENT

Over the years, the South African education system has been faced with a problem of poor learner performance, particularly in mathematics, both in the General Education and Training (GET) and Further Education and Training (FET) bands of public schools (Jojo, 2019:5). Several intervention on plans of action have been introduced to address this challenge; however, the problem of dismal learner performance in mathematics persists.

The HoDs have a major role to play in effective management and implementation of curriculum in schools. Their role involves improving learners' achievement in the subjects for which they are responsible within designated departments and the overall functioning of the entire school, particularly on curricular matters. The HoDs are ideally curriculum leaders who should ensure that effective teaching and learning occurs in schools. Currently, there is a high failure rate of learners in mathematics in the General Education and Training (GET) phase (Grades R to 9) in South Africa, which is a major problem in schools in the OR Tambo Inland District. These problems emanate from various factors, which include failure by the HoDs to supervise and monitor the teaching and learning of the subject for which they are responsible, which, in this study, is mathematics. Therefore, this study aimed at investigating the role of the HoDs in the teaching and learning of mathematics in the GET band (Grades R to 9).

1.4 RESEARCH QUESTIONS

In order to bring the problem statement into sharp focus, the main research question and sub-questions that this study sought to address were formulated as follows.

Main research question

What role do the heads of department play in the teaching and learning of mathematics in the General Education and Training Band?

Sub-questions

- What policies and workshops are in place to help the HoDs in the performance of their duties?
- What role do the HoDs play in mathematics teaching and learning?
- What are the HoDs' perceptions of the high rate of learners' underachievement in mathematics?
- What strategies do the HoDs employ to ensure effective teaching and learning of mathematics in schools?
- How effective are the strategies put in place to enhance learners' achievement in mathematics?
- What can the HoDs and their departments do to address the poor performance of learners in mathematics?

1.5 AIM AND OBJECTIVES OF THE STUDY

1.5.1 Aim

This study aimed to investigate the role of HOD in the teaching of mathematics in primary schools of the Eastern Cape Province.

1.5.2 Objectives

- To investigate the role of HOD in teaching and learning mathematics.
- To recommend the best practice that would enhance the performance of teachers in mathematics in the General Education and Training Band in the district of Mthatha.
- To identify and describe the current policies and workshops in place that help HoDs' develop their expertise in their field of management.
- To describe the role played by HoDs in mathematics teaching and learning.
- To explore HoDs' perceptions on the challenge of high underperformance in mathematics.
- To determine the current strategies used by HoDs in the development of mathematics.
- To identify challenges influencing poor performance in mathematics.

1.6 SIGNIFICANCE OF THE STUDY

It is assumed that the findings and recommendations of this study would contribute to the improvement of learners' achievement in mathematics not only in the selected schools, but also in other schools nationally. The findings could also help the officials of the DBE at various levels, SMTs, the HoDs, mathematics teachers and parents in formulating effective intervention strategies and programmes that could enhance the learners' achievement in mathematics.

Some of the benefits that may come out of the study include the following: an improvement in the learners' abilities in all components of mathematics; a positive attitude towards mathematics; an increase in the learners' technical and academic competencies in mathematics; enhanced learners' independence and creative thinking; and the improved interaction and cooperation between learners and teachers.

1.7 RESEARCH METHODOLOGY AND DESIGN

The study used a qualitative research methodology. As Ruben and Babbie (2016:649) postulated, qualitative researchers try to study human behaviour from the perspective of participants or insiders. This approach involves an emic understanding, meaning that behaviour is explored and described from the participants' perspective and is context-specific. The research design, population, sample and sampling methods applied in this study are discussed in more detail in the following sub-sections.

1.7.1 Research Design

Research design refers to an overall plan for conducting research including data collection, sampling, ethics and analysis (Creswell, 2014:2). This study adopted a qualitative approach and a case study design specifically. Qualitative research seeks to explore and understand the meanings that individuals or participants give to a social or human problem (Creswell 2014: 4). The problem and nature of data to be generated in order to answer the research questions influence the choice of a qualitative design. Data was collected from the HoDs, and the study focused on eliciting in-depth descriptions of the HoDs' views and experiences regarding the role they played in teaching and learning and learners' performance in primary schools of the OR Tambo Inland District. A case study is defined as an "intensive study about a person, a group of people or a unit, which is aimed to generalise over several units" (Heale, 2018:8). The views of the HoDs in relation to the current performance of learners in teaching and learning and their suggestion on effective measures that can improve the learners' outcomes during formative and summative assessments were fully described. The goal was to explore and understand human behaviour, rather than to describe and predict it (Ruben and Babbie, 2016:57).

1.7.2 Population

The population of a research study is the entire group of persons or objects that the researcher wants to explore and understand (Asiamah, Mensah & Oteng-Abayie, 2017:61). The population of this study included 12 HoDs in the OR Tambo Inland District. The HoDs were considered to be appropriate participants as they were directly involved in the management of both learning and teaching mathematics in the primary schools of OR Tambo Inland District.

1.7.3 Sampling and Sampling Methods

Sampling involves selecting research participants from the entire population, or the process by which a sample is drawn (Asiamah et al., 2017:67). Due to the qualitative nature of this study and the need to access rich data that is relevant to the research questions and objectives, non-probability sampling method was used to select the participants. Non-probability sampling is any kind of sampling where selection of research participants is not determined by the statistical principle of randomness (Alvi, 2016:29).

Participants in this study were identified according to their knowledge, experience and the type of information that was sought. Purposive sampling was used to select 12 participants for this study based on the researcher's judgement about their knowledge of and experience of the phenomenon under study. A more detailed discussion of the research methodology used in this study is provided in Chapter 3.

1.8 RESEARCH SETTING

The research setting refers to the location where the study is conducted (Alvi, 2016:33). The inquiry was conducted in selected primary schools in the OR Tambo Inland District, in the working environment of the participants. Further details on the research context are provided in Chapter 3.

1.9 DATA COLLECTION

According to Sutton and Austin (2016:227), data is collected in order to understand the experiences of participants and to document the meanings that they have created. To achieve this, semi-structured interviews and focus group discussions were conducted wherein only broad guidelines were used to direct the process of collecting data. The rationale for these approaches is that they allow for deeper, more thoughtful responses, as they are not based on preconceived answers, and they are appropriate for explanatory studies as they provide rich, diverse data (Sutton & Austin, 2016: 228). Ruben and Babbie (2016:292) stated that group interviews create meaning when participants engage in discussions that provide direct evidence of the similarities and differences in their views.

The focus group interview is a method where participants meet in a group to discuss a topic formulated by the researcher under his or her guidance. Focus group interviews were deemed appropriate for this study as they allowed participants to share their

thoughts, views and experiences, and they facilitated the generation of new ideas about the roles and performance of the HoDs and the strategies that they proposed to improve professional practice. Further details on the interviews and focus groups are provided in Chapter 3.

1.9.1 Data Analysis

Bengtsson (2016:9) defined data analysis in qualitative studies as a process of inductive reasoning performed during and after data collection. The study followed Colaizzi's (1978) process of qualitative data analysis to identify common issues that recurred, which were summarised in a narrative form. A detailed account of the data analysis procedures is provided in Chapter 3.

1.10 DEFINITIONS OF KEY CONCEPTS

1.10.1 Head of Department

In a school context, the main functions of the HoD are to lead the development and delivery of a specific subject area and manage the teaching staff and financial resources allocated to the DBE (2016:34). In this study, the HoD is a teacher in a school in charge of a subject, learning area or phase.

1.10.2 Mathematics

Mathematics is a form of expression or language that uses symbols and notations to describe numeric, geometric and graphical relationships. It involves observing, representing and investigating patterns and quantitative relationships in physical and social phenomena and between mathematical objects themselves. It helps to develop mental processes that enhance logical and critical thinking, accuracy and problem-solving that can contribute to decision-making (DBE, 2016:36).

1.10.3 Primary Schools

According to the DBE (2016:39), the South African existing schooling system and formal learning institutions are classified as follows:

- Pre-school: catering for children from 3 years to 5 years.
- Primary school: catering for learners from Grade R to Grade 7, ages 6–13 years.

- Secondary school: catering for learners from Grade 8 to Grade 12, ages 14–18 years.

1.10.4 Role

Role is defined ‘as a set of associated practices, rights, obligations, ideas, and norms as conceptualised by people in a social situation’ (Arain & Arain, 2016:108). In this study, this refers to specific duties performed by the HoDs on a daily basis.

1.11 ASSUMPTIONS

This study assumed that some of the HoDs do not have relevant academic and professional qualifications though they may be well educated. In spite of this, the study assumed that the HoDs had an innate capacity for determining their teaching techniques and knew what was applicable in their classrooms and what worked best for them in obtaining the desired learning outcomes. This study assumed that the teachers would be willing to cooperate and help in any way possible.

1.12 DEMARCATION OF THE STUDY

This study was conducted in eight schools of Circuits 9 and 12 in the OR Tambo Inland District of the Eastern Cape Province. The participants in the study were 12 HoDs from the selected eight schools. The main aim of the study was to investigate the role of the HoDs in the teaching and learning of mathematics in the GET Band in the OR Tambo Inland District. This study also recommends best practices that could enhance the performance of teachers in teaching mathematics in the General Education and Training (GET) band in the OR Tambo Inland District.

1.13 LIMITATIONS OF THE STUDY

Some of the limitations of the study include the fact that it was confined to one district of the EC Department of Education, namely the Oliver Tambo Inland Circuit, although there are many districts within the EC Province. This demarcation limited the generalisation of the study findings to other districts. This study was demarcated to Circuits 9 and 12 of the OR Tambo Inland District out of many circuits in the district. It would have been ideal if the study were extended to more circuits. However, all the above limitations of the study did not jeopardise its significance to teachers, learners, curriculum advisors, HoDs and policy makers.

1.14 CHAPTER OUTLINE

This study is composed of five chapters structured as follows:

Chapter 1: Introduction and Background

This chapter presents the background to the study and the related components, namely problem statement, aim and objectives of the study, significance of the study and the definition of terms.

Chapter 2: Literature Review and theoretical framework

This chapter reviews the relevant literature as well as the theories related to the study.

Chapter 3: Research Methodology and Design

The chapter discusses the research methodology followed in undertaking the study, the research methods, procedures and sampling techniques used to obtain and process data.

Chapter 4: Data analysis and interpretation

This chapter is devoted to an analysis, interpretation and discussion of the findings that emerged from data collected.

Chapter 5: Conclusions and recommendations

In this final chapter, the conclusions of the study are drawn and recommendations intended to improve the practice in relation to the study problem are proposed.

1.15 CHAPTER SUMMARY

This chapter presented the introduction and background to the study. It stated the research problem, research question, aim and objectives of the. The operational terms such as an HOD, mathematics and role were defined. The qualitative research methodology and a case study design adopted for this study were explained briefly. The assumptions, demarcation and limitations of the study were outlined as a detailed discussion on these is included in Chapter 3. Finally, an outline of the dissertation was presented. The next chapter presents a literature review and the theoretical framework for the study.

CHAPTER 2:

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 INTRODUCTION

Chapter 1 briefly discussed the history of the South African education system. The problem statement, motivation for the study, aims and objectives, main research question and sub-questions, preliminary literature review, and research methods were discussed. This chapter presents literature review based on the main research question and its sub-questions. Indeed, the literature review is aligned to the research questions. This chapter discusses the literature on the current and ideal situation of the DBE on subject areas, conceptualisation, teaching and learning of mathematics in the Senior Phase, and the leadership and management of the HoD.

2.2 CURRENT AND IDEAL SITUATION OF DEPARTMENT OF EDUCATION ON SUBJECT AREAS

Although the change in the education system signifies a great achievement, the poor quality of passes in key subjects such as mathematics, physical sciences, accounting, life sciences, economics, geography and history, remains a matter of concern to the DBE. A national diagnostic report on learner performance revealed that these subjects are still registering pass rates below 50% at the 40% achievement level (DBE, 2016:3). This was the case despite the fact that the DBE had planned to improve the results in these key subjects and stated that the “quality” must be the focus in 2013 (DBE, 2013:23). This would allow the DBE to develop a quality improvement plan and implement it accordingly (DBE, 2013:23; McKay, 2020:1).

For the DBE to accomplish the desired educational results, teachers should be well equipped to meet the challenges of teaching mathematics well. In the same vein, an earlier study by Mosoge and Pilane (2014:6) confirmed that sound subject knowledge, experience and education level of teachers lead to good passes in the subject area. They further suggested that the HOD should be an expert in the subject area to support other teachers. Similarly, a study by Mohale (2014:2) recommended that HoDs should be appointed on the strength of their subject expertise. This would provide opportunities to all teachers who have specialised in the subject area.

Recent studies have highlighted the decline in the pass rate of Grade 12 mathematics, from 59.1% in 2013 to 53.5% in 2014 as announced by the Minister of Basic Education in January 2015 (DBE, 2015:50). Some initiatives to overcome the situation were to ensure availability of assisting programmes such as Mathematics, Science and Technology (MST) grant and Funza Lushaka Bursary programme (DBE, 2017:23). This would help to develop teachers in the mathematics field and the MST grant will also help in providing teaching aids and funds for professional development skills in the field of mathematics.

In addition, the National Development Plan proposes a target of 450 000 learners who would be eligible for a Bachelor's programme with mathematics and science by 2030 (DBE 2018:14). The DBE will continue to seek initiatives and strengthen institutional mechanisms such as the MST Grant and the Funza Lushaka Bursary Programme to promote teaching and learning of these subjects (EC DoE 2016:34). The DBE (2016:30) report on the performance of learners in mathematics revealed that in spite of the interventions highlighted above, the challenges persist.

2.2.1 The Management and Leadership Role of the HOD

There are different understandings and conceptualisations of the roles and responsibilities of the head of a department within a school context. The HoD has formal responsibilities and accountabilities and exerts influence horizontally and vertically within and beyond the department and school (Jacobs & Spangenberg, 2014:8). In order to tackle the challenges facing the education system, especially the underperformance of learners in mathematics, it is imperative to embrace new ways of looking at leadership in relation to learner performance. In this context, it is imperative to explore and possibly adopt instructional leadership, as it is a well-researched area of study globally. This kind of authority is also appropriate in the South African schooling system. Instructional leadership helps to ensure that every learner receives top-quality instruction daily. Applying this requires that instructional leaders lead for the enhancement of the quality of teaching and for the advancement of student learning (Daniyan, 2015:13).

Moreover, Adler (2017:31) asserted that the mathematics HoD should serve as an instructional leader and regard teaching and learning as the central task of their job. He further stated that the effective instructional leadership of the HoD can enhance learner achievement significantly. The improvement in the learners' academic performance at a

departmental level depends on several factors, like the dedication of the HoD to the subject area. The DBE (2013:9) indicated that the concept of instructional leadership is aimed at enhancing the school's core activities of teaching and learning.

According to Brown, Armstrong and Thompson (2014:2), the instructional support that the HoDs provide to mathematics and science teachers is linked to instructional leadership theory in that the concept is strongly concerned with teaching and learning, including the professional learning of teachers. This is consistent with the finding of Brown et al. (2014:6) that the support that the HoDs as teacher-leaders provide to mathematics teachers includes work-related tasks such as providing the necessary resources, space and addressing adequate time and professional development issues.

According to the Organisation for Economic Cooperation and Development (OECD) (2017:10), an extensive volume of work concerned with managing the teaching and learning process takes place at the middle management level in schools. However, the OECD (2017:10) also reported that the local and international literature on school leadership fails to emphasise the key role that HoDs play or could play in coordinating curriculum development, monitoring and ensuring the delivery of quality teaching. The OECD further cautioned that leadership development that relies totally on experiential teaching and learning including peer mentorship without expertise runs the risk of ending in malpractices.

In a study that evaluated the role of HoDs in enhancing school improvement in public secondary schools of Limpopo province, Maluleke (2014:56) noted that the goal of attaining better results in mathematics has still not been achieved because of ignorance and lack of competence at different levels of school management.

A study by Moyo (2004:36) identified the following leadership paradigms, which play a vital role in organisational management: scientific education management approach, education management approach and education governance and management. Table 2.1 below displays these.

Table 2.1: Leadership paradigms in South Africa

1 Scientific Education Management [Control]	2 Education Management [Leadership]	3 Governance and Management [Facilitation]
• Professionalism • Hierarchy and regulation • Rule compliance • Planning • Organising • Guiding • Control • Works study • Personnel classification	• Decentralisation • Devolution of power • Performance • Strategic planning • Mission driven • School effectiveness • Human resource management • Total Quality Management • Customer focus	• Relationship building • Recognition of diversity • Participation and communication • Responsiveness • Balance and reconciliation • Collaboration • Change Management • Support • Negotiation

Source: Moyo (2004)

In a study that investigated the role of instructional leadership within the education system, Hompashe (2018:3) stated that the mission of leadership is to bring people from the place where they are to a place where they have never been. Therefore, where leadership exists, leaders usually move teachers from poor performance to a higher standard. In the context of this study, this requires leaders or HoDs who can provide strategies that seek to improve the standard of education in mathematics. Glewwe and Muralidharan (2016:19) asserted that school leadership lies second in importance to learning, after the quality of classroom teaching. They further elaborated that the quality of classroom teaching depends on the quality of school management. Similarly, a study by Saavedra (2017:5) of 100 schools that were managed or administered well, found that 93 had good performance and this was attributed to good administration. Out of 100 schools that were not managed well, only one had good levels of learner achievement.

The conclusion that can be drawn from the above findings is that, to some degree, learners' achievement depends on effective management of the school. Moreover, strong leadership is required to influence teachers to raise learner achievements. In highlighting the influence of leadership on school effectiveness, Posner and Kouzes (2018:9-10) submitted that guidance in authority contributes between 4 and 8% of the variation in learner attainment across schools and maintained that leadership and management

functions should be balanced and accept challenges and enable others and their teams and schools to fulfil the extraordinary activities.

