



The use of instructional leadership in the management of mathematics education

E. Meja

 orcid.org/0000-0002-1481-086X

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Supervisor: Professor Edmore Mutekwe

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Student number: 28532104

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ABSTRACT

The purpose of this study was to explore the role of instructional leadership in the management and leadership of mathematics teaching and learning so as to promote improved learner performance. The study adopted a mixed method as the overall methodology and an explanatory sequential mixed method as the design genre. Data were collected from systematically randomly sampled respondents through self-administered structured questionnaires for the quantitative aspect of the study and from purposefully sampled participants through unstructured questionnaires and interviews for the qualitative aspect of the study. Overall, a total sample size of 74 participants or respondents took part in the study. The data analysis for the quantitative part of the study involved the use of descriptive statistical analysis, exploratory factor analysis, confirmatory factor analysis and structural equation modelling with the aid of a quantitative data analysis software, SPSS version 24.0. For the qualitative part of the study, the analysis of data involved a thematic approach, where data codes were clustered into super ordinate themes and aided by a qualitative data analysis software, Atlas-ti formed the basis of the discussion of the findings of the qualitative part of the study. Among the key findings of the study was that very few instructional leaders in schools, employ real instructional leadership practices in encouraging mathematics educators and learners to excel. The conclusion drawn from this study was that unless and until the relationship between a sound instructional leadership and the extent to which the mathematics educators and learners are encouraged to be focused is upheld, performance standards in mathematics will remain a cause for concern for South Africa. A key recommendation from the study was that effective instructional leadership practices need to be fully adopted if a significant improvement in mathematics achievement is to be realised in South African schools.

Keywords: Instructional leadership, Shared leadership, Mathematics learner achievement.

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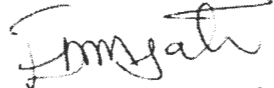
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- Above all, God Almighty for opening my mind and grant me wisdom to make valuable explorations in the field of educational leadership and management.

DEDICATION

This dissertation is dedicated to my wife Chenai and children for their encouragement and continual support for my heartfelt desire to continue doing research.

DECLARATION

I the undersigned hereby declare that the work contained in this dissertation is my own original work and that I have not previously in its entirety or in part submitted it at any university for a degree.

Signature: 

Date: 2018. 05. 14

LIST OF ACRONYMS USED IN THE DISSERTATION

IL	Instructional leadership
HoD	Head of department
SMT	School management team
NMM	Ngaka Modiri Modiri
TIMSS	Trends in International Mathematics and Science Study
WEF	World Economic Forum
DBE	Department of basic education
SANDP	National Development Plan
NWP	North West Province
PIRLS	Progress in International Reading Literacy Study
SACMEQ	Southern Africa Consortium for Monitoring Educational Quality
NEEDU	National Education Evaluation and Development Unit
NCME	National council on measurement in education
AERA	American Educational Research Association
APA	American Psychological Association
CDE	Centre for Development and Enterprise
MATHS	Mathematics

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CHAPTER 1: INTRODUCTION AND BACKGROUND TO THE STUDY

1.1 INTRODUCTION

The purpose of this mixed methods explanatory sequential study was to explore the use of instructional leadership in leading mathematics teaching at school and classroom levels and how it impacts on the mathematics curriculum delivery for learners. Various aspects of instructional leadership practices were explored in relation to their applicability to South African schools. An exploration of instructional leadership and its effects on mathematics learner performance was conducted in one district, with the study confined to five schools in the Ngaka Modiri Molema (NMM) District of Mafikeng in the North West Province in South Africa. The target population comprised all schools in the province, of which one district was conveniently sampled. From within the district, five secondary schools were selected using the systematic random sampling procedure and, from each school, participants included the principal, deputy principal, Mathematics Head of Department (HoD), school management team (SMT) members, mathematics teachers and three grade twelve learners who were purposively selected.

1.2 BACKGROUND TO THE STUDY

South African learners perform poorly in both primary and secondary school mathematics compared to other countries in the world (Taylor, 2008). Trends in International Mathematics and Science Study (TIMSS, 2015) placed South Africa second from last in global rankings for mathematics achievement. The South African Department of Basic Education (DBE, 2014), Reddy *et al.* (2015) and Spaul (2011), as cited by Robertson and Graven (2017), all report alarmingly low performance levels by South African learners in mathematics and numeracy results in national, regional and global assessments. The World Economic Forum (WEF) ranked South Africa last in the quality of mathematics and science education (Global Information Technology Report, 2015). This is symptomatic of a serious social ill for South Africa as a whole, considering the role mathematics education plays in the country.

In a broader spectrum, mathematics is key to multiple opportunities, seeing as it contributes both indirectly and directly to various disciplines of learning, namely; medicine, finance, business and engineering, to name but a few (Palmer *et al.*, 2014). To the nation, mathematics

provides a sound knowledge base to fully participate in the global technological competition, while to the citizens it renders the ability to make informed decisions in many practical situations and to the student it opens doors for several career opportunities. Learner achievement in mathematics is one marker of a country's broader intellectual capacity and a key indicator of long-term national economic potential (Jamaican National Mathematics Advisory Panel, 2008; Programme for International Student Assessment, 2012; Darling-Hammond, 2012). It is for this reason that mathematics achievement in high schools has moved from the fringe to the core of policy debates on national education in both developed and developing countries (Palmer *et al*, 2014).

South Africa cannot, therefore, afford to ignore this problem hence; lasting solutions to poor mathematics learner achievement should be pursued. The factors contributing to this poor performance cannot be precisely pinpointed but multiple possible factors are suggested by researchers. For instance, Bansilal (2014) gives teachers' low proficiency levels in mathematics as one contributory factor. Authors such as Taylor (2008) give reasons for poor performance as, among others; the teachers' poor mastery of subject content and pedagogical skills, the socio-economic levels of the schools and their surrounding communities, learner and teacher absenteeism which negatively affect curriculum coverage efforts. In addition, Bush *et al*. (2010) cite the absence of effective management of the teaching and learning of mathematics which, in itself, constitutes quite a number of fundamental attributes. Details of the South African mathematics problems in secondary schools are thoroughly explored in chapter 2.

Bush and Clover (2009) and Taylor (2007), as cited in Bush, *et al*, (2010:162), note that sound and proactive leadership and management of learning is one of the fundamentals for developing effective teaching and learning in schools. Instructional leadership focuses much on the management of instruction, teaching and learning in a distributive nature across all levels of the school leadership platform (Ng *et al*, 2015). Manaseh (2016: 30) interprets instructional leadership as dwelling much on knowledge management and development and the implementation of curricular and assessment practices.

According to the department of basic education, instructional leadership focuses on leading and managing a learning area (mathematics for instance). It constitutes curriculum planning,

management, development and classroom practice. Waters, *et al.* (2003), in their meta-analysis of studies conducted over thirty years on the effect of leadership on student performance levels and achievement, posit that successful schools are characterised by effective instructional leadership. On the other hand, Van der Berg, *et al.*, (2011) report that the analysis of data from National School Effectiveness Study (NSES) confirms that many indicators of instructional leadership are associated with learner performance outcomes. In an endeavour to promote mathematics education and improve learner performance in schools, it was therefore found imperative to explore the usefulness of instructional leadership in the management of mathematics education.

1.3 PROBLEM STATEMENT

The South African National Development Plan (SANDP), as part of its Vision for 2030, emphasises the significance of improving the quality of education and educational outcomes in South Africa (Visser & Juan, 2015). Proper teaching and learning of mathematics and high levels of performance in particular are fundamental resources in global competition for technological development, yet South African learners perform poorly in mathematics at all levels of learning. The poor performance in mathematics has posed a lot of controversies in South Africa.

There is growing concern from parents, the DBE officials, school principals, school instructional leaders and classroom practitioners on why learners continue to perform poorly in mathematics. As a result, there is a lot of blame shifting among these stakeholders. Although the causes of this poor performance cannot be precisely pinpointed, research conducted by Taylor (2008), Bansilal (2015), Marchis (2013), among others, however puts on the table quite a number of factors that have an influence on the level of performance of mathematics learners. Visser *et al* (2015), pinpoint the socio-economic status of a school, parental occupation, income status and level of education, the language of teaching and learning (LTL), especially when the language spoken by learners at home is different from the LTL at school, the mathematics teachers' proficiency levels and instructional leadership and management styles which are not effective enough to help learners to perform at their best.

Many researchers in South Africa, for example Bush et al (2009), Taylor (2007), and Clover (2009), among others, researched on factors that influence learner performance in mathematics, but there is very limited reported research and literature that specifically investigate the role of instructional leadership in managing and leading mathematics teaching and learning in South Africa, particularly in the North West Province. It is, therefore, in this light that this study wishes to explore the extent to which instructional leadership can contribute to the management and leadership of mathematics teaching and learning.