Besides the heavy workload the HoDs of mathematics might experience, a study by Mokgohlwe (2016:56) reported that a few factors that impact collaborative or distributed authority include the totalitarian ethos of the principal; cultural and gender biases; teams' meetings; and teachers' wariness to engage in leadership roles. Despite HoDs' numerous challenges listed above, the concept of 'curriculum head' or 'curriculum developer' cannot be separated from the instructional leader. This means that the HoD of mathematics has a designated role to perform in curriculum implementation. The school principal, deputy principal and HoD should execute their duties and responsibilities with dedication. He further stated that some of the duties and responsibilities that the principal and deputy principal should perform are in the realm of administration, personnel, teaching, interaction with stakeholders, extracurricular activities and communication.

The guidelines on mentoring, evaluation, and development assist in the implementation of curriculum; hence, the study reflects on the Integrated Quality Management System (IQMS) and Performance Management Standards as the programme to be led by curriculum heads in schools. In South Africa, this was introduced as a measure to hold schools accountable though their democratic unions which linked the IQMS with pay progression, which distorted its developmental purpose (Mosoge & Pilane, 2014:1).

The HoD of mathematics is expected to design programmes that focus on planning, preparation, teaching techniques, classroom management, classroom environment, curriculum knowledge, learner assessment. The DBE (2016:76) reported that lesson plans had been developed to assist teachers to align their teaching plans with the Learning and Teaching Support Material (LTSM) in Mathematics, Natural Physical Sciences and Technology at Senior and FET Phases.

2.2.1.1 Characteristics of an HoD

HoDs should possess necessary skills and qualities of being experts in their academic fields. The DBE (2016:30) indicated that these skills help in providing quality education to learners. Those skills and qualities include, but are not limited to, the following: a comprehensive understanding of current educational trends, particularly trends in the teaching of mathematics; being an excellent classroom teacher; excellent organisational

and time management skills; ability to use different points of view to assess situations; competence to work collectively as part of a team; ability to successfully manage a number of diverse tasks in a busy school environment; ability to communicate positively and effectively with all members of the school community; a commitment to ongoing professional development; a commitment to extracurricular activities; and an acceptable sense of humour with a positive outlook.

2.2.1.2 Influence of HoDs in the mathematics pass rate

By virtue of being responsible managers of their subject areas, HoDs ought to ensure that learning materials and other devices are available for use in their respective classes. This helps learners to pass mathematics as they will use these devices and materials to study better. The HoDs also play a dominant role in recruiting teachers that are experts in their areas. Such teachers would contribute to the pass rate of the subjects they teach. However, these HoDs also play a major role in the curriculum development and implementation process. Lastly, their influence positively contributes to the entire performance of learners in their subjects (Sofowara, 2014:29).

2.2.2 Teaching and Learning of Mathematics in Senior Phase

This section is made up of two parts, namely mathematics curriculum, and support and workshops in place for mathematics teachers.

2.2.2.1 Mathematics curriculum

In its Curriculum Assessment Policy Statements (CAPS), the DBE (2014:10) stipulated that mathematics in Senior Phase covers the following five main content areas: numbers, operations and relationships; patterns, functions and algebra; space and shape (geometry); and measurement and data handling. Each content area contributes towards the acquisition of specific skills. In terms of the CAPS, each subject should have a curriculum in place before it is implemented (DBE, 2013:15). This helps teachers to understand the expected areas to be covered in the subject. Curriculum is developed based on a situational analysis, which informs the planners about the areas to be covered in the subject field. In particular, a curriculum for mathematics is a document that guides teachers in the teaching and learning of the subject.

According to the United Kingdom's Department for Education (2013:3), the country's Advanced Mathematics Support Programme/Mathematics Enhancement Programme outlines the aims of mathematics national curriculum and ensures that learners become fluent in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time. This is done to develop their conceptual understanding and ability to recall and apply knowledge rapidly and accurately. In the same vein, Stabback (2016:8) explained that a well-developed curriculum influences learner achievement. He proposed that a curriculum should be composed of material and other resources that support the learning.

In a study that explored active learning approaches in mathematics education at universities, Jameela and Alib (2016:123) asserted that learners' enjoyment of mathematics promotes the pass rate in the subject. They further stated that a country with low support for mathematics would experience challenges in getting high numbers of learners enrolling for mathematics in post-school programmes. However, they noted that a lack of mentoring and competent teachers, and enough resources to support learning lead to many learners, including those with potential, failing mathematics or dropping the subject altogether.

In South Africa, the mathematics curriculum was developed under CAPS to improve learners' performance in mathematics after many curricula had been tested after 1994, namely Outcomes-Based Education, the NCS, the Revised National Curriculum Statement (RNCS) and CAPS. These South African curriculum strategies have led to some good outcomes in mathematics although the country is significantly underperforming in mathematics education in comparison with other countries including those with poorer economies in a sub-Saharan Africa. This is a worrying situation that raises the question of whether the HoDs are effective enough as subject teachers and in supervising the teaching and learning of mathematics. Further, Byrne, Carthy and McGilloway (2019:3–4) recommended that a well-developed curriculum influences learner achievement. They also proposed that a curriculum should be composed of material and other resources that support learning. In South Africa, the CAPS for mathematics describes this curriculum and presents a policy statement for learning and teaching of mathematics in South African schools (DBE, 2016:14).

One of the objectives of the CAPS is to endow learners, irrespective of their socio-economic background, race, gender, physical or intellectual ability, with the knowledge, skills and values necessary for self-fulfilment, and meaningful participation as citizens in a free country (DBE, 2016:4). Thus, it is important that mathematics curriculum for Grades 7–9 should be designed in a manner that would enable the attainment of these outcomes.

The CAPS is based on seven principles, which stipulate the minimum standards of knowledge and skills to be achieved at each grade. These seven principles are: (i) social transformation: ensuring that the educational imbalances of the past are redressed, and that equal educational opportunities are provided for all sections of the population; (ii) active and critical learning: encouraging an active and critical approach to learning, rather than rote and uncritical learning of given truths; (iii) high knowledge and high skills: the minimum standards of knowledge and skills to be achieved at each grade are specified and set at a high but achievable standards in all subjects; (iv) progression: content and context of each grade shows progression from simple to complex; (v) human rights, inclusivity, environmental and social justice: infusing the principles and practices of social and environmental justice and human rights as defined in the Constitution of the Republic of South Africa. The CAPS is sensitive to issues of diversity such as poverty, inequality, race, gender, language, age, disability and other factors; (vi) valuing indigenous knowledge systems: acknowledging the rich history and heritage of this country as important contributors to nurturing the values contained in the Constitution; and (vii) credibility, quality and efficiency in providing an education that is comparable in quality, breadth and depth to those of other countries (DBE, 2013:24).

Despite the low academic results of learners, the curriculum is clear and well structured; however, the challenge is that it is not implemented properly because of numerous factors such as a shortage of resources and suitably qualified and competent teachers, who are required to deliver the curriculum competently in the classroom and achieve good learner outcomes. The DBE (2014:6) stipulated that the instructional time in Senior Phase (Grades 7, 8 and 9) in all nine subjects including mathematics, should be 27.5 hours per week, wherein mathematics is apportioned 4.5 hours per week.

The teaching and learning of mathematics is a complex process that involves multiple challenges, and as such, the mathematics HoD should be capacitated and empowered as a leader, manager and mathematics teacher. What is implemented in the classroom

should reflect good pedagogical practices that are in line with the curriculum objectives. However, Sofowara (2014:53) asserted that studies conducted by the Trends in International Mathematics and Science Study (TIMSS) in mathematics classrooms revealed that teaching is cultural since most teachers within a culture use similar methods. The study also established that teachers with strong mathematical knowledge showed the same cultural patterns of teaching as teachers with weaker knowledge. This suggests that improving the culture of teaching can enhance student learning and outcomes in mathematics. Among other strategies of ensuring good outcomes in learning and teaching is the ongoing motivation of learners. Similar studies by Brown, Armstrong and Thompson (2014:7) showed that knowledgeable teachers motivate learners while the less knowledgeable ones can have a demotivating effect.

Moreover, the effective learning of mathematics in the classroom is often associated with a good quality of mathematics instruction. In this regard, Glewwe and Muralidharan (2016:654) maintained that improving the quality of mathematics instruction across classrooms, schools and jurisdictions is a pressing issue for both researchers and practitioners. They further contended that school leaders in many countries are under increasing pressure to improve student learning opportunities in mathematics.

Although there have been continuous efforts by different stakeholders to improve the classroom image and learning, in most classrooms, particularly of mathematics, learners lack the ability to grasp mathematics concepts as expected. This is a consequence of teachers failing to organise and manage the classrooms to maintain order and achieve subject objectives.

One of the responsibilities of the mathematics HoDs is to deal with non-compliance and poor implementation of curriculum. This gap was observed by the National Education Collaboration Trust where its CEO, Mr Godwin Khoza stated, “a challenge that remains inadequately addressed is that of low reading levels in our classrooms, consistent with our country’s poor reading culture” (National Education Collaboration Trust, 2016:07).

Improving the quality of mathematics instruction across classrooms, schools, and broader educational jurisdictions is a pressing issue for both researchers and practitioners. Mastering the implementation of curriculum for any subject remains the responsibility of the HoDs and provides an indication of the standards of the education system in a

particular subject. Therefore, mathematics teachers play an indispensable part in ensuring the effectiveness of learning by ensuring the implementation the approved curriculum. However, Froneman and Hitge (2018:2) labelled the CAPS curriculum as too prescriptive and restrictive arguing that the most dramatic change brought about by CAPS has been its shift in focus from assessment of learning to learning for assessment.

Effective curriculum implementation is negatively affected by various factors such as scarcity of exceptional teachers; the mounting number of experienced, expert teachers quitting the profession; a burdensome and intransigent CAPS system introduced without adequate research and testing, and low standards which do not reach the 50% pass in English and Mathematics (Maddock & Maroun, 2018:207). The implementation of the curriculum requires teachers, HoDs, deputy principals and principals with advanced pedagogical and subject matter knowledge. In this respect, one of the core responsibilities of the SMT is to ensure the effective and efficient implementation of mathematics curriculum in the GET band. However, as Nkambule and Amsterdam (2018: 38) noted, some obstacles to this goal are: the vision vis-à-vis the country's realities; symbolism vis-à-vis mass expectations; the curriculum framework vis-à-vis applicability; conditions of implementation and actual practice in schools; and expected outcomes vis-à-vis the capacity of teachers to translate them into reality.

Furthermore, teachers have not been trained properly on the implementation of the CAPS project. They have received no support from the SMT, HoDs at the sites and school clusters, leading to low teacher morale and high teacher absenteeism. For example, the Learning and Teaching Support Materials (LTSM) for the CAPS which is meant to facilitate learning and improve the learners' performance have been found to be inadequate and some schools do not have books delivered on time so that they can start teaching from the first day of the school year. In addition, some teachers have huge classes due to a shortage of classrooms and teachers (Muthusamy, 2015:32). As a result, many teachers are increasingly being treated for stress-related illnesses.

2.2.2.2 Resources assisting HoDs of mathematics

Despite the low rate of learners' achievement in mathematics, the DBE continues to support the schools' efforts to improve performance in the subject, although the impact seems to be minimal considering the learners' general dismal performance. Govender

(2018:3) stated that, to be effective in their job, mathematics teachers require assistance in teaching the subject from their subject heads. Furthermore, Govender (2018:3) criticised the unacknowledged poor teaching of mathematics in the majority of schools. Even the few competent teachers do not cover the field of mathematics adequately and there is not much done to develop the HoDs who could assist in teachers' professional development efforts, especially in content knowledge and professional content knowledge.

In addition, Adler (2017:2) identified two objectives for developing mathematics teachers, namely, to improve their mathematics content knowledge and teaching practices, and to determine whether and how the interventions made influence student learning. A number of intervention programmes have been launched to improve the teaching and learning of mathematics in South African schools. For instance, at the University of the Witwatersrand, there is a project called Wits Maths Connect Secondary, whose mandate is to improve the teaching and learning of mathematics in secondary schools (Adler, Alshwaikh, Essack & Gcsamba, 2016:9). This mandate cannot be adequately attained unless strategies such as the recruitment, professional development and retention of competent mathematics teachers are considered.

It is said that many learners fail mathematics due to lack of good teachers. In a study that investigated the factors associated with high school learners' poor performance, Banerjee (2016:4) identified outdated teaching practices and a lack of basic content knowledge which result in poor teaching standards. The poor standards have also been exacerbated by a large number of under-qualified or unqualified teachers teaching in overcrowded and non-equipped classrooms. What compounds the problem is that even in schools where there are teachers for critical subjects like mathematics, there are inadequate or no facilities and equipment needed to promote effective teaching and learning.

Interventions suggested by Graven (2016: 12-13) included launching of a project that aimed at providing mathematics workbooks to the DBE and to support learners,. There were approximately 97% workbooks accessed in this project across all grades in the country in 2014. This indicates that the DBE is making good progress with regard to the provision of workbooks in schools.

Although the South African DBE has made notable achievements with respect to the procurement and provision of workbooks to schools, there are still some significant challenges that remain in the education system. Two challenges appear:

- Firstly, to find and establish innovative ways to make the education system in its current form work better and to figure out the 21st century learning and make it part of our system. South Africa is making efforts to address the first challenge as it appears in the National Development Plan. Initiatives such as Funza Lutshaka Bursary are given to all deserving learners to do mathematics. This may enhance the pass rate in the subject such as mathematics.

- The second challenge will be largely dependent on the brainpower, skills mix and degree of national effort to be put into finding ways on how the teachers could prepare children for the future.

Therefore, innovation is at the centre of these twin imperatives. This means that the departmental officials including stakeholders need to engage in quick, deliberate acts of overcoming the differences between the public and the private sectors and between older, more experienced teachers who may not necessarily be technologically competent and technologically savvy young people.

The DBE also needs an effective plan to rise above the often-tired ideologies subscribed to by the different players in the education space. Openness to new ideas, selflessness, courage and trust should define how we engage. This is the challenge the NECT faces on a daily basis (DBE 2017: 15).

In practice, capacity building of employees is continuously done through the Workplace Skills Plan and the personal development plans of teachers in the DBE. This capacitation depends on the departmental needs and the teachers' professional development needs expressed in the IQMS.

2.3 THEORETICAL FRAMEWORK

This study is founded on the connectivism theory which is discussed below. Furthermore, the researcher applied this theory of connectivism in the study in order to address the role of HoDs and other stakeholders in the performance of mathematics in primary schools. It is believed that this theory connects multiple stakeholders and the environment where the

learning takes place in order to attain a good outcome in mathematics. The HoD plays a major role in connecting stakeholders and classroom environment. These stakeholders are the principal and deputy principal, mathematics teachers, parents and learners. Figure 2.2 provides a diagrammatic overview of the framework.

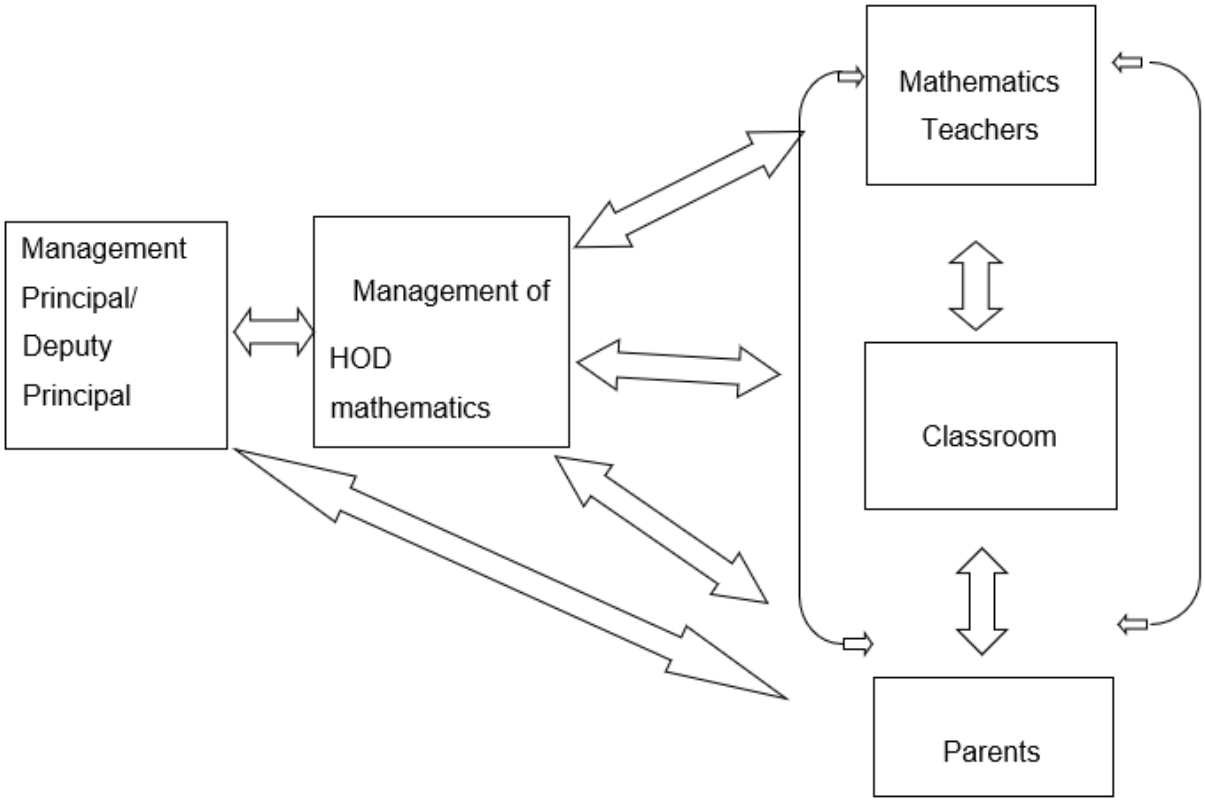

Figure 2.1: Diagrammatic presentation of the theoretical framework

2.3.1 Connectivism Theory

In order to underpin the study, connectivism theory was chosen as it was relevant to this study that explores the role of mathematics HoDs in primary schools. This theory focuses on the connectivity amongst the individuals to achieve a common goal. In this study, one of the roles of the HoD is to connect with the mathematics teacher whose teaching strategy should be involving learning, researching information on their own and delivering the curriculum. This theory promotes problem-based learning which allow learners to participate actively in class rather being spoon-fed by the teacher in a system of traditional learning. This theory was a regarded as an effective theory in the study (Muiys & Reynolds, 2018:4). Similarly, Ofori-kusi (2017:38) stated that the theory is an instrument

providing necessary requirements for research studies and improving teaching irrespective of whether is equitable or inequitable. He further suggested that instead of its equitableness, interest lies in its efficacy.

In a mathematics classroom, improvement of mathematics learning is closely related to developments in teaching. However, teaching succeeds through a learning process which teachers and learners are engaged in the curriculum. To make this a reality, teachers must first acquire the knowledge and skills to teach and encourage learners in their thinking processes. Learners have different learning styles which makes it hard for a teacher to accommodate the learning styles of the minorities in a class. The teacher needs to have the ability to choose and apply the most suitable strategies which can suit different learner backgrounds, abilities and styles for a lesson to be deemed effective (Muiys & Reynolds 2018: 4).

Connectivism theory is considered a teaching and learning theory for the twenty-first century. The connectivism theory posits that experience and action of teachers and learners be connected by using group knowledge. The group knowledge is knowledge that interactions within the network. In connectivism, the teachers' role has shifted from expert "input or answer giver", "spoon feeder" or known as traditional mathematics practices such as repetition and memorisation to facilitator, listener, observer and organiser for the collaborative classroom. In the mathematics classroom, learners with different levels of ability and intelligence learn in different ways.

The use of a variety of techniques helps the learners to be more proficient in mathematics. Using different techniques in teaching and learning is a relatively complex strategy for the trainer and the teachers. To be a good teacher, four components must be addressed such as variation in techniques in teaching; listening and questioning skills; teaching the learner how to study; and understanding whether the objective of educating has been reached or not. Teachers need to encourage the learners to do investigating and hands-on work such as group projects and teamwork. Therefore, the role of the HoDs is to ensure that a variety of teaching techniques is used in order to obtain good outcomes in teaching of mathematics. It is argued that this theory is applicable because it enables learners to actively take responsibility of embarking or researching information and presenting it in the classroom (Akintande, 2017:13).

Furthermore, the researcher applied this theory of connectivism in the study in order to address the role of HoDs and other stakeholders in the performance of mathematics in primary schools. It is believed that this theory connects multiple stakeholders and the environment where learning takes place to attain good outcomes in mathematics. The HoD plays a major role in connecting stakeholders and classroom environment. These stakeholders are the principal and deputy principal, mathematics teachers, parents and classroom teachers.

2.3.1.1 Principal and deputy principal

In every public school, a principal is appointed by the DBE to lead and manage the implementation of curriculum. The primary role of the principal is to ensure that teachers teach the authorised curriculum, which in the context of this study is the approved mathematics curriculum. In this context, it is imperative that the principal leads the implementation of the curriculum and cultivates a culture of teaching and learning at school. The principal and deputy principal should coordinate the efforts of teachers, parents and other stakeholders in order to facilitate teaching and learning to achieve good learner outcomes.

With regard to the principals' role in professionalism, the DBE (2014:1) explained that they must adequately advance, document, administer and reinforce quality teaching and learning, the purpose of which is to enable learners to attain the highest levels of achievement for their own good, the good of their community and of the country as whole. Due to the wide scope of work, some of the responsibilities of the principal are delegated to the deputy principal to reduce the workload.

Mohale's (2014:132) study on the role of principals as instructional leaders identified the following as hurdles in their job: lack staff professional development; insufficient learning resources; lack of support and monitoring of curriculum implementation in the classrooms; lack of parental involvement and concern; inadequate support from the DBE; and excessive workloads. A comparative study by Wang, Hancock, Lim, Muller, Tulowitzki and Stricke (2017:7) in North Korea, United States and Germany revealed that school principals were responsible for improving student learning opportunities, being innovative leaders and assisting teachers with curriculum development. Since the responsibilities of the principal are onerous, some of these responsibilities would be delegated to the HoDs

in the school to manage a department; thus, the HoD has a critical role to play in managing the mathematics department.

Mestry (2017:1) pointed out that the idea of instructional leadership of the HoDs has come to the fore as considerable pressure is placed on academic standards and the demand for schools to be accountable grows. There is an urgency for greater accountability on the part of principals in the quest for learners' improved achievement in mathematics. In this sense, increased attention is paid to the role of principals as instructional leaders in order to improve learners' performance. In spite of this imperative, Mestry (2017:4) also observed that principals spend most of their time on administrative matters rather than on managing and monitoring the quality of teaching and learning.

A principal who utilises instructional leadership is expected to develop and equip the key role players of the school, that is, the School Governing Body (SGB), SMT, teaching staff and non-teaching staff. Since the curriculum polices are the pillars of curriculum implementation, the SMT should be informed by the principal and should be able to use these policies to manage and implement the school curriculum, particularly the teaching and learning of mathematics. The DBE (2006:16) emphasised that teachers need information to successfully put the curriculum into practice.

The principal is expected to report to every stakeholder including parents about the operations of the school, challenges, successes and failures. This would give them the assurance that teachers are accountable and take their work seriously. It is also asserted that the most important role of the principal as an instructional leader is to work with parents, school boards and other interested groups to share and interpret the achievement of results, areas that need improvement, and plans for improvement efforts (Mohale, 2014:120). The DBE (2014:01) has stipulated that as part of their leadership role, school principals must perform the following key roles: promote, record, manage and support the best quality teaching and learning.

Further, the Australian Institute for Teaching and School Leadership (AITSL) (2015:19) found that principals used community meetings as a strategy to identify school matters, learner issues and other educational activities. This helps in giving an overview of the school. Therefore, matters that need attention urgently are tackled with immediate effect, and the SGB also fulfils its mandate in ensuring that the SMT is accountable in school-

related matters such as provision of teaching aids, ensuring satisfactory school results and managing the conduct of teachers and learners. The DBE (2016:24) further asserted that principals as instructional leaders should maintain and model a focus on improving teaching and learning in mathematics by helping teachers improve their instructional practices and making learners' achievement the highest priority.

The HOD as curriculum head and as member of the SMT is tasked with involving the parents of the learners who are taught mathematics as a critical subject. However, in the findings of a study conducted by Mohale (2014:126-127), the HoDs interviewed expressed the view that lack of parental involvement in the activities of schools was a major problem. Therefore, using connectivism theory is relevant in creating teamwork among teachers, parents, learners and SGB.

2.3.1.2 Mathematics teachers

Mathematics teachers have a crucial role to play in ensuring that learners pass the subject during formative and summative assessments (Letshwene, 2019:iii-iv). However, for this to happen, the principal should organise effective management and implementation of curriculum at school and supervise mathematics teachers. As postulated by connectivism theory, with coordination or connection between two or more people, common goals can be achieved. This can help learners to grasp knowledge if the mathematics teacher uses a variety of teaching strategies. For example, the theory of connectivism emphasises the importance of using group and teamwork discussions. This type of teaching strategy promotes problem-based learning wherein learners become independent rather than being dependent on the mathematics teacher. In such as a scenario, the mathematics teacher's role becomes to ensure that learning takes place. In a situation where the HoD is a trained mathematics teacher, their responsibility is to embark on teaching, organising and supporting learners in diverse ways.

Mathematics teachers are gradually reflecting dissatisfaction in their chosen careers. This also raise questions for the researcher, namely, is such dissatisfaction known by the principal, HoD and parents? The present situation reflects that little or nothing has been done by many GET band schools in the country. Spaull (2013:5) argued that the low performance of South African learners for mathematics at Grade 5 and 9 (and science at Grade 9) is linked to the factors in the home, school and community environments.

The connection between the mathematics teacher and learners could produce positive results in mathematics since teamwork brings multiple ideas to the group for consideration (McEwan, Ruissen, Eys, Zumbo & Beauchamp, 2017:9). To conclude this section, a mathematics teacher is accountable and has to be in the classroom at all times during the lesson, attending to all learners' needs. Connectivism theory helps in ensuring that mathematics teacher communicate with the HoD, learners and parents where it is required for the benefit of learners.

The DBE provides support and content to the key pillars of education, namely curriculum, teacher development and, enrichment and extracurricular programmes. In terms of curriculum support, content on human rights, nation building and constitutional awareness is provided for in the workbooks, while in terms of training, support is provided for teachers in addressing gender-based violence in schools, implementing the Oral History competition and the Bill of Responsibilities in the classroom, among others (DBE, 2016: 60).

Vistro-Yu and Toh (2019:2-3) showed that there are crucial weaknesses in some areas of the overall schooling system in Singapore, and further stated that these are especially found in mathematics and languages. This is directly related to under-qualified teachers and inadequate coordination of the schooling system's various levels and components. In the constructivist classroom, teachers provide learners with opportunities to test the adequacy of their current understanding and apply this to the new situations. Learners are engaged to build their knowledge and are encouraged to become involved in group interactions (OECD, 2017: 24). Van der Wal (2015:31-32) revealed that, in South Korea, classes in the schools are divided according to years of schooling and not according to the ability of the learners. He further concludes that, "the main objective is to promote students' learning according to their aptitudes, talents and abilities. The common course is intended to equip learners with basic life skills such as the traditional three R's (reading, writing and arithmetic), foreign language acquisition, literacy in information technology and interpersonal skills". The researcher is of the view that in the study used in the South Korean mathematics classroom there were teaching strategies used that enhanced mathematical learning. Since the current study was conducted to assist learning and teaching of mathematics and to confirm what teaching strategies could be suggested and

transferred to other classrooms, these strategies could be applicable to South Africa as well.

The mathematics teacher has a major role to play in creating a mathematics classroom more interesting and conducive to learning and teaching of mathematics. Learners in mathematics classroom require motivation and guidance to achieve that environment. Hence Sofowara (2014:63), in goal theory, advocated that an individual with a mastery (or learning goal) orientation values the improvement of skills or knowledge in a given domain and believed that success depends on working hard, attempting to understand the domain, and collaborating with others. In contrast, an individual with an ego (or performance goal) orientation values establishing “superiority over others” and believes that success depends on social comparison and assertion of superior ability.

2.3.1.3 Classroom

From the inside, the classroom usually looks different perceptions of it at a distance or from outside. What is happening inside the classroom often differs from what is expected to be done. Studies have raised the alarm about what should be prevented and what should not. In this respect, Van der Wal (2015:18) observed that teachers use large amount of time addressing and explaining concepts when they should rather endorse approaches that are less dependent on transmission and are more participatory. The HoD has both the responsibility of being a mathematics teacher and an instructional leader. Various studies continuously advancing the readers to yield and gain a better insight with advice on strategies that the schools in South Africa and the continent can use. Some teachers complain about learners who are misbehaving in class others citing evidence of those paying less attention or other incidents. These could be caused by various factors as many readers may anticipate. Akintade (2017:162) in discussing the effect of computer-assisted instruction on learners’ achievement and attitude towards geography, emphasised that, in a constructivist classroom, learners are engaged with the content and are encouraged to participate in group interactions.

When learners are exposed to real-life situations, they usually enjoy the work and pay attention, although this may not always work. Ojo and Adu (2018: S1) revealed that learners showed great enthusiasm when taught with the use of ICT. Defining collaboration as a teaching strategy that used innovative devices to make lessons interesting would be

of great value to SMTs of South African schools. Akintande (2017:152) explained that collaborative learning is a way of coming together to solve problems and complete projects; it deepens students' learning and builds collaborative skills.

The HoDs need, however, to realise that factors contributing to success in a classroom are complex. One specific problem experienced in South Africa is the Language of Learning and Teaching (LOLT). Learners who speak languages that differ from the LOLT may find it difficult to grasp mathematical language. Similarly, Chikiwa and Schäfer (2018: 1) noted that the LOLT is, in many cases, not developed to a level which these learners can comfortably use as a medium of instruction. They further explained that this presents teachers with a dual task of teaching mathematics in the LOLT and translating some concepts into the learners' first language to ensure that they grasp the mathematics concepts. It has been also indicated that critical thinking skills are taught through speech interactions between the teacher and learners in the classroom – if there is a lack of understanding of the spoken language, such critical thinking skills may not be fully developed.

Performance of learners involves all the school stakeholders as studies suggest that teamwork is necessary in achieving the goal of quality education. The HoD of mathematics is mandated to teach as well as to monitor, guide, evaluate, report and develop the skills of their subordinates. Consequently, mathematics teachers are expected to teach using all the required period to achieve the expected goal of ensuring that learners pass well. This is in line with the process of teaching and learning with the purpose of implementing the mathematics curriculum as discussed earlier.

The DBE report revealed that there are factors outside the principals' control – class size, funding, parental involvement, length of school day – were not the reasons one school was higher performing than another. Rather, it was the practical disciplines or areas they could control that made the difference. The research found that one of the factors in higher performing schools was that the principals focused on instructional practice or leadership.

Recent studies on the use of technology in the classroom and how best mathematics can be taught in that regard (Akintande, 2017:47) revealed that the use of ICT in the classroom empowers teachers to teach better, improves lesson planning and preparation, develops

a more positive attitude towards their work and improves efficiency of management and administrative tasks.

2.3.1.4 Parents

The principal, deputy principal, HoD, and or mathematics teacher have a major responsibility of communicating with parents of the learners in the classroom. The parents experience many challenges; for example, Mathekga (2016:23) found that the involvement of parents depended on their own educational attainment, their views on the appropriate division of labour between teachers and parents, the amount of free time that parents had available, and the socio-economic status of the family. Beare, Caldwell and Millikan (2018:3-4) argued that parents with children in poorer schools engaged in less effective parental involvement in the management and governance of the school than those whose children in attend schools serving wealthier communities. Some teachers find themselves communicating with the parents alone without the assistance of the SMT. While these factors might have contributed to the learners' poor performance in mathematics, studies maintain that parents need to be part of their children's education.

In an attempt to answer the above question, Cheng and Chen (2018:2) suggested that parental involvement should not be seen as a teacher issue only but must also be viewed as a departmental issue. The author emphasised this by claiming that schools should provide training for school staff and that teacher education institutions should make parental involvement a core module in their teacher training programmes. Hassani, Khatib and Moghaddam (2020:76-77) shared this view, stressing that teacher training programmes must involve modules on how teachers can work effectively with the learners' parents to better their children's education. Methods course work should provide opportunities for prospective teachers to learn how to write effective notes, letters and newsletters to families.

Matlala (2016:8-9), in a study conducted in Limpopo province which aimed at exploring and describing the experiences of teachers, parents and pregnant learners regarding facilitation of health for pregnant learners, explained that a parent refers to the biological mother or father, caregiver or guardian of a learner, and any person legally entitled custody of a learner (DoE, 1996). A parent, according to the DBE (2016:4), has a

responsibility to support the learning process of his or her child and to contribute towards the development of the school the child is attending.

Briefly, the transformation of the education system in South Africa since the advent of democracy in 1994 has placed parental involvement at the centre of its agenda by emphasising the role that parents must play in school activities. The DBE came up with an initiative called the Quality Learning and Teaching Campaign to improve the quality of South African education relative to those of neighbouring countries. This campaign emphasised the establishment of partnerships amongst all education stakeholders and parents were identified as critical role players who must be involved to improve the quality of education (Mathekga, 2016:31). This author further stated that many studies have revealed that there are several barriers to effective parental involvement in children's education like low socio-economic status, work-related commitments, poor parenting skills, and negative teacher attitudes towards parents among the impediments to effective parental involvement. Current conceptions (and calls for) equal education have been insufficient to deal with specific issues on how to provide effective mathematics education to many of our learners who were previously disadvantaged by apartheid education. It is not possible to avoid saying anything about the ideology of 'apartheid' because the imbalances that have been caused by the past will continue to make an impact on society both now and in the future. Parental involvement in teaching and learning is sorely needed. However, challenges of the apartheid regime have contributed negatively to the process of parental involvement in teaching and learning of mathematics, because they themselves were never taught it adequately.

However, Mathekga (2016:1), on teachers' perceptions of parental involvement in children's education in rural Limpopo province schools, stated that the transformation of the education system in South Africa since the advent of democracy in 1994 has placed parental involvement at the centre of its agenda by emphasising the role that parents must play in school activities (DoE, 1996). The author further elaborated on what is expected from parents, that, among other things, the campaign calls for parents to check the quality of written work given to their children and to assist them with their homework activities by creating an environment conducive to learning in their homes. Teachers, meanwhile, are well positioned to form perceptions about whether parents regularly check the quality of the written work and homework given to learners and are experiencing non-compliance

with regard to parental involvement. The researcher also emphasised that this should be added to the major responsibilities of the HoD of mathematics and create a tool to monitor and manage the involvement of parents in the classroom.

In conclusion, on parent involvement in the mathematics classroom, it is evident that little has been done to improve their children's performance although there are initiatives like workshops for families and maths clubs. However, lack of parent involvement is identified by many researchers as an obstacle to children's successful scholastic development (Mathekga, 2016:79).

2.4 CHAPTER SUMMARY

This chapter gave a brief overview of the literature reviewed. It indicated many aspects that are vital for a subject like mathematics. It has been revealed by many authors that mathematics is still a challenge and learners are continuously failing it despite the well-designed CAPS curriculum. This emanates from many factors like a lack of competent and relevant teachers in the subject. The chapter also discussed the role of HoD in teaching and learning. Poor leadership from HoDs was also seen as major problem. The conceptualisation and many aspects like teaching aids were discussed. The next chapter discusses the research methodology the study followed.

CHAPTER 3:

RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

The preceding chapters have discussed the specific rationale for this study and reviewed the related literature which located the study the conceptual framework. This chapter deals with the data collection process, the selection of the research participants, research design, data collection instruments and treatment of data. A descriptive account is provided on the different instruments employed when collecting data and how data was analysed. In order to understand the philosophical context of the research approach and methods used in the study, the research paradigms that undergird them are discussed.