1.4 AIMS AND OBJECTIVES

The aim of this study was to explore the role of instructional leadership in the management and leadership of mathematics teaching and learning and in promoting mathematics learner performance in the NMM District of the North West Province in South Africa. Pursuant to this aim, the following objectives were formulated;

- To examine how instructional leadership practices, promote the management, teaching and learning of mathematics in secondary schools in NMM district of NWP.
- To establish how instructional leadership in the management of mathematics education in secondary schools contributes to improved learner performance.
- To determine the extent to which mathematics performance by learners in secondary schools depends on instructional leadership practices.
- To establish whether instructional leadership in the management of mathematics learning can be used as a benchmark for learner performance in mathematics in secondary schools in the NMM District of the NWP.

1.5 RESEARCH QUESTIONS

The study was guided by the following research questions;

- How does instructional leadership promote the management of teaching and learning of mathematics in secondary schools in the NMM District of the NWP?
- To what extent does instructional leadership in the management of mathematics education in secondary schools in the NMM District contribute to effective learner performance?
- To what extent does the performance of learners in mathematics in secondary schools in the NMM district in the NWP depend on instructional leadership practices?

- How can instructional leadership in the management of mathematics teaching and learning be used as a benchmark for mathematics learner performance in secondary schools in the NMM District of the NWP?

1.6 HYPOTHESIS

The study also tested the following null hypotheses;

- There is no statistically significant association between learner achievement in mathematics and instructional leadership practices.
- There are no statistically significant relationships between the multiple dimensions of instructional leadership and learner performance,

The two hypotheses were tested at 5% level of significance in the quantitative study using analysis of covariance structures by combining confirmatory factor analysis (CFA) and structural equation modelling (SEM).

1.7 THEORETICAL FRAMEWORK

The study adopted Hallinger's (2009) model of instructional leadership as a theoretical framework for reviewing the role of instructional leadership in the management of mathematics education (Mestry, 2017). Hallinger's (2009) model was derived from three predominant models that were developed over the past two decades; Hallinger and Murphy, Murphy and Weber's models (frameworks). The original theoretical formulations of these frameworks took place in 1985, 1990 and 1996 respectively (Al-Mahdy & Al-kiyumi, 2015). Instructional leadership practices, as theories presented in the form of models, are conceptualised in the form of dimensions which are further subdivided (Ng *et al*, 2015) into multiple dimensions called traits and sub-dimensions. A comprehensive exploration of the instructional leadership theory, the three predominant models of instructional leadership and the Hallinger (2009) model and how effective the implementation of these models influences learner achievement in mathematics, was done in chapter 3

1.8 LITERATURE REVIEW

The underpinning ground for this study is a comprehensive literature review, which is a thorough examination of previously done research work on instructional leadership in the management of a learning area (Okeke & Van Wyk, 2016: 133). Central to the literature review

of this study is the role of instructional leadership in the management of mathematics teaching and how it contributes to learner performance in secondary schools. The literature review unfolds with a review of the meaning of instructional leadership and how it affects learner performance in mathematics locally and internationally. It develops by examining the theoretical framework as well as unpacking other sections of the research objectives as spelt out on page 4.

1.8.1 Instructional Leadership

Instructional leadership is mainly concerned with the improvement of instructional, curricular and assessment practices. Most researchers refer to instructional leadership as “shared” leadership among stakeholders involved in the system (Ng *et al*, 2015) and that effective school instructional leadership can develop and sustain effective motivated teachers and, therefore, increase student achievement (Barrett & Breyer, 2014). In South Africa, successful schools (mathematics and science schools) tend to share leadership work among teams of leaders without relying on a single leaderhence; the existence of elaborate structures that effectively and constantly monitor instruction and students learning in such schools (Jita, 2010).

Instructional leadership improves pedagogical quality and raises learner achievement (Manaseh, 2016). In pedagogical leadership, the leader’s prime focus and main responsibility is to promote better performance levels for learners through a strong emphasis on the quality of practical curriculum delivery, teaching and learning. According to Bush *et al*. (2009), the central importance of teaching and learning lies on three main important aspects; the educator having sufficient time and material for teaching learners, a pedagogically sound classroom practice and good management of instruction. According to Bush *et al*. (2010), the three core aspects of teaching and learning are enshrined in the focus of pedagogical leadership hence; as a management model, it must have some influence on learner performance.

1.8.2 Instructional Leadership and Mathematics Learner Achievement

Literature review of problems related to mathematics teaching and learning, instructional leadership theory and its effects on mathematics learners’ achievement was given in detail in chapters 2 and 3. The review consolidated studies done abroad in countries like Singapore (Ng *et al*, 2015), Indonesia (Sofa *et al*, 2012), United States (Shatzer *et al*, 2013). Research

conducted in South Africa by Fleisch (2008), Bush *et al.* (2010) and others is also explored. Though reports by some researchers (Ng *et al.*, 2015) show that learner achievement is a function of many variables, it was deduced from these studies that, if instructional leadership practices are executed effectively, a noticeable difference in mathematics achievement by learners is inevitable. Research findings (Stein *et al.* 2009 and Boaler & Staples, 2008), among others, as cited by Melissa (2016), associate effective instructional leadership practices with high learner achievement in mathematics. Research also shows that if persistent instructional practices and monitoring systems are not embraced by instructional leadership practices to provide continuous consistency and deeply rooted understanding of concepts in mathematics, learner achievement levels will be poor (Donaldson, 2015).

1.9 RESEARCH DESIGN AND METHODOLOGY

Research methodology, as a procedure for collecting, analysing, interpreting and reporting data in a research study, followed an explanatory sequential mixed methods design. This encompassed a sequential integration of quantitative and qualitative designs to generate new knowledge (Plano Clark, 2011). Grove *et al.* (2013:195) define methodology as clearly defined structure within which the study is carried out in order to achieve results. A research design gives the researcher greater control of the study and, in turn, promotes its validity. There are three major types of research designs and these are; qualitative, quantitative and mixed methods research methodologies.

According to Subedi (2016), the explanatory sequential mixed methods design to be adopted in this study consists of first collecting and analysing quantitative data, followed by qualitative data collection and analysis to elaborate on the quantitative results. The rationale for this approach is that the quantitative data collection provides a general picture of the research problem, then a follow up with qualitative data collection, analysis and analysis results, would give an elaborated explanation of the research results (Creswell, 2012). The in-depth exploration of participants' view would further refine and explain more on the statistical results. It was assumed that when quantitative and qualitative research methodologies are brought together, the strengths of both approaches would be combined, and this would lead to a better understanding of the research problem than when either approach is used alone (Creswell & Garrett, 2008:322).

Each of these research designs has genres. For example, the qualitative design uses the following design genres; ethnography, narrative, phenomenological, grounded theory and case studies. In this study a case study genre was used because of its strength in generating in-depth data (Yin, 2009). Under the quantitative design are the following genres; survey, correctional, causal-comparative (quasi experimental) and experimental genres. The researcher used a survey design in this study because of its ability to allow researchers to judge behaviour and then present the findings in an accurate way. In addition, the survey design can allow further exploration of the research problem by means of a qualitative paradigm (Creswell, 2013).

1.10 POPULATION AND SAMPLING

According to Creswell (2013), a population is a set of common elements that have common predetermined characteristics with respect to some research problems. In this study, the target population consisted of all secondary schools in the NWP. Sampling, on the other hand, is a process which involves selecting a group of people or participants, events, behaviour or other elements involved in a study (Grove *et al*, 2013:37). In this case, it is a process of choosing participants or respondents to represent the whole population so that inferences or conclusions about the whole population can be made (Polit & Beck, 2012:275).

It is important to note that sampling designs are either probability or non-probability. Probability sampling design uses probability theory to randomly select population elements and, on the other hand, in non-probability sampling design, population elements are not selected randomly (Creswell *et al*, 2016). Examples of probability sampling include simple, stratified, cluster and systematic random sampling designs. On the other hand, quota, convenience, snowball and purposive sampling methods are examples of non-probability sampling (Creswell *et al*, 2016).

One district was conveniently sampled from the target population. A systematic random sample of five schools was selected from the conveniently selected district. The researcher conveniently sampled the district due to its proximity to the university campus. This was done in order to cut the costs of doing the survey (Creswell *et al*, 2016). From each school, grade 12 learners, mathematics teachers, SMT members, deputy principals and HoDs were

systematically selected from each school. In addition, systematic random sampling was used to select five schools in the district because it is straight forward, precise and can give a more representative sample of the population (Elsayir, 2014). The sample size targeted for this study is seventy-four participants to compromise for mixed methods study.

1.11 DATA COLLECTION METHODS

Data collection is defined as the gathering of information to address a research problem (Polit & Beck, 2012:175). For this study, a self-administered questionnaire consisting of closed and open-ended questions (Appendix A) and an interview guide (Appendix B) with structured and unstructured interview questions were used to collect the data. A voice recorder was used to conduct face to face interviews and for onward transcriptions. One questionnaire with three sections (A, B and C) was designed by the researcher and administered to the members of the instructional management team in the schools, which comprised mathematics teachers, SMT members, deputy principals and the HoDs. Sections A, B and C comprised demographic, closed and open-ended questions respectively. For further probing, the interview questions required the participants to give more informed opinions and views than merely respond to closed ended questions (Creswell, *et al*, 2016). As a result, face to face unstructured interviews were administered to the two groups, with the help of a voice recorder. In the next section, a discussion of each of the above-stated research tools is done.