3.2 RESEARCH PARADIGM

Makhubele (2015:38) defined a research paradigm as "a set of fundamental assumptions and beliefs on how the world is perceived which then serves as a thinking framework that guides the behaviour of the researcher". Msezane (2015:32) added that research paradigms are crucial filters that enable researchers to organise their observations and reasoning. He identified three categories of paradigms commonly used in education: the (a) positivist (objectivist) paradigm, (b) constructivist (interpretive) paradigm and (c) the pragmatist paradigm.

3.2.1 Positivism Paradigm

According to Aliyu, Bello, Kasim and Martin (2014:81-82), the prevalent belief in this paradigm is that the social world can be studied in the same way as the natural world. In this regard, Creswell (2014:38) noted that the positivists believe that different researchers who observe the same factual problem can generate a similar result by carefully using statistical tests and applying a similar research process during the investigation. However, this study adopted the qualitative methodology. Basri (2019:63) also explained that the proponents of positivism hold that only one reality exists, and that it is researcher's duty to discover that reality.

3.2.2 Constructivism Paradigm

Varpio, Ajjawi, Monrouxe, Brien and Rees (2017:42) submitted that constructivism or interpretivism is based on the following principles:

- A belief that reality is constructed by social factors and people's perceptions of it. This implies that in constructivism, individuals with their own varied backgrounds, assumptions and experiences contribute to the construction of reality.
- Constructivism is associated with subjectivity and social reality may change and can have multiple realities. This means is that there are many explanations of the causes of a particular problem.
- The purpose of constructivist research is making meaning by engaging the world, while positivist research is concerned with the verification of measurable, objective and factual data.
- That meaning is created by means of a partnership between the researcher and the participants, during the research process.

Similarly, Msezane (2015:34) suggested that interpretivism focuses on the ways in which meanings are made through relationships. He further explained that this means that the researcher and the researched (participants) interact to interpret and expose the meaning of their interaction. The researcher of this study, therefore, employed some principles of this paradigm as they are related and could assist in interpreting findings concerning the role of the HoDs in the teaching and learning of mathematics.

Keeys (2020:10-12) describes a paradigm as a set of scientific and metaphysical beliefs that make up a theoretical framework in which scientific theories can be tested, evaluated, and if necessary, revised. It has been mentioned that this study attempts to investigate the role played by HoDs in the teaching and learning of mathematics and therefore, it followed an interpretivist research paradigm.

Interpretivist positions are founded on the theoretical belief that reality is socially constructed and fluid, which is a critique of positivism in the social sciences (Opie, 2019:11-15). Singh (2014:68) added that social reality is viewed by multiple people with perspectives of reality. Moreover, the role of the researcher in the interpretivist's "paradigm is to understand, explain, and demystify social reality through the eyes of different participants'' (Singh, 2014:68). Similarly, Dibete (2015:55) advocated that the

world should be studied in its natural state, rather than in a controlled, laboratory-type environment, and with minimum intervention on the part of the researcher. In current research practice, this means that acknowledging that facts and values cannot be separated and that understanding is inevitably biased because it is situated in terms of the individual and the event (Pratomo, 2017).

3.2.3 Pragmatist Paradigm

However, the researcher further explores more content regarding this paradigm which is needed in the study. Various studies define the pragmatist paradigm as focusing on a phenomenon of interest that makes meaning, for example, Gelman and Hennig, (2017: 968-970). Alexander (2019:107-109) advocated that pragmatism believes that objectivist and subjectivist perspectives are not mutually exclusive because what works best for understanding a particular research problem is considered the best method.

3.3 RESEARCH APPROACH

The research approach is the method the researcher used as tool in the process of data collection. Hence, research methods refer to all the methods the researcher uses during the course of studying the research problem (Singh, 2014: 71), while a study by Debeti (2015:55) stated that the research methodology focuses on the research process and the type of tools and procedures to be used. Furthermore, these methods are classified into broad categories, namely, quantitative, qualitative and mixed methods (Ruben & Babbie, 2016:25).

However, the researcher employed the qualitative method for the study. Msezane (2015:37) emphasised that qualitative method is “a method concerned with identifying, perhaps comparing, the qualities or characteristics of empirical evidence, from essays to apprehend external appearances to internal, difficult-to-capture characteristics”, while Singh (2015:71) argued that the qualitative method is concerned with collecting and analysing information in as many forms as possible, chiefly non-numeric information. Similarly, Makhubele (2015:42) emphasised that the word ‘qualitative’ implies “an emphasis on the qualities of entities and processes and on meanings that are not experimentally examined or measured in terms of quantity, amount, intensity or frequency”. In a nutshell, qualitative research implies a direct concern with experience as it is “lived”, “felt” or “undergone” (Singh, 2015:71).

Furthermore, Msezane (2015:37) advocates that interpretivism uses a qualitative approach to extract an understanding of the social reality of the research, with the research questions guiding the methodology. For example, the researcher guided by the qualitative research methodology has advantage of suitable research questions, hence, Ruben and Babbie (2016:26) clarifies the different between qualitative and quantitative data, that, “the distinction between quantitative and qualitative data in social research is the distinction between numerical and non-numerical data; for instance, when you say someone is ugly, you have made a qualitative assertion. When you say he or she is ‘a size 9’, you are attempting to quantify your qualitative assessment.” In addition, Thanh and Thanh (2015:24) agreed with the discussion above listing the principles of qualitative approach as follows: believing in multiple realities; a commitment to identifying an approach to understanding that supports the phenomenon under study; being committed to the participants’ viewpoints; conducting the research in a way that limits disruption of the natural context of the phenomenon under study; acknowledgement of the participants in the research process; and reporting data in a literary style rich with participants’ commentaries.

The qualitative research approach that was used for the purposes of this research was the inductive one. According to this approach, researchers begin with specific observations, which are used to produce generalised theories and conclusions drawn from the research. The reasons for using the inductive approach were that it takes into account the context where the phenomenon is present, while it is also most appropriate for small samples that produce qualitative data. However, the main weakness of the inductive approach is that it produces generalised theories and conclusions based only on a small number of observations, thereby bringing the reliability of research results into question (Ruben & Babbie, 2016:23).

A qualitative approach to research pays attention to the context of data gathering in order to enhance the value of the data. For this reason, I sampled six comparative rural schools. The schools were purposively selected as they were in the same geographical area and for had similar socio-economic characteristics but there was a wide disparity in their results. The mathematics HoDs in each school were experienced teachers and qualified in their subject. This allowed for a clear focus on the HoDs’ perceptions and implementation strategies as instructional leaders in the absence of significant additional

distinguishing factors which might have impacted on the results of each school. The following represents both advantages and disadvantages of qualitative methods in a study.

3.3.1 Advantages of Qualitative Research Method

In qualitative research, data collection happens when the researcher builds a picture of the phenomenon from particular or specific to wider themes, whereafter the researcher makes his/her own interpretations because of the insight gained, in this study's case, through face-to-face interviews (Creswell, 2014:680). Qualitative research is research guided by an approach that explores and understands what meanings individuals ascribe to human problems and is a process that uses open-ended, flexible questions (Creswell, 2014:681). According to Seidman (2013:25), researchers may want to "explore alternatives to the structure and procedures". The structure should be maintained in such a way that it allows the participants to reflect upon the questions and then allows them to reconstruct their answers (Seidman, 2013:3). Seidman (2013:4) further suggested that maintaining the structure should be the guiding principle, which gives enough flexibility for elaboration to get closer to the experience participants have. Chidziva (2017:49) also asserted that qualitative research attempts to study the everyday life of groups of people in their natural settings such as educational settings and processes.

3.3.2 Disadvantages of Qualitative Research Method

Some of the literature criticises the qualitative research and it was important for the researcher to take note of the uncertainties that may crop up. The following problems may arise: qualitative research approaches sometimes leave out contextual sensitivities, and focus more on meanings and experiences (Rahman, 2017:104). Rahman (2017:105) stated, that, in terms of research method, the smaller size raises the problem of generalisability to the whole population of the research, although this is not usually the intention of qualitative studies.

3.4 RESEARCH METHOD AND DESIGN

The case study design was used. According to Ghauri, Gronhaug and Strange (2020), a case study is a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real-life context using multiple sources of evidence. The case study approach has considerable ability to generate answers to the

questions “why” as well as “what” and “how”. For this study to be able to achieve its aims and objectives, the researcher employed a case study as a convenient design. However, it was necessary to determine all the characteristics of this research design before using it. A case study is described by various researchers, some criticising and others approving. In the current study, the definition by Chidziva (2017:48), namely that, in a case study, data collection is extensive and varied depending on the type of situation, was appropriate. The case study was used in six schools within OR Inland District in the Eastern Cape Province.

3.5 POPULATION AND SAMPLING

The population comprised of all the HoDs employed at the research sites. From these HoDs, the sample was selected. According to Maree (2016:45), sampling refers to the process which is used to select a portion of the population for the study. Dibete (2015:56) added that qualitative inquiries view the sampling process as dynamic, ad hoc, and phasic rather than static or a priori parameters of populations. However, literature suggests that the accuracy of the findings largely depends on the way the researcher selects the sample (Singh, 2014:84). In the same way, Dibete (2015:56) described sampling as a technique that involves decisions about which people, settings, events, behaviours and/or social processes to observe.

The researcher used non-probability purposive sampling, implying judgmental sampling that involves the conscious selection by the researcher of certain participants (Robledo & Donnellan, 2016:2). Purposive sampling is appropriate in instances where a researcher desires to discover specific types of cases that suit the researcher’s study for in-depth examination (Robledo & Donnellan, 2016:3). Purposive sampling does not generalise findings to a large population but rather obtains a deep-seated understanding of the phenomenon under study from a few knowledgeable individuals. The researcher chose participants with an unambiguous rationale in mind as depicted in Figure 3.1 below:

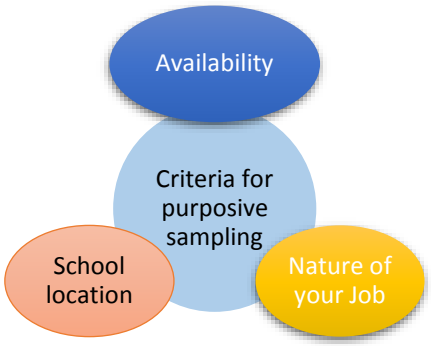

Figure 3.1: Criteria for purposive sampling

The following types of employees were considered for the study i.e., HoDs for mathematics subject. There was no equal representation of the HoDs of the schools; hence, the researcher chose the participants based on the criteria stated in Figure 3.1. The participants were chosen based upon their school location within the region under study. The researcher also chose the participants based upon the nature of their jobs which were the HoDs and those who were available for the study. The participants were drawn from six schools in the region. The researcher chose participants who were accessible. The researcher worked as a teacher within the nearby region and this made him having better chance to make appropriate appointment with the target group in each selected school.

The size of the sample was considered satisfactory when data saturation was reached, implying that no new information was forthcoming during subsequent interviews (Grove, Gray & Burns, 2014: 214). Data saturation was attained and the researcher stopped the interviews thereafter.

3.6 DATA TECHNIQUES

The following methods were employed in collecting the data: semi-structured interviews; and focus group discussions

3.6.1 Semi-structured Interviews

Semi-structured interviews were used to collect data from individual participants. This was a suitable way for collecting data in the study. DeJonckheere and Vaughn (2019:3) stated the advantages of the semi-structured interview format as follows: it provides depth of information; the researcher can probe to understand perspectives and experiences; the

interview guide ensures that a core list of questions is asked in each interview; and because the order of questions is not fixed, the flow and sharing of views are more natural.

As advocated by DeJonckheere and Vaughn (2019:4), the disadvantages of using the semi-structured interview format include the following: trained interviewers are needed to probe without being directive or judgemental; analysis of findings is difficult and must be done by people who did the interviews; the researcher must avoid bias in analysis; the researcher needs to know something of the local culture to capture the interviewees' real meaning; data analysis is time-consuming; and it is difficult to generalise findings.

In this study, eight HoDs were purposely selected and interviewed using the semi-structured interview format.

3.6.2 Focus Group Discussion

Focus group discussions, according to Merriam-Webster's Learner's Dictionary (2018: online definition) refers to "a small group of people whose response to something (such as a new product or a politician's image) is studied to determine the response that can be expected from a larger population". It is a good way to gather together people from similar backgrounds or experiences to discuss a specific topic of interest. The group of participants is guided by a researcher who introduces topics for discussion and helps the group to participate in a lively and natural discussion amongst themselves. In this study, appointments were made to avoid any inconvenience and eight participants were interviewed using the focus group discussion format. Permission was given to the researcher to make audio-recordings and take notes during the interviews. These notes and recordings were kept secure so that no-one but the researcher had access to them. The information helped the researcher during the data analysis.

3.7 PRE-TESTING

Ruben and Babbie (2016:226) argue that "no matter how carefully researchers design a data collection instrument such as a questionnaire, there is always the possibility indeed the certainty of error. They will always make some mistake: an ambiguous question, a question that people cannot answer". The research instrument was pre-tested at two primary schools respectively using two HoDs – neither the schools not the HoDs were part of the main study. The pre-test was done to determine whether the instrument would enable the researcher to collect relevant data. The pre-test allowed the researcher an

opportunity to adjust the research instrument in order to make it more effective in gathering the required data. In addition, pre-testing provided an indication of how long it would take to go through the interview schedule.

3.8 DATA COLLECTION

Face-to-face interviews with individuals were used to collect the research data. In this type of interview, the interviewer personally attends and is physically present to conduct the interview and thereby ensures that the questions are answered (Brace, 2018: 33). It can be stated that face-to-face interviews were used in the study to enhance the quality of the data. Face-to-face interviews allow researchers eminent control of the data collection process as well as the environment (Schober, 2017: 291 -292). Each interview took approximately 40-45 minutes. The interviews took place at each selected school.

Only one focus group took place at one of the sample schools. This was as a result of the sampling that the researcher used.

With the permission of the participants, the researcher also used an audio-recorder to record the interviews. This made it possible to capture the information gathered accurately. The use of the recorder allowed the researcher to focus on the proceedings. The data was collected over a period of three weeks. The researcher transcribed the recordings after each interview and after the focus group discussion. Field notes were part of the data collection process used in the research. Field notes thus assisted the researcher to bring to memory the elements of the interview and explore the processes of the interview (Ruben & Babbie, 2016:229).

3.9 DATA ANALYSIS

According to Franklin, Klingenberg and Agresti (2017:4), data analysis refers to “a process of examining and interpreting data in order to derive meaning, gain understanding and develop empirical knowledge”. Further, Msezane (2015: 50) stated that data must be organised in detailed from and must be categorised. Elaborating further, Castleberry and Nolen (2018: 807-808) asserted that the collection of data analysis can increase the level of quality in the research findings.

After conducting the semi-structured and focus group interviews, the researcher started the data analysis and interpretation process with the aim of extracting all the information

that was relevant to the study. This is also supported in a study by Dibete (2015:63), that the majority of approaches to qualitative data analysis include the following five steps: documentation of the data and the process of data collection; organisation/categorisation of the data into concepts/themes; examination of relationships to show how one concept may influence another; authenticating conclusions by evaluating alternative explanations, disconfirming evidence, and searching for negative cases; and reflexivity.

In this study, Colaizzi's process of qualitative data analysis was employed to analyse data which entails "identifying, analysing and reporting patterns (themes) within data and minimally organises it and frequently it goes further than this, and interprets various aspects of the research topic" (Akinyode & Khan, 2018:163).This allows for the data to be interpreted and for trends to be identified in the findings (Grove, Gray & Burns, 2014: 214). This method emphasises organisation and rich description of the data set. All stages of Colaizzi's processes of qualitative data analysis were covered during data analysis. The transcripts of the recordings were encoded and interpreted including the tones and emphasis in the voices of the participants. The researcher repeatedly read the transcribed data as well as listening to recording to pinpoint key words, trends, and themes. The key themes were identified and transformed into codes. All the themes are discussed in Chapter 4.

3.10 TRUSTWORTHINESS OF A RESEARCH STUDY

There were four scientific rigours used in the study, namely; credibility, transferability, dependability, and confirmability. In a study by Dibete (2015:64), it was advocated that, when qualitative researchers speak of "validity and reliability" they are referring to research that is both credible and trustworthy. Furthermore, Creswell (2014:201) explained that qualitative validity means that the researcher checks the accuracy of the findings by employing certain procedures, while qualitative reliability indicates that the researcher's approach is consistent across different researchers and different projects. In addition, van der Wal (2015:44) summarises strategies used to establish trustworthiness as follows:

Table 3.1: Summary of strategies used to establish trustworthiness

Credibility	Transferability	Dependability	Confirmability
Prolonged and varied field experience Time sampling Reflexivity Triangulation Member-checking Peer examination Interview technique Establishing authority of researcher Structural coherence Referential adequacy	Nominated sample Comparison of sample to demographic data Time sample Dense description	Dependability audit Dense description of research methods Stepwise replication Triangulation Peer examination Code-recode procedure	Triangulation Reflexivity

3.10.1 Credibility

Dibete (2015:64) emphasised that credibility shows that the researcher returned to the participants to check the accuracy and completeness of the data collected informally to ensure the information collected was distorted during the data interpretation.

Credibility was met in this study by ensuring that the research was driven by ethical considerations and conducted in professional manner. The researcher enhanced the credibility of the study by using prolonged interviews of approximately 60 minutes, by recording of the interviews. One participant from the focus group read the transcript from the focus group to confirm that they were a true reflection of what had been discussed. The credibility of the study was enhanced by continuing with the data collection until data saturation had been attained. The researcher increased interactions with the HoDs participants until no further useful information was obtained.

3.10.2 Transferability

Transferability depends upon the degree of similarity between contexts. Research findings are considered to be transferable or generalisable if they can be applied in new contexts apart from the original research context. When the findings are published, the reader will thus be capable of noting the specific details of the research situation and methods, and hence be able to compare them with familiar situations. The degree to which

research findings are generalised is termed transferability which is equivalent to external validity in quantitative studies. Generalisability denotes the degree to which one can relate the settings of a specific situation or populace to other people, periods or environment than those who are under study directly.

To ensure transferability, the researcher gave a detailed description of the research method and the situation under which the research was done and how the data was gathered. A thorough description of processes and data was given to allow judgements about transferability to be made by the reader. Transferability allows readers the opportunity to apply results to outside contexts.

The researcher aimed to achieve transferability of the study by selecting information-rich HoDs, by conducting data collection until data saturation was achieved, by providing in-depth accounts of the implementation of best practice measures for mathematics, and by providing dense descriptions of the research data, so that in similar contexts and conditions the results could be transferable.

3.10.3 Dependability

Literature defines dependability in various ways depending on the research methods to collect data. Dibete (2015: 64) explained triangulation as the use of multiple methods rather than just one method of data collection. He suggested that the various methods used complement each other so that their respective disadvantages may be eliminated. He concluded that if the findings obtained using different methods correspond and result in the same results or similar conclusions, then this ensures the validity of such findings and the conclusions drawn.

To ensure dependability the researcher did not go into the study with predetermined answers or ideas. The research findings and content were based on set theories and explorations of other studies already undertaken. The researcher reported in detail on each process of the study thus ensuring that an external researcher would be able to repeat the inquiry and achieve similar results.

3.10.4 Confirmability

Dibete (2015:64) explained that confirmability refers to the degree to which the research findings are the focus of the inquiry and not the researcher's bias. The researcher ensured

that the results reflected the participants' views and experiences that they revealed during data collection. The researcher also sought confirmation from the participants that the interpretations were true reflections of their views and experiences. Tthe fourth section of Table 3.1 refers to the confirmability of the research, which gives an indication of whether the researcher was neutral during the study (Dibete 2015: 45). The researcher did not show prejudice or influence the HODs.

3.11 ETHICAL CONSIDERATIONS

According to Ruben and Babbie (2016:118), "ethics is a matter associated with morality and ethical guidelines serve as standard which forms the basis for the research to evaluate one's conduct". Similarity, the research stated that the study is compulsory to implement the ethical standards. The following explains the procedure that was followed during this study namely voluntary participation, informed consent, ensuring no harm, confidentiality and anonymity, and debriefing.

3.11.1 Voluntary Participation

It should be the participants' choice to take part in the research. The researcher did not use any force or deception or coerce the participants to be part of the study. The researcher notified the participants that at any time they had the right to abandon the study. The researcher informed the participants that the research was an investigation into the role of HOD in teaching and learning mathematics in the primary schools of the Eastern Cape.

3.11.2 Informed Consent

To obtain informed consent, the participants or their representative need to be made aware of any potential dangers, disadvantages, advantages, the study procedures and goal of the study. The credibility of the researcher should also be made known to the participants. The researcher provided the participants with detailed information on the research methods, possible outcomes, possible associated risks and the fact the study was intended for academic purposes. The researcher ensured that participants consented based on the facts provided by the researcher with regard to the research. The researcher advised the participants about the estimated time that the interviews would take. The participants were asked to sign a form indicating their agreement to participate.

3.11.3 Ensuring no harm

According to Ruben and Babbie (2016:113), social research “should never injure the people being studied, regardless of whether they volunteer to be part of the study or not”. This signifies that the participant should be informed of the risks and the research purpose should be explained. The potential risk related to the study was psychological; therefore, the researcher made counselling arrangements for participants who might show signs of emotional breakdown during the interview. During the interviews, the researcher was cognisant of emotions shown by the participants and would give breaks in between and asked for consent to continue with the interview. In situations where the participants showed signs of discomfort or emotional breakdown, the researcher would create a friendly and supportive environment that would allow them to recover and continue with the session.

3.11.4 Confidentiality and Anonymity

Anonymity and confidentiality were observed in the study. Ruben and Babbie (2016: 71) stated that a researcher “guarantees confidentiality when the researcher can identify a given person’s responses but promises not to do so publicly.” The researcher explained to the participants how the information would be stored, and that the data would be accessed only by the researcher, the supervisor and the translator involved in the research. The researcher ensured that he did not disclose any identifiable information about the participants, and he protected their identity during the write-up of the study. The research assistant was also requested to maintain confidentiality. In the write-up, codes were used in place of the participants’ names to maintain confidentiality. No discussions on the participants or issues arising from the interviews were done outside the interviews.

3.12 CONCLUSION

Chapter 3 provided details of the research design. The discussion in this chapter started by describing the research approach, followed by research methods. This discussion was followed by the research approach that was used. The research site and population were described, and the sampling of participants was explained. Details on data collection and data analysis methods were provided. The four principles of evaluating the rigour of qualitative research were discussed. This chapter concluded by providing ethical considerations in the study. The findings are discussed in the next chapter.

CHAPTER 4:

DATA ANALYSIS AND INTERPRETATION

4.1 INTRODUCTION

The previous chapter discussed the following: research methodology, sampling, data collection, data analysis techniques and research ethics. This chapter analyses the findings on the role of the heads of departments in the teaching and learning of mathematics in primary schools of the Eastern Cape Province. The main research question that this study sought to answer is framed as follows: What role do Heads of Department play in the teaching and learning of mathematics in the primary schools of the Eastern Cape Province?

- What policies and workshops are in place to help the HoDs in the performance of their duties?
- What role do the HoDs play in mathematics teaching and learning?
- What are the HoDs' perceptions of the high rate of learners' underachievement in mathematics?
- What strategies do the HoDs employ to ensure effective teaching and learning of mathematics in schools?
- How effective are the strategies put in place to enhance learners' achievement in mathematics?
- What can the HoDs and their departments do to address the poor performance of learners in mathematics?

The next section explains the methods that were used by the researcher to analyse data.

4.2 DATA ANALYSIS AND INTERPRETATION

The analysis was guided by conventional procedures suitable for qualitative data. As proposed by Ruben and Babbie (2016:108), in conducting qualitative data analysis, data was broken down into manageable themes, patterns, trends and relationships. The voice recorder was played to listen to the interviews and read all the responses collected through semi-structured interviews and the focus group discussion as discussed in Chapter 3. Conte and Davidson's (2020:3-4) approach of organising data into categories through coding to reduce information was used in a way that facilitated the interpretation

of the findings. All the emerging categories were grouped and reduced according to their importance and similarities to each other, and coded. For the purpose of clarity and to avoid confusion, sampled schools were assigned letters A, B, C, D, E and F, while the HoDs were coded as HoD-A1 to HoD-E2.

4.3 RESPONSE RATE

There were only eight participants who were interviewed as displayed in the graph.

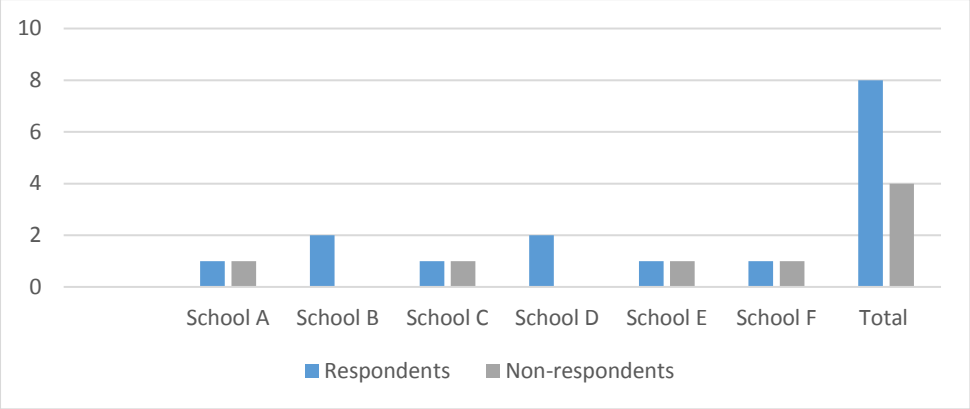

Figure 4.1: Response rates

The above graph also indicates that four schools presented 50% average response rate. These schools are: A, C, E & F, while School A and School D had an average response rate of 100%.

4.4 DEMOGRAPHIC DATA OF THE SAMPLE

Data was collected through semi-structured interviews, specifically individual and focus group interviews. There were eight female participants with ages ranging from 36 to 56 years and above. The experience range of the HoDs ranged from 2 to 21 years. The participants' qualifications for teaching mathematics were analysed. Their qualifications included advanced certificates in education, honours' degrees, and master's degrees. Their ethnic group was also analysed in the study. All these demographic details are presented in a form of graphs and tables.

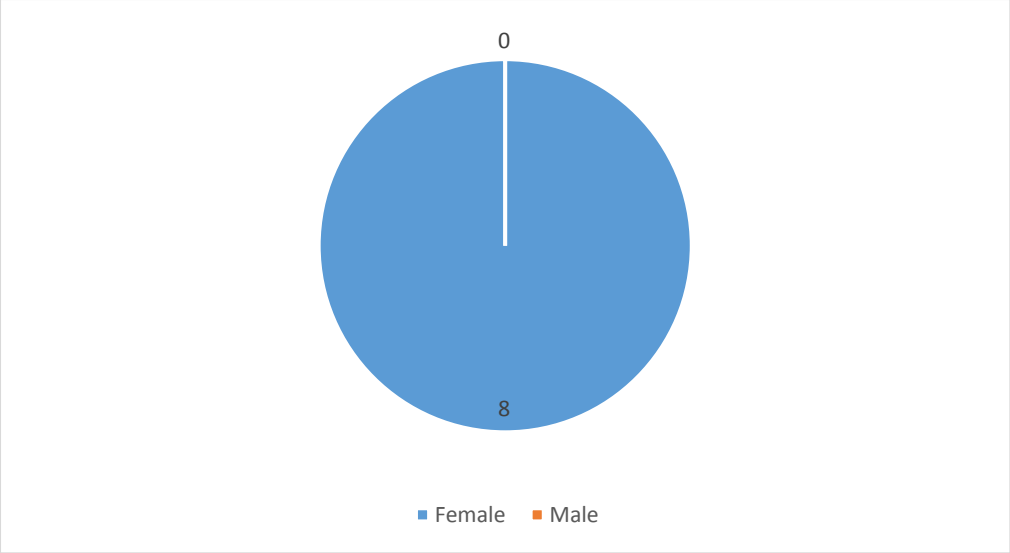

Figure 4.2: Gender distribution

All eight (100%) participants in the study were female.

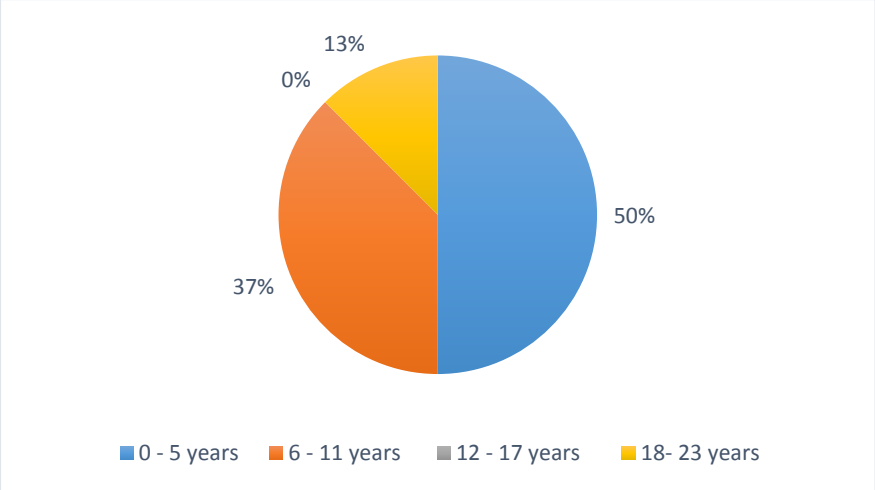

Figure 4.3: Working experience of HoDs

As reflected in Figure 4.2, the working experience for the eight heads of departments interviewed was as follows: 4 (50%) had served for 0–5 years, 3 (37%) had 6–11 years, nobody was in the range of 12–17 years, and only one (13%) had 18–23 years.

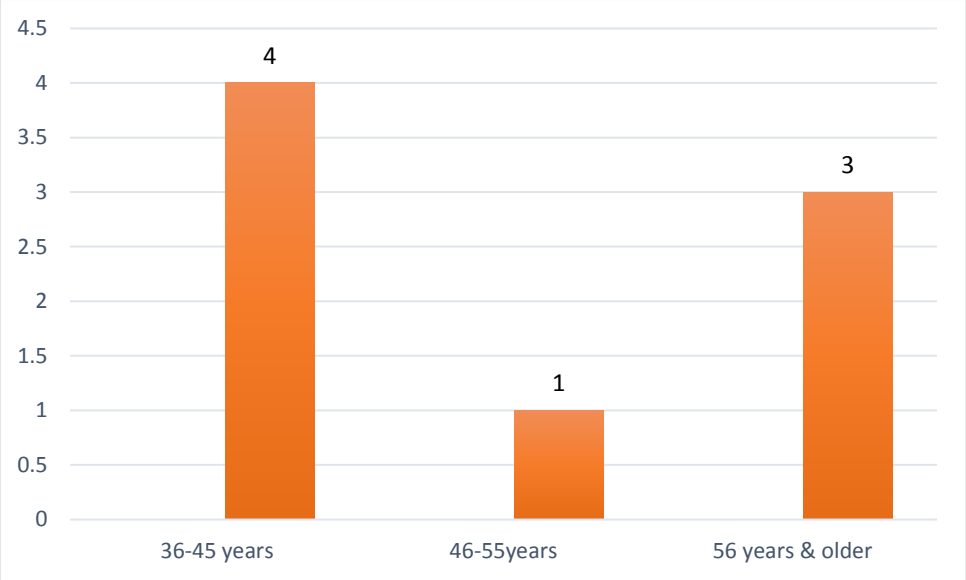

Figure 4.4: Age distribution

Of the eight participants interviewed, only one (13%) was aged between 46-55 years. Three (38%) of the participants interviewed were aged 56 and older, while four (50%) fell in the age group of 36-45 years.

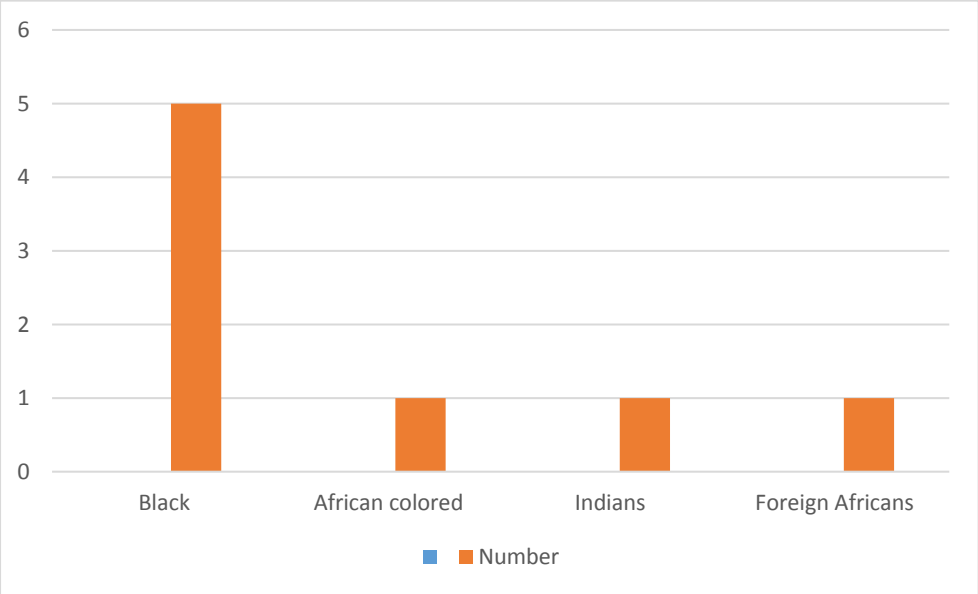

Figure 4.5: Ethnic groups

Of all the eight participants interviewed, there was only one (13%) African coloured, Indian and foreign African respectively, and the remaining five (63%) were black South Africans.

Table 4.1: Categories of HoDs according to their schools

Schools	HoDs Coding	Keys
A	HoD-A1	Present
	HoD-A2	Absent
B	HoD-B1	Present
	HoD-B2	Present
C	HoD-C1	Present
	HoD-C2	Absent
D	HoD-D1	Present
	HoD-D2	Present
E	HoD-E1	Present
	HoD-E2	Absent
F	HoD-E1	Present
	HoD-E2	Absent
Total	**12**	**Total**

Table 4.2: Participants' with teaching qualifications related to mathematics

Total Schools sampled	Relevant HoDs to mathematics	Irrelevant HoDs
6	5	3

Out of the eight HoDs sampled from six schools, three (37%) held teaching qualifications and subject specialisations that were irrelevant to mathematics, while 5 (63%) had specialised to teach mathematics.

Table 4.3: Highest qualifications

Qualifications	Number
Advanced certificate in education	2
Honours degree	5
Master's Degree	1
Total	**8**

Of the eight HoDs interviewed, two (25%) held an advanced certificate in education, while most, i.e., five (63%) held honours degrees. In all, only one (13%) HoD had a master's degree.

4.5 THEMATIC PRESENTATION

A total of three themes and four sub-themes emerged from the data collected. Three data sets were generated from the individual interviews and focus group discussion (FGD) respectively. The information presented in Table 4.4 summarises the themes that emerged from these datasets.

Table 4.4: A summary of themes that emerged during data analysis

Themes	Subthemes
4.4.1 Performance management system (I & FGD)	4.4.1.1 Roles and responsibilities of a HoDs in schools (I) 4.4.1.2 Daily activities of HoDs and organisation of their work (I & FGD)
4.4.2 Barriers in achieving good performance of learners in mathematics (I & FGD)	4.4.2.1 The HoDs' challenges in achieving good performance in mathematics (I & FGD)
4.4.3 Support system in mathematics (I & FGD)	4.4.3.1 Resources available in the support of mathematics (I & FGD)

I = interviews; FGD = Focus Group Discussion

4.5.1 Theme 1: Performance Management System

It is argued that performance management system cannot be functional without a proper accountability system. Accountability systems are features of effective education systems in many countries such as the United States of America (USA), England, Australia and Wales (Mosoge & Pilane, 2014: 1). Through the accountability system, the government is able to determine whether teachers are performing according to the required standards. The expectations are that learners should achieve high levels of academic performance. This can be attained if the measurement of performance is coupled with rewards and sanctions.

According to Mosoge and Pilane (2014:2), in South Africa, the DBE uses the IQMS to assess teachers' performance. The IQMS consists of three related systems: the Developmental Appraisal System (DAS), Whole School Evaluation (WSE) and a Performance Measurement System. The DAS is designed for the development of the teacher by their supervisor in order to improve their performance based on an appropriate improvement plan. Performance management should be carried out before a teacher is

appraised and it acknowledges the principle that a person cannot be held accountable without clear goals and precise measurement (Mosoge & Pilane, 2014:2). Mchunu and Steyn (2017: 9314-9315) further indicated that this ongoing cycle involves continuous actions of planning and monitoring review on the part of both the teacher and the team leader. The WSE which is guided by the national DBE, is a quality assurance system that enables schools and external supervisors to provide an account of the performance of various schools (Govender, Grobler & Mestry, 2016: 997).

4.5.1.1 Sub-theme 1: Roles and responsibilities of HoDs in schools

HoD-A1

School A had two HoDs; however, during the fieldwork, one was reported to be absent due to family problems, and this HoD was coded as HoD-A2. Accordingly, the researcher focused on the HoD who was present during data collection and was coded as HoD-A1. HoD-A1 responded comfortably at the start of the interview. In response to the question asking this HoD about the general roles of the HoDs, this participant stated thus:

> *"Okay, the… role of an HoD is to mhmm… see to it that education at school, in fact …learning and teaching, are effective. You look after all the educational activities in the classes that are allocated to you. For example, I have been appointed to be an acting HoD at the Foundation Phase. My role is to see to the smooth running of all the educational activities." (HoD-A2).*

This participant seemed to be aware of the general duties of the post as outlined in Education Labour Relations Council Collective Agreement (ELRC, 2013: s 4.4 [iv]). The duties and responsibilities of the job are individual and varied and depend on the needs of a particular school. They may include assisting in the management and monitoring of the school resources, textbooks and equipment for the department. However, the participant could not be specific on the above; hence, the response is categorised as general roles of the HOD.

School B had two HoDs in the GET band coded as HoD-B1 and HoD-B2 respectively, and both of them participated in this study. HoD-B1 explained that she provided both professional supervision and support when teachers experienced problems. During the interview, she explained that her role was:

"To supervise mathematics teachers, their classes and also to support them. When teachers have problems, they can come to me as a supervisor. Learners always think mathematics is a difficult subject; then I encourage them to participate in their classes…"

HoD-B2 mentioned professional supervision of teachers as her key responsibility to ensure that they went to classes prepared. During the interview, HoD-B2 said:

"Eh…eh…to ensure that teachers attend their periods, and that they are prepared before they go to classes, and that they prepare according to the policy of the subject, and that they do the assessment in the time frame that is suggested in the pace setter, showing the content that should be covered at the particular time."

Both participants clearly stated the roles of the HoD, as stipulated in the Education Labour Relations Council Collective Agreement (ELRC, 2003: s 4.4 e (ii)), namely "…to control the work of teachers and learners in the department; to control the mark-sheets; and to control test and examination papers and memorandums". Public primary schools in South Africa cater for learners from Grade R–7 where a number of school subjects must be taught: four in the Foundation Phase, six in the Intermediate Phase, and nine in the Senior Phase (Singh, 2015:98). As indicated in the previous statement, in every department in a public school, subject heads share the workload of the principal. Singh (2015:98) supported the view that it is common practice in schools to make use of subject and grade heads that provide leadership to smaller departments.

In School C, only one HoD was available for the interview, and the other one responsible for mathematics did not want to participate. The HoD who participated in the study was coded HoD-C1. She explained that she used to teach mathematics at the school before and stopped because she was assigned to teach Afrikaans as there was no one else to teach it. On the question about her key responsibilities, she mentioned management of the department and being an all-rounder, implying that she was responsible for the general management, oversight and functioning of the department. In her unedited response, she said:

"I am an HoD; Eh… mhmm, basically for Afrikaans and Life Skills, and I am also managing Grades 6 and 7. I am an all- rounder…"

Both HoD-D1 and HoD-D2 at School D showed insight and some similarities in articulating their key responsibilities which included teaching mathematics, and supporting and mentoring new teachers. HoD-D1 expressed her understanding of her role as follows:

> *"…to recruit and support teachers…; to guide teachers on how to use the syllabus like showing different approaches…; to assist in the evaluation of the results and moderation of work done…; to analyse the results and think about subject improvement strategies…; and to assist in the management of the school…."*

In the same vein, HoD-D2 explained her role as follows:

> *"...I am responsible for the Physical Science department…. I have to see to it that all classes are occupied by the teacher…; that they do work… and we have to do certain things practically, practical work, tests with the learners and give them homework …"*

During the interview, HoD-E1 disclosed that she managed seven subjects including mathematics in the GET and FET bands. Among her key responsibilities, she mentioned her involvement on the SMT, which included assisting the school principal in her position. Specifically, she indicated that as the HoD, her responsibilities were:

> *"…to see to it that all the teachers are supervised and mentored and to give support to those teachers who need development; … to complete procurement forms for the school laboratory, that is, I need to budget for the lab…."*

There was only one HOD from School F, who was accordingly assigned code, HoD-F1. HoD-F1 was only managing mathematics in the GET band (Grade 8 to Grade 9). She stated that as the HoD, her role was:

> *"…to guide teachers on their work especially the new teachers who are fresh from the college…; to ensure that teaching and learning is happening and effective...; [lonto ke] it needs to be controlled by tools, that is, monitoring tools to check the syllabus coverage…; to check the assessment, daily activities…; to check whether learners are given homework or not…; and whether they are doing the homework. Some teachers do have the energy to chase learners, and so I pitch in as the HoD to pressurise learners to do the work and even to contact parents about their performance."*

The participants' responses were relevant to the duties of the HOD as discussed in the literature. Specifically, HoD-F1's response reflected that her workload was focused mainly on her duties as the HoD in the GET band.

4.5.1.2 Sub-theme 2: Daily activities of HoDs and organisation of their work

In this study, both focus group discussions and individual interviews showed similar responses with regard to the HoDs' daily activities at work. They further explained that teaching was their everyday activity. However, with regard to class visits to check if teachers honoured their periods, very few mentioned how they divided their time for this. In this regard, HoD-D2 said:

> *"I teach and monitor teachers. I teach two classes for about two hours. The rest of the time, I have to see to it that teachers conduct practical work for learners."*

On the same note, when asked about her daily activities, HoD-E1 responded thus:

> *"I have got my teaching lessons, marking responsibilities as well; sometimes setting tasks. Besides, I also manage the lab…. I also do class visits, which is two times in a week, visiting two teachers…. I am also a head in the disciplinary committee….; all the disciplinary issues are brought to me on a daily basis."*

Most of the participants had no idea as to how their time was divided on activities on a normal working day. When expatiating how the activities were implemented, HoD-F1 disclosed:

> *"We do not have the exact amount of time. What I know is that I must be able to see at least two teachers a week not per day, so that I can find the challenges, and try to address those challenges through communication with the SMT. We discuss with the SMT how we can help teacher so and so. So, like one might have a challenge of class control because he/she is young, others are having a problem of being lazy to mark learners' work. So, we strategise on how to have a tool that is going to guide the HoD to monitor…. I do not have the particular time, but we spend roughly four hours in administrative work as the HoDs a week."*

The majority of HoDs, especially during the focus group discussions, disclosed that the tasks they implemented in their schools included organising teaching and learner support material, coordinating the plans for the DBE, communicating notices, advising the school

managers towards the improvement of teaching and learning and supporting mathematics teachers. In this regard, HoD-D1 said,

> *"I enjoy using the skills I acquired during my academic life, especially the technical skills to make mathematics easy for learners, trying to improve their critical thinking and develop the love for mathematics."*

4.3.2 Theme 2: Learners' Barriers in Achieving Good Performance in Mathematics

Many studies have discussed the factors that hinder learners from achieving good academic performance; however, these barriers still persist especially in the Eastern Cape schools. A study by Daniyan (2015:v) on the challenges in teaching learners experiencing barriers in mathematics at the Intermediate Phase, revealed issues related to education such as: language barriers, overcrowded classes and lack of resource materials.

4.3.2.1 Sub-theme 3: The HoDs' challenges in achieving good performance in mathematics

During the interviews, most participants revealed that the HoDs faced various challenges in achieving good performance in mathematics, notably high numbers of learners in classes and learner-teacher ratios.

This is consistent with studies conducted by other researchers. For example, Marais' (2016:1) study on learner-teachers' challenges when teaching in overcrowded classrooms mathematics found that the large numbers in classes not only affected this subject, but languages as well. It was also revealed that 30%–40% of teachers endured discipline problems with learners, particularly those in huge classes more than in small classes. This could be attributed to limited comprehension skills among learners and cultural mismatches between them and teachers.

In a parliamentary report on school realities in 2012, the Minister of Basic Education, Mrs Angie Motshekga explained that some provinces had achieved the learner-teacher ratio of 30:1 as envisaged in the national target. Although this level of learner-teacher ratio had been achieved, some HoDs still experienced overcrowded classes and this raises a concern about the manageability of big classes (Zenda, 2019: 2). Table 4.5 presents the learner-teacher ratio per province in South Africa. These provinces are abbreviated as

follows: Eastern Cape (EC), Northern Cape (NC), Gauteng province (GP), Limpopo (LP), Mpumalanga (MP), KwaZulu-Natal (KZN), Free State (FS), Western Cape (WC), and North West (NW).

Table 4.5: Learner-teacher ratio

Province	EC	FS	NC	GP	NW	LP	WC	KZN	MP	SA
LE	29.1:1	27.1:1	30.6:1	31.4:1	30.6:1	30.1:1	30.6:1	31.2:1	31.1:1	30.4:1

Source: PoliticsWeb.co.za (2012)

A study by Okeke and Mtyuda, (2017:57) found that teachers complained about lack of resources. They also established that learners had no calculators which made it difficult for them to perform and solve some mathematical problems. According to Kucirkova and Flewitt (2020:136), a lack of resources like models, pictures, drawings, graphics, calculators and charts contributes to the learners' negative attitudes towards mathematics. In order to improve the learners' performance in the subject, mathematics classrooms should ideally be organised in such a way that they have a mathematics feeling and touch.

In line with the above recommendation, the EC Department of Education (2016:9) wrote, "in delivering on the department's key service which is to provide quality teaching and learning the Education Department commits itself to undertake and honour Batho Pele [People First] principles''. It further committed that the Batho Pele principles would be incorporated and embedded in key strategic documents at planning, implementing, monitoring, evaluated and reporting levels. For example, the EC provincial documents lists the required service standards, and call upon the subject advisors to visit schools at least once per quarter to monitor and report on curriculum coverage as well as the learners' quality of written work. Another effort as stipulated in the service standards under curriculum management is that Grade 8 and 9 mathematics teachers should undergo professional development fortnightly. This would in familiarising them with all the upcoming challenges or behaviours, especially in the classes. However, a classroom is also a place where positive or negative attitudes towards mathematics can develop and flourish, and therefore, it is important that learners should see mathematics around them. Academic performance is affected by the quality of leadership in place. In this respect, many schools experience challenges as the mathematics HoDs never call meetings with teachers and learners' work is neither supervised nor moderated. Authors such as Day

and Sammons (2014:8) suggested that one important aspect of the HoD's role is to organise, manage and lead a team of teachers in order to manage these challenges. Meetings facilitate communication and the flow of important information. Teachers believe regular meetings may assist them with curriculum issues, specific questions around subject content and improvement of their style of teaching. Teachers articulated a need for effective assistance, guidance and mentoring in most aspects of teaching, but specifically around issues of lesson planning.

The participants also stated that learners without a background in mathematics from previous classes or previous phases struggled to pass mathematics. Numerous complaints have been lodged formally and informally to the DBE regarding learners' lack of basic foundation in mathematics. According to Omoniyi and Gamede (2019: 139-140), this could be linked to the fact that some learners are from impoverished backgrounds and, as a result, some lag behind academically. This is similar in the situation of the existing study where the schools are based in communities that are underdeveloped and socieconomically poor. Poor quality schools and their catchment areas could also contribute to poor performance of learners.

Further, Thomson, Casey, Lombardi and Nguyen (2017: 52-54) advocated that there is a confluence of factors that contribute to learners' low achievement in mathematics. In this regard, Akintande (2017:11) argued that many learners view mathematics as a difficult subject due to their poor foundation in the subject and the lecture method often adopted by teachers. Over the years, researchers have explored alternative ways of teaching mathematics to low-performing learners, irrespective of their subject area in the mathematics classrooms (Lowrie, Logan, Harris & Hegarty, 2018:n.p.; Lindenskov & Tonneson, 2020:8).

According to Singh (2014:112), some of the challenges facing teachers in public schools are heavy teaching workloads, extra and co-curricular activities, administrative duties and communication with stakeholders. She also suggested that teachers must sacrifice some of their time during the school day or after school hours in order to fulfil their duties and get the work done. HoD-F1 revealed her continuous frustration with teaching learners who lacked background in mathematics as follows:

"…learners come from GET band without the required knowledge in signs, that is, negative (-) and positive (+) numbers (integers)."

Most participants revealed that learners who display negative attitudes towards mathematics are likely to fail it, while those who display positive attitudes are likely to achieve good results. Similarly, a study by Jacobs and Spangenberg (2014: 92-93) on learners' attitudes towards mathematics found that their positive attitudes reflect a positive emotional disposition towards mathematics, while negative attitudes show a negative emotional disposition.

Some of the participants further stated that in their schools, some teachers lacked requisite skills for teaching mathematics, which contributed negatively to the learners' academic performance. In this regard, HoD-A1 disclosed,

"There are challenges in teaching mathematics; the skills are not acquired by the educators. There is a barrier, the teachers are not able…; they are having a content barrier of teaching the subject."

Although the participants stated that they enjoyed teaching mathematics, they revealed that there were inadequate resources to teach the subject in their schools, which frustrated them. These resources included teaching aids, equipment, technical resources and library resources. This indicates that learners are taught without sufficient, relevant teaching aids, which hampers their performance in the subject. In the same manner, a study by OECD (2017: 9) revealed that the required resources at schools do not only involve personnel and equipment, but also technology, time and funds.

4.3.3 Theme 3: Support System in Mathematics

The HoDs as the heads of curriculum are the key beneficiaries of support from the DBE. Education White Paper 6 pointed out that the inclusive system is about giving support to all learners, teachers and the whole system in order to reach the full capacity of learning needs with emphasis on development of good teaching strategies that would be beneficial to all learners (DBE, 2016:17). This is in line with Katz's theory (1997) of different development needs of teachers, which suggests that support and training have to be matched with the developmental stage of teachers (Betawi & Jabbar, 2019:41).

4.3.3.1 Sub-theme 4: Available support system in mathematics

Despite numerous challenges associated with mathematics, most participants in both focus group discussions and individual interviews disclosed with confidence the kind of support they received from their schools. In particular, they cited the employment of teachers who are experts in mathematics by the SGB with the support of principals and other teachers, which enhanced the learners' performance in the subject as reflected in the excerpt below. In this respect, one HoD revealed,

> *"...we have got an office that is helping us a lot because … they have created extra classes and they pay teachers who teach them. We even hire from outside. We do not allow a teacher to teach them on Saturdays, while he is still teaching them during the week. So, we are finding new teachers, hiring new teachers whom we think a learner can gain more by hearing another voice…" (HoD-FI)*

One HoD for mathematics stated that they needed support from the DBE in the form of workshops to improve performance in the subject as stated below.

> *"There is support because the Department of Education is running workshops though they are not effective. These workshops are not effective because they are run by the province and the province trains certain individuals to pass the knowledge to the majority of teachers and so when this knowledge from the province goes down to the teachers, it becomes fabricated…."*

The DBE (2016:21) stipulated that its mandate is to carry out capacity building for effective schooling structures, and to ensure through sustained monitoring and support that systems operate efficiently. However, these HoDs are still uncertain about the way the workshops are carried out.

A few participants mentioned other support systems, namely the internet and funding, which assist in the learning of mathematics. They disclosed that learners used these resources to improve their performance in the subject. Moreover, the availability of these resources gave other teachers an opportunity to access more information related to the subject where prescribed textbooks are not helpful. HoD-C1 further revealed that her internet devices and data bundles provided powerful support in the following manner:

"The other support from myself is that I am an 'internet freak', if I can use that word because whenever I need to look for something, I go straight to the internet. Some of the methods I showed them I have seen from the internet and it works wonders …."

HoD-E1 revealed her school's secret as follows:

"Each year, we get a funder outside the school not in the Department of Education, but we get a funder Pocket Optima Trust … [which gives], +/- R300 000 that is meant for maths activities only. So, we are able to buy more study guides, and as a result, we opened a library specifically for mathematics. We call [it the] 'Maths Library' where we have other resource material besides normal textbooks…"

4.4 CONCLUSION

This chapter described the findings derived from interviews and focus group discussions with eight HoDs from six primary schools in Mthatha, in the EC Province. The chapter identified and discussed three main themes and subthemes that emerged from data analysis: performance management system, learners' barriers to achieving good performance in mathematics, and support system in mathematics. These themes highlighted the roles, responsibilities and daily activities of the HoDs at school. The chapter also outlined some barriers that hindered learners from achieving good performance like lack of basic teaching aids. Finally, it was established that the district education office plays a critical role in supporting teachers' efforts to improve learners' achievement by providing personnel and material resources.

The next chapter presents a summary of the study, conclusions from literature and empirical findings and based on these, proposes recommendations on how mathematics HoDs can improve their efficiency in leading their departments, and improving teacher productivity and learner achievement in the subject.

CHAPTER 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

The previous chapter presented the interpretations and discussion of findings generated from Chapter 4. Data was analysed from both semi-structured interviews and a focus group discussion in order to interpret the findings. All the themes generated during the analysis were used to provide an in-depth interpretation of the findings. The present chapter also draws conclusions, highlights limitations of the study, and provides recommendations on how the heads of department can play a more meaningful role in the teaching and learning of mathematics in the selected primary schools of EC Province through effective leadership and support of teachers.

The main purpose of this study was to investigate the role of HODs in the teaching of mathematics in primary schools of the EC Province. The participants comprised of HoDs of mathematics. The literature review was conducted in order to address the main research question and sub-questions posed in chapter 1 (i.e., subsection 1.4). In order to attain those questions, the researcher established the objectives which were specific in achieving the entire purpose of the study. These objectives were outlined as follows namely:

- To investigate the role of HOD in teaching and learning mathematics.
- To recommend the best practice that would enhance the performance of teachers in mathematics in the General Education and Training Band in the district of Mthatha.
- To identify and describe the current policies and workshops in place that help HoDs' development trainings in their field of management.
- To describe the role played by HoDs in mathematics teaching and learning.
- To explore HoDs perception on the challenge of high underperformance in mathematics.
- To determine the current strategies utilised by HoDs in the development in mathematics.
- To identify challenges influencing poor performance in mathematics.

When designing the interviews schedules for both semi-structured interviews and focus group, the above questions were used as a framework of reference in order to minimise the inconsistencies and enhance credibility of research data. The conclusions of the study were based on these questions.

5.2 SUMMARY OF THE STUDY

In Chapter 1, background to the study, problem statement, main research question, and sub-questions were presented probing the role of HoDs in teaching and learning of mathematics in primary schools of the EC Province. In Chapter 2, literature review was conducted on the historical background of the roles of HoDs mathematics perspectives on the national and international perspectives of the mathematics were investigated. A conceptual framework was developed using the different theorists. Some of these theories that were behind the development of education strategies in mathematics were the constructivism and connectivism theories. The theories provided a history of and perspectives on the role of mathematics HoDs in teaching and learning, as well the rationale behind a paradigm shift to an effective education system in subject phenomenon. Finally, the chapter highlighted the challenges of mathematics HoDs that hindered them from carrying out their roles and responsibilities in ensuring good learner performance in mathematics.

Chapter 3 presented the interpretive paradigm, qualitative research methodology and a case study, and the research design adopted for the study. The instruments and strategies used to collect data were also highlighted.

Chapter 4 presented an in-depth analysis of data collected through semi-structured and focus group discussion interview format with the HoDs. The participants' responses were recorded verbatim using an audio recorder and field notes were taken to supplement the voice recordings. The audio recordings were transcribed verbatim into text data and themes were generated which were broken into subthemes to help the researcher to make an appropriate analysis of data and to avoid duplication of information between themes.

Chapter 5 summarises the study with special reference to literature review and research findings, draws conclusions from literature review and research findings, and proposes recommendations that can improve practice in the role of mathematics HoDs in teaching and learning of mathematics in the primary schools of the EC Province. The

recommendations are largely related to the mathematics performance management standards on a broad level.

5.3 CONCLUSIONS FROM LITERATURE REVIEW

This section gives an overview of the different themes explored in the literature review on the role of HoDs of mathematics in primary schools of the EC Province.

5.3.1 Conclusion related to Research Objective 1: The Role of Heads of Departments in Teaching of Mathematics

The review of literature reveals that HoDs of mathematics should be knowledgeable about the statutes, policies and regulations that govern the curriculum development of mathematics. In particular, the Constitution of South Africa legitimises the implementation of relevant curriculum for effective and efficient performance in the mathematics subject. The knowledge of policies and regulations assists the school management to organize HoDs to interpret for the benefit of mathematics performance. Mashapa (2019:5) concurs that HoDs should lead and direct stakeholders at school to eliminate deviations from policy and confusion. For this to happen, they need to acquaint themselves with the new education laws and policies of education.

Despite numerous factors such as absenteeism emanating from social and family problems, the HoDs were found to be aware of their role as outlined in the South African Schools Act of 1996. Those roles include but are not limited to the activities such as planning and management of school stock, textbooks and equipment for the department, supervision of teachers, monitoring of classes' performance including provision of effective support, ensuring lesson plans are prepared before delivering them in class, controlling of the teachers' work and learners in the department, controlling mark-sheets and test examination papers as well as memoranda. Some interviewees declared that part of their roles include general oversight and functioning of the school as stipulated by the DBE. Support such as effective recruitment enhances the effective performance of the HoDs and guidance on the use of syllabus in the subject. The participants showed adequate understanding that they are obligated to facilitate procurement of required items for the school including controls in the budget.

According to Wits School of Governance and Bridge (2016: 33-34), HoDs are responsible for ensuring quality education and redress of educational inequalities through available

basic equipment, resources and other required needs for school functioning especially in the subject such as mathematics and strengthening of gender equality during recruitment and selection process. However, HoDs, as accounting officers, are also responsible for dealing with disciplinary issues. A study by declared that organising teaching, learner support material, and coordinating plans for the subject in their disciplines is their responsibility. HoDs need cooperation from other stakeholders for mathematics good outcomes. Those stakeholders are the parents, other teachers and learners, in addition to the principals and the officials from the DBE. With effective support of these stakeholders, good performance of learners in mathematics be successfully attained. The next section discusses the drivers of good performance.

5.3.1.1 Key drivers of good performance in mathematics and their roles

The study revealed that the key drivers of good performance in mathematics are effective teachers and mathematics HoDs, supportive parents, and dedicated learners. These stakeholders are necessary at all levels of education for improving and maintaining learners' performance in mathematics.

Parents' role

The role of parents is to support their children educationally in order to achieve good results at school. Their support includes guidance and assistance of their children in the homework given by their teachers. Parents and teachers should work together in attaining the expected outcomes of the learners. In Chapter 2, it was suggested that there should be teacher training programmes aimed at assisting learner teachers how to write effective notes, letters and newsletters to families. It was also revealed that parents of learners in poorer South African schools do not give teachers the assistance they need. Ideally, parents should support their children educationally and add value to the efforts of teachers in their children's education. This study also revealed that the participants give little input as part of their responsibility to contact parents about the performance of their children. The HoDs expected parents to help with their children's homework and to create a conducive environment at home.

Teacher's role

The findings revealed that a mathematics teacher is there to support, deliver, facilitate and teach learners. The intention is to get good exit level outcomes at the end of each

section of the subject curriculum. Some participants stated that the role of the mathematics teacher is to plan a lesson according to the required policy standards including the curriculum of the subject. The study further revealed that mathematics teachers are expected to create a conducive classroom environment for effective teaching and learning to enable learners to perform better in mathematics. It was also established that motivated learners are likely to achieve better results in each assessment. A school has various structures or committees meant to facilitate the organisation and management of its operations. In this respect, the HoDs are key drivers in the running of such committees and the implementation of their decisions. It is further argued that support and accountability are required from a mathematics teacher. the theory of connectivism explored in this study demonstrated that, with support, learners can perform better.

The participants showed consistency in their love for mathematics despite teaching different subjects. The participants further affirmed that part of their role was to supervise and support learners. In addition to this general statement from most participants, some HoDs stated that they guided teachers on how to use the syllabus properly and different approaches such as supporting, monitoring and evaluation were used to enhance facilitation of learning to improve learners' performance.

Learners' role

The study revealed that learners have the platform to express their dissatisfaction on learning activities to teachers and parents. However, learners are also obligated to share ideas on improving the learning areas amongst themselves and teachers. Once the relationships and bonding between teachers and learners are established, learners are likely to achieve the expected outcomes. In addition, learners need to be guided and have the responsibility to lodge complaints where there are assumed failures. The learners' role includes reading and covering the entire syllabus in time for good outcomes in all assessments.

5.3.2 Conclusion related to Objective 2: Recommendation of Best Practices

Many authors have determined standards necessary for good outcomes of mathematics. Such authors include Mulaudzi (2019: 1-2) who stated that the HoDs should always plan before implementing any practice standard to avoid unnecessary failure. He further

argued that for effective education in mathematics, HoDs should take full responsibility for all subject-related matters to ensure best practice and good outcomes. The following standards are proposed based on the research findings.

HoDs should take the following list of recommendations into account and should work towards implementing the recommendations effectively in school settings.

- District management and principals should appoint sufficiently qualified teachers at schools.
- District management should ensure that they employ enough mathematics teachers in all schools.
- The district management should strengthen procurement systems that would promote availability of the required resources and teaching aids.
- The DBE should ensure that all learners receive a solid grounding in mathematics at primary levels. This would promote good performance in the subject area in the Senior Phase.

5.3.3 Conclusion related to Objective 3: Training

There are many policies that were designed to help teachers with the implementation of the school curriculum. Some of these policies recommend workshops that would enhance HoDs' development in teaching and management within the field of mathematics. For example, the National Education Policy Act 27 of 1996 (ELRC, 1996: s1) stipulates that a teacher should be trained in developments that were not part of a teacher's curriculum during their tertiary studies. According to National Skills Development Plan (DHET, 2019:24), each employer has the responsibility to train their staff in areas where skills are lacking. These skills plan should also be submitted to the Department of Labour as stipulated for compliance purposes. The LRA stipulates that employees should be capacitated in their workplaces and thus the Skills Development Act was established. In the context of this study, DHET has multiple support systems to improve standards of education.

5.3.3.1 Existing support system in mathematics

In terms of the multiple challenges experienced by HoDs in the school setting, some participants stated that the support systems included professional development, the

availability of office equipment, hiring of new teachers, workshops, extra classes, limited access to the internet, and study materials. The study also revealed that these support systems are insufficient as they do not cover all schools and even for those schools that received positive support, not all the resources are available. Jameela and Alib (2016:124) stated that support systems available for mathematics is not uniform across all schools. They further stated that allocation of resources is still a challenge especially in science subjects. All participants emphasised that improving standards of education would promote good performance of learners. These participants further stated that they expected the DBE to allocate resources according to the needs of each school.

In general, HoDs and teachers in mathematics are not formally trained in many training needs for the subject. It has also been established that, currently, CPD programmes are not provided at the expected pace which has a negative effect on the teachers' teaching abilities in mathematics. This emanates from poor management in terms of planning systems which leads to high failure rates in mathematics. It also emerged from the literature review that HoDs have theoretical, skills and knowledge gaps with specific reference to mathematics and that if the status quo does not improve, learners will continue failing despite other support activities. Unfortunately, the literature review highlighted the concern that the current approach to teacher development and training is not up to the expected standard as failure of learners was still a major problem. In this context, future studies could be done to improve the competency of HoDs in the field of concern.

5.3.4 Conclusion Regarding Objective 4: Underperformance in Mathematics

Despite various support systems in place by the DBE to improve performance of learners in mathematics in primary schools of the EC Province, this study revealed that many mathematics teachers are underperforming. This includes the HoDs for various reasons such as lack of proper supervision; negative attitudes of teachers and learners towards mathematics; lack of support such as mentoring and coaching; and poor planning and managerial skills by HoDs. Learners perceived that having material resources in school would not help if their teachers are not competent in teaching them. Many HoDs perform poorly because of lack of effective systems to support them in teaching the subject while other are not even mathematics teachers though they hold position of being HoDs in the mathematics. Poor performance in mathematics is linked with incompetence in

management and teaching. Therefore, further extensive effort to improve their knowledge level in the subject is required.

5.3.5 Conclusion Regarding Objective 5: The Development of Mathematics

There is a slow progress in capacitating teachers and HoDs in their roles. Some of strategies currently include but are not limited into supplying technological systems such as computers with access to internet although most rural schools do not have access to this. However, participants revealed that having access to internet assisted them in finding solutions that were not provided in their textbooks. Secondly there is the strategy of continuously supplying of textbooks, desks, and other study apparatus. These all help in learners' performance. Thirdly, there is a need for government collaboration such as integration with the Department of Transport to ensure that roads are maintained to allow learners and teacher to have better physical access to schools. The study found that the SMT plays a vital role in overcoming major difficulties such as shortage of teachers and a lack of skills among teachers.

5.3.6 Conclusion Related to Objective 6: Challenges influencing Poor Performance in Mathematics

This section presents the conclusions on the findings about challenges identified from participants during both semi-structured and focus group interviews. These factors are categorised into two sub-sections namely human and material resources. Before discussing factors under these categories, the researcher discuss factors affecting good performance from a broader perspective.

5.3.6.1 Factors affecting good performance in mathematics

Participants indicated that there are various challenges faced the HoDs in their endeavours to achieve good performance in mathematics. These challenges are an obstacle to quality service delivery in the subject of phenomenon. These challenges include overcrowding in classrooms and a high learner-teacher ratio. Many schools in South Africa have classroom enrolments of more than 40 learners (although the official statistics show otherwise – cf. Table 4.5), which impact teaching and learning negatively. During the interviews, the mathematics HoDs mentioned that the learner-teacher ratio was high and unfavourable and unsuitable for effective teaching and learning.

The participants attributed the learners' poor performance in mathematics to the fact that some of them lacked a solid background in the subject. It was reported that the Eastern Cape Department of Education provides assistance with monitoring in the form of moderation of assessments though there are still existing challenges. Therefore, mathematics teachers were advised to hold meetings to discuss matters related to the poor performance of learners in the subject and to formulate strategies that could address the problem and submit them to the SMT. The researcher observed that other studies revealed that the participants who displayed negative attitudes towards the subject are likely to fail, while those who display positive attitudes towards the subject are likely to attain good results.

The study also revealed that many teachers lack skills in mathematics and that contribute to learners' failure. Though the teachers understand their job specifications, government support is still inadequate. This emanates from the existing inadequate resources to help in mathematics such as teaching aids, limited equipment, lack of technical resources and library resources. The study discussed the theoretical framework that would enhance the flow of information, including roles and responsibilities. This would help learners in classroom activities. This theoretical framework aimed at helping learners to achieve the expected quality of education. One important finding which also hinders performance of the learners is that the HoDs employed in the Senior Phase managed various subjects with some not having a background in the subjects they oversee. This contribute to the failure rate of learners in mathematics.

Human resources

The key drivers of human resource of this study are SGB, parents, principal or deputy principal, mathematics teachers, HoDs and learners. The study revealed that though there are still challenges faced by the participants, they declared that they had the support of both SGB and SMT regarding employment of SGB teachers.

Indeed, the role of the SGB is to govern in the public and independent schools. Its main duty is to establish policies and ensure their implementation by the SMT, teachers, support staff and learners. This contributes to the improvement of the quality of education. Though there was concern about the lack of parents' involvement in the learners'

activities, the SGB emphasised the importance of the parents across the educational levels.

This study discussed the role of the parent as a valuable resource in assisting in the achievements of the schools' vision and mission. Some discussions revealed that parents in the poorer schools were not competent to perform many of the school governance tasks such as drafting of budget and establishment of a recommendation letter to appoint a principal. This contributes to the failure of policy implementation. However, those parents who assisted their children with daily activities contributed positively to learner performance. Therefore, parental involvement can improve learner performance and decrease drop-out rates and foster more positive attitudes towards the school activities.

This study found that there were inadequate leadership skills in schools, especially among the principals. This led to many issues not being resolved because of the poor leadership. In addition, some operational strategies that are the responsibility of Circuit Managers and Senior Educational Specialists did not assist in improving the performance of learners in mathematics. This also contributed to high failure rates.

Similarly, despite the participants getting support from the SGB regarding the employment of teachers to address the workload they experience, there is evidence of a great need to employ permanent qualified mathematics teachers. This will add value to the available human resource required in schools.

Time management is one of the resources that the human resource person, that is, the HOD of mathematics and mathematics teachers have to adhere to. The management of lesson presentations and daily activities including administrative activities are among the duties of the HoD of mathematics and mathematics teacher. However, this study revealed that most of the participants had no idea as to how their time was divided on activities on a normal working day.

The study also emphasised that the learners as precious resources are the focus of all educational endeavours. Many studies have identified the roles of key drivers that contribute to the development of a child as a learner in an organised education system. Various authors discussed ways to develop the learner to achieve good results in mathematics, including encouraging learner to be curious to learn, to learn with other

learners and to participate in all activities. However, the environment must be conducive for learning to take place so that the learner will be motivated to be independent.

An independent learner will be able to participate meaningfully as a self- driven learner. Such a learner will be able ask questions, be willing to assist weaker learners and develop a love for their work. Ultimately, this type of a learner will be able to contribute to the economy of the country as a responsible citizen. Therefore, a learner who is self-motivated will be able to complete school tasks; that means that the learner must adhere to school rules that are formulated by the mathematics teacher as mathematics class rules. However, the study revealed that most of the learners that participated in the study did not do homework.

Material resources

This study revealed that there are multiple material resources that contribute to the effective teaching and learning will be term resources. These resources can be both tangible and non- tangible (e.g. school finances) assets of the school. These vary from school to school; for example, stationery, DBE workbooks, textbooks, teaching aids like cubes, square grids papers, square dotted paper, relevant charts, chalk boards, square grid chalk boards, chalks and coloured chalks, tablets, laptops, smart boards, projectors, relevant videos, e-learning programmes, TV programmes, Wi-Fi, internet and electricity. These might not be available in all schools, but the minimum requirements need to be met; for example, the participants in this study complained about the lack of material resources – only one participant mentioned a mathematics library and the use of internet. Therefore, this indicates that the majority of these schools still lack the minimum requirements for effective teaching of mathematics. The study reported that the help of external donors and partnerships with sponsors are vital for learner performance. This also indicates that for the school to get support, stakeholders of the school also have the responsibility to attract investors to assist the teaching and learning of mathematics.

Performance management systems challenges

It was necessary to determine the role of HoDs in the learning and teaching to improve performance of learners. Results showed that the schools as described by the majority of participants experienced serious challenges in teaching and learning. These challenges include high number of learners in classes versus available teachers. The participants

also commented that the progress of learners without the necessary background in mathematics was viewed as an obstacle to successful learner performance. It was also pointed out that the majority of learners who struggle to pass mathematics displayed negative attitudes towards it.

The study also revealed that there are teachers who were teaching mathematics, yet they did not have basic skills in the subject. Apart from all the challenges, there is also a lack of resources to teach mathematics. These resources include teaching aids, limited equipment, lack of technical resources and library resources. Poor performance of learners were evident as a challenge by many authors. It has been found that lack of resources and basic skills in mathematics, negative attitudes, and a poor foundation in mathematics had a negative impact on learners' performance (Jameela & Alib, 2016:123).

The study further revealed that many teachers who are in charge of mathematics are not competent as they are not experts in mathematics. Therefore, they cannot even provide solutions when they have to deal with mathematics-related matters. This posed many questions with regard to the employment of HoDs within the DBE. Performance management factors included attitudes of teachers rendering the subject of concern. Negative attitudes lead to high failure rates.

5.3.6.2 System barriers

System barriers refer to challenges that prevail because of system inefficiencies and these can only be rectified by the DBE. The literature reviewed in this study established that there is a huge backlog in certain aspects that are fundamental to the establishment of effective systems for full-service schools and some key areas, especially in mathematics. Several studies found that in some learning environments, access is still a major challenge because of poor planning of physical facilities. Indeed, the buildings are old and need major renovation to ensure safety and security of teachers and learners.

Though in South Africa there is a plan to build all school infrastructure for effective education standards including recruiting competent and committed teachers, the literature revealed that there is a not enough space for teaching, which contributes to the fact that teachers work in overcrowded classes. This unbearable situation of overcrowded classes undermines the role of teachers in implementing effective standards in the classroom especially in subjects like mathematics. According to the DBE guidelines, schools should

be clean and tidy and have adequate classrooms in order to accommodate the recommended teacher-learner ratio (DBE, 2010:37). It is noted that the DBE has failed in its promise of infrastructure development to support school management and learners in science subjects. In other words, the DBE is not carrying out its mandate to the fullest. A lack of adequate physical resources reduces the capacity of school management to facilitate inclusive education effectively, since the budget allocated for running costs of a school cannot be used to build classrooms or to do major renovations.

5.4 RECOMMENDATIONS

The study recommends variety of interventions that would help in addressing the current issues related to the role of HoDs in mathematics in the following sub-sections.

5.4.1 Training and Development

The study perceived that having material resources while teachers do not know how to use them will not help learners to pass mathematics. It is recommended that the current HoDs should be capacitated on use of teaching aids, management and administration. This will help them to respond to the current challenges they face in the subject they lead and to improve their performance in their roles.

5.4.2 Mentorship Programme

The study found that there are HoDs who are not mathematicians. Therefore, it is recommended that these HoDs should be enrolled in a mentorship programme that would introduce them to the mathematics field and address negative attitudes towards mathematics.

5.4.3 Infrastructural Development

The study found that some schools have poor performance because their school building plans do not accommodate the current learner numbers and the full spectrum of learners' needs. Therefore, it is advised that the schools need to be built according to the current departmental plans of buildings that allow all educational activities to take place including library facilities. The classes should also be increased to accommodate more learners.

5.4.4 Support Systems

The study revealed that some HoDs do not perform well because of poor support. The researcher recommends that a variety of support services need to be provided. Such support includes a scheduled supervision programme to monitor and evaluate HoDs' performance. Secondly, technical support like the provision of internet access is recommended. Teachers could use it for educational activities and even students would benefit in using it for learning purposes. Installation of proper software such as GeoGebra could be installed to help both teachers and learners to understand mathematics.

5.4.5 Career Exhibitions in Lower Grades Levels

HoDs perceived that their failure to ensure an improved pass rate in mathematics emanates from various reasons such as the poor mathematical background of learners. Therefore, the researcher recommends that at the primary levels, there should be career education about mathematics. This would help learners to understand how important mathematics is and can encourage positive attitudes to the subject.

5.4.6 Sponsorship

The researcher recommends that the DBE should liaise with external donors and ensure strong partnerships for support purposes in teaching aids such software programmes and computers. The availability of teaching aids and competent teachers would assist in the performance of learners in mathematics. The SMT and SGB should ensure that they canvass community stakeholders to assist with the teaching and learning of mathematics.

5.5 CONTRIBUTIONS OF THE STUDY

This study has revealed the challenges and experiences of HoDs from the management perspectives in mathematics, and that this had a negative impact on learners' performance. Several factors contribute to the learners' performance were highlighted. The knowledge generated from HoDs (their views regarding the role they play in learners' performance in teaching and learning setting) could provide management at district, provincial and national level with insights into how HoDs schools experience challenges related to mathematics. The study highlighted several measures that could be used to improve standards of performance of learners, and it is believed that these measures will enhance mathematics teachers' work experience and improve the quality of education.

Learners' satisfaction with teaching is viewed as an important indicator of success in all education school systems.

5.6 CONCLUSION

The challenges of HoDs were viewed as a critical issue in the study because this compromised the standard of education in the mathematics field. Therefore, more needs to be done to investigate, plan and implement effective measures that are likely to improve the standard of mathematics in the schools. The majority of HoDs had a mathematical background while few did not. Those HoDs with no background of mathematics were unanimous regarding the provision of advancement opportunities like resources required to improve the standard of mathematics. This indicates that they did not know what was happening in the subject area. Lastly, it was concluded that providing attractive incentives in the form of rewards and benefits and providing emotional and psychological support to all teachers of mathematics would enhance their performance and positive attitudes.

5.7 FURTHER RESEARCH

It is recommended that further research be conducted in the following areas:

- Factors influencing the performance of mathematics teachers in the GET Band Schools.
- Mathematics teachers' experiences of working in primary schools in the EC Province.
- Exploration of the influence of the assessment on the performance of mathematics teachers in selected GET Band Schools of OR Tambo District Municipality, EC Province.

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APPENDIX A: ETHICAL CLEARANCE

Appendix 1A

UNISA university of south africa

UNISA COLLEGE OF EDUCATION ETHICS REVIEW COMMITTEE

Date: 2017/06/14

Ref#: **2017/06/14/50289969/38/MC**
Name: Mr NK Zide
Student: 50289969

Dear Mr Zide,

Decision: Ethics Approval from 2017/06/14 to 2020/06/14

Researcher:
Name: Mr NK Zide
Email: 50289969@mylife.unisa.ac.za
Telephone: 078 616 6463

Supervisor:
Name: Prof M Lekhetho
Email: lekhem@unisa.ac.za
Telephone: 012 429 3781

Title of research:

The role of Heads of Departments in teaching and learning of Mathematics: The case of six general education and training band schools in Mthatha district in the Eastern Cape Province

Qualification: M Ed in Education Management

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 2017/06/14 to 2020/06/14.

The medium risk application was reviewed by the Ethics Review Committee on 2017/06/14 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:

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

1. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
2. 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.
3. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
4. 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.
5. 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.
6. 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.
7. No field work activities may continue after the expiry date 2020/06/14. Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note: .
The reference number **2017/06/14/50289969/38/MC** *should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.*

Kind regards,

Dr M Claassens

CHAIRPERSON: CEDU RERC

mcdtc@netactive.co.za

Prof V McKay

EXECUTIVE DEAN

Approved - decision template – updated 16 Feb 2017

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APPENDIX B: INFORMATION SHEET

Appendix 2A

INFORMATION SHEET

For

DISTRICT SUBJECT FACILITATOR, SCHOOL PRINCIPAL, HEADS OF DEPARTMENT AND METHEMATICS TEACHERS

Dear Department official, School Principal and Mathematics Heads of Department

I, Nkosinati Kennedy Zide, postgraduate Master of Education student at the University of South Africa (Unisa), wish to conduct research on the influence of Heads of Department role in the teaching and learning of Mathematics in public secondary schooling.

This study is for degree purposes and the title of this research report is: THE ROLE OF HEADS OF DEPARTMENT(HODs) IN THE TEACHING AND LEARNING OF MATHEMATICS: THE CASE OF SIX GET BAND SCHOOLS IN MTHATHA DISTRICT IN THE EASTERN CAPE PROVINCE in the context of recent high failure rate in this subject.

The study aims to investigate the role of HODs in the teaching and learning of mathematics in the GET band (grades R to 9). This study focuses in public schooling in the senior phase (grade 7/8 & 9).

I will be using a case study approach. The participants will be the two HODs in each of the six GET band schools in the Mathematics Department. The study will be conducted in the Mthatha district.

The method of data collection will be a qualitative one which will include: (i) Semi-structured interviews with the HODs which would be captured by means of digital audio recording. (ii) Focus group discussion with HODs which would be captured by means of digital audio recording.

Once the data has been collected and analysed, and the research report drafted, the audio- recordings and transcripts will be kept locked in the researcher's department safe at the Unisa College of Education and destroyed after 3 years. The data collection will take place in term 2 and/or 3 of 2017 and the time required of each participant is stipulated in each consent letter offered to the participants.

Participation of the participants in this research is voluntary and if they so wish may withdraw from the study at any point in time without accountability. They also may choose to leave any part of the information gathering sheet unanswered and decline answering any question posed to them during the interview. Participants will be guaranteed anonymity in that labels and pseudonyms will be used for their schools and themselves respectively. If a person other than either of the researchers will be used to transcribe the audio-recordings of the interview, anonymity is still guaranteed.

I look forward to your support in my study.

Should you require further information, please contact me:

Researcher: Mr Nkosinati Zide: Cell: 078 616 6463

E-mail: 50289969@mylife.unisa.ac.za

Thanking you in anticipation

Mr Nkosinati Zide (Date: 23/02 /2017)

APPENDIX C: REQUEST FOR PERMISSION TO CONDUCT RESEARCH

Appendix 2B

REQUEST FOR PERMISSION

Department of Basic Education Eastern Cape (This serves as the covering letter to accompany the Eastern Cape Department of Basic Education Request form)

Dear Sir/Madam

I, Nkosinati Kennedy Zide, postgraduate Master of Education student, request your permission to conduct a study on the role of HODs in the teaching and learning of Mathematics – the details of which are provided in the attached information sheet and on the prescribed ECDE request form.

Kindly sign this form:

I, (full name) ..... in the capacity of (state position within the Department of Education) ..... acknowledge receipt of the information sheet and declare that I fully understand the contents thereof.

I grant /do not grant permission (delete whichever is inapplicable) for the study to be conducted.

ECDE official: Signature: ..... Date: .....

Mr Nkosinati Kennedy Zide:

Signature: ..... Date: .....

APPENDIX D: PERMISSIONF FROM DEPARTMENT OF EDUCATION

Appendix 3A

Province of the
EASTERN CAPE
EDUCATION

STRATEGIC PLANNING POLICY RESEARCH AND SECRETARIAT SERVICES
Steve Vukile Tshwete Complex • Zone 6 • Zwelitsha • Eastern Cape
Private Bag X0032 • Bhisho • 5605 • REPUBLIC OF SOUTH AFRICA
Tel: +27 (0)40 608 4773/4035/4537 • Fax: +27 (0)40 608 4574 • Website: www.ecdoe.gov.za

Enquiries: B Pamla Email: babalwa.pamla@ecdoe.gov.za Date: 10 August 2017

Mr. N K Zide

Mt Nicholas JSS

P O Box 723

Libode

5160

Dear Mr. N.K Zide

PERMISSION TO UNDERTAKE A MASTERS THESIS: THE ROLE OF HEADS OF DEPARTMENT IN THE TEACHING AND LEARNING OF MATHEMATICS: THE CASE OF SIX GET BAND SCHOOLS IN OR TAMBO INLAND DISTRICT IN THE EASTERN CAPE PROVINCE

1. Thank you for your application to conduct research.
2. Your application to conduct the above mentioned research in the six general education and training bands schools in (O R Tambo Inland District) of the Eastern Cape Department of Education (ECDoE) is hereby approved based on the following conditions:
   a. there will be no financial implications for the Department;
   b. institutions and respondents must not be identifiable in any way from the results of the investigation;
   c. you present a copy of the written approval letter of the Eastern Cape Department of Education (ECDoE) to the Cluster and District Directors before any research is undertaken at any institutions within that particular district;
   d. you will make all the arrangements concerning your research;
   e. the research may not be conducted during official contact time;

[redacted]

APPENDIX D: INFORMED CONSENT

Appendix 4A

REQUEST FOR CONSENT HEAD OF DEPARTMENT PARTICIPANTS

Dear Sir/Madam

I, Nkosinati Kennedy Zide, postgraduate Master of Education student, wish to invite you to participate in my study, on the role played by HODs in the teaching and learning of Mathematics in GET Band Schools-senior phase (grade 7/8 & 9 only)

This research attempts to add value to the teaching and learning of Mathematics by strengthening classroom practice and ultimately improving learner performance. This study views your prospective participation as a positive influence on improvement for Mathematics education as a whole.

I would like to assure you that the findings of this study would be available to you if you so wish.

Kindly sign this form:

I, (full name) ……, Head of Department in Mathematics of (state name of school) …… acknowledge receipt of the information sheet and declare that I fully understand the contents thereof. I am aware that:

- My participation is voluntary and that I may withdraw from the study at any time;
- I can leave any part of the questionnaire unanswered;
- I am also invited to participate in a semi structured interview;
- I can decline answering any question posed to me during the interview session;
- I am guaranteed anonymity i.e. the student/researcher will use labels and pseudonyms for my school and me, respectively;
- My participation in the study will not affect me adversely; and
- The study will take place during term 2 and/or 3 of 2017 and would take up approximately a 2hours 45 minutes of my time. (Approximately 120 minutes would be sufficient to complete the semi-structure interviews and 45 minutes will be also sufficient to complete focus group discussion).

I consent/do not consent (delete whichever is inapplicable) to be a participant of the study.

Signature: …… Date: ……

Mr Nkosinati Kennedy Zide Signature: …… Date: …….

APPENDIX E: REQUEST FOR AUDIO-RECORDING

Appendix 5A

REQUEST FOR CONSENT FOR AUDIO-RECORDING OF THE INTERVIEWPARTICIPANT-HEAD OF DEPARTMENT (HOD)

Dear Sir/Madam

I, Nkosinati Kennedy Zide, postgraduate Master of Education student, seek your consent to have the interview with you audio-recorded and transcribed.

Kindly sign this form:

I understand that the transcriptions will be used in conjunction with the questionnaire data I will be providing and analysed for the purposes of this study. I also understand that I will remain anonymous throughout this study.

I, (full name) ..... Head of Department at (state name of school) ..... acknowledge receipt of the information sheet and declare that I fully understand the contents thereof. I also understand the contents of this request to engage in an interview with the researcher of this study and have the interview recorded.

I grant /do not grant consent (delete whichever is inapplicable) for the interview to be audio-recorded.

Interviewee Signature: ..... Date: .....

Mr Nkosinati Kennedy Zide

Signature: ..... Date: .....

APPENDIX F: SEMI-STRUCTURED INTERVIEW QUESTIONS

Appendix 6A:

SEMI STRUCTURED INTERVIEW with the HOD

Greetings:

Introductory remarks:

Set the scene as to acknowledging time taken to participate, purpose of the research, confidentiality, the acceptance of tape recording the interview or not as well as any disclosure to show participants the report prior to submission as to whether changes should be made.

Questions to the HOD

1. Please can you explain what your role is with in the field of work? What are the key responsibilities in your position?

2. Please explain, what activities you are engaged in, an average day? (The participants should be directed to discuss how their time is divided out between job related activities)

3. What challenges do you face in achieving good performance in mathematics? (Participants should be prompted to discuss the availability of support to achieve compliance – what barriers they have experienced and how they feel these barriers could be minimised?)

4. Please can you explain what strategies can be put in place to assist the development of mathematics good standard?

Discuss further recommendations that could be implemented in future.

APPENDIX G: FOCUS GROUP DISCUSSION QUESTIONS

APPENDIX 7A

FOCUS GROUP DISCUSSIONS with the HOD

Greetings:

Introduction Remarks:

Set the scene as to acknowledge time taken to participate, the purpose and the nature of this discussion group, confidentiality, acceptance of the digital audio recording the discussion or not as well as any disclosure to show participants the report prior to submission or as to whether changes to be made. Thereafter question HODs about themselves, about working experience and their roles.

SECTION A – PERSONAL QUESTIONS

1. Please introduce yourself

(a) Gender

(b) Age [**1**-(25years and younger), **2**- (26-35years), **3**-(36-45years), **4**-(46-55years), **5**- (56 and older)

(c) Racial group

(d) Subject(s) you teach

(e) Highest qualification[**1**-(Teaching certificate), **2**-(Teaching Diploma), **3**-(Bachelor's Degree), **4**-(Advance certificate in education(ACE)), **5**-(Honours degree), **6**-(Master's degree), **7**-(Doctoral degree).

SECTION B-WORKING EXPERIENCE and THE ROLES and RESPONSIBILITIES

2. What experience do you have in this field as teacher? Share your working experiences

(a) [**1**-(1-5years), **2**-(6-10years), **3**-(11- 15years), **4**-(16-20years), **5**-(21 and older)

3. For how long have you been in this field as a Head of Department? Discuss further the tasks you have enjoyed implementing and those you have not. (Follow up question will prompt the participants to give more information for in- depth, for example; Why…?)

4. What do you do if a teacher in your department is struggling in teaching of mathematics?

SECTION C-OPINION

5. Please can you explain what steps could be taken by HODs in order to improve learners 'performance in mathematics? Explore both existing and non-existing ways that are implemented or not implemented in your school. (Follow up question can be employed to allow the participants to justify these steps, for example, why the existing ways are not implemented? if they are implemented, how these are implemented? what are the outcomes then that are implemented?)