1.11.1 Closed and Open-Ended Questionnaires

A questionnaire is a data collection instrument consisting of a series of questions and other prompts for the purpose of gathering information from respondents (Abawi, 2013). Questionnaires can be open or closed ended. The researcher used both closed and open ended questions in order to restrict the responses (generating quantitative data) and elaborate on the underlying reasons for the answers to the closed-form questions (generating qualitative data). It was assumed that open ended questions would allow the researcher to understand the world from the point of view of the respondents and, therefore, the researcher could capture people's views without pre-determining them (Acharya, 2010).

Therefore, in this study, a questionnaire that comprised closed ended and open ended questions was administered to the sample by the researcher himself in order to give a brief explanation to each participant regarding what was expected. In addition, this gave the researcher an

opportunity to probe for more views and opinions from the interviewee. Each participant was given twenty five minutes to independently respond to the questions. This was done to allow the interviewee to give as much information as possible without being rushed.

1.11.2 Structured and Unstructured One-on-One Interviews

In this study, the researcher adopted structured and unstructured interviews (Appendix B). In a structured (objective) interview, behavioural questions are based on a thorough analysis of a specified characteristic or trait (Mathers *et al*, 2002). Participants will be asked similar questions and responses are assessed in a standardised manner against specified characteristics or traits using a predetermined scorecard (Alshenqeeti, 2014). Conversely, an unstructured (subjective) interview is completely unplanned. This type of interview helps the researcher to develop a real sense of the interviewee's real understanding of the situation. Interviewees are randomly asked questions, but their responses are not evaluated in any consistent manner (Alshenqeeti, 2014).

The researcher used an interview guide to collect the data from the interviewees. A voice recorder (twenty minutes of oral interviewing) was used to collect data from the unstructured interviews. The interviews were each twenty minutes long to allow time for detailed introduction and interrogation by the interviewer.

1.12 DATA MANAGEMENT AND ANALYSIS

After data collection using self-administered questionnaires, interview guides and voice recorders, prior to data capturing, the researcher scored (coded) the data from the closed ended questions, which implies assigning scores to responses (Creswell, 2013). The assigned scores generated quantitative data and were captured in SPSS 24.0 statistical software. Data from open ended questions generated qualitative data which were captured into Atlas ti software. Thereafter, the data were thematically analysed, thereby generating main and sub-themes that existed in the data set (Okeke & Van Wyk, 2016: 469).

Before data analysis was done, the researcher cleaned the data and accounted for missing data in the data collection instruments. Missing data resulted from failure by respondents to the research instrument inquisition to respond to some sections of the questions in the instrument.

Data cleaning is a process of checking whether all scores in the spreadsheet are within the accepted range in the code book (Creswell, 2014). This was done through constructing frequency distributions using the Microsoft Excel or SPSS 24.0 software.

Data cleaning was done in continuity until no discrepancies of data entries were observed; trial runs of data validation were done by checking whether the entries corresponded with the items and sub-items in the questionnaires and interview guides. Where discrepancies were identified, the original questionnaires or interview guides were consulted, and corrections were made prior to the actual and conclusive analysis (Creswell, 2012). In addition to the above, the researcher sorted items of interest into proto-themes, which were re-examined until the final themes were constructed for more detailed analyses and inferences (Braun & Clarke, 2014).

Data analysis, as the process of making sense out of the data, implies that the researcher explains, consolidates, reduces and interprets what the participants have said and what he may have seen and read (Creswell, 2014). Quantitative data for this study was analysed using a mixture of exploratory (cross tabulations, and bar graphs), descriptive analysis, exploratory factor analysis (EFA) (and structural equation modelling (SEM) analysis (Appendix H) (Shatzer, *et al*, 2013).

Qualitative data, on the other hand were analysed using a thematic approach, whereby the researcher explored patterns or common themes that emerged from specific responses in the data and identified any deviations from these patterns (Okeke & Van Wyk, 2016). The researcher picked up interesting themes and subthemes that emerged from the data and decisively evaluated if patterns and emergent themes suggested any further steps of inquiry. In addition, the researcher verified whether patterns that emerged supported the findings of other prior qualitative analyses that were conducted before for any similar subject of inquiry (Creswell, 2014). The results of the analysis were used to improve on instructional leadership approaches to school systems, structures and procedures that impact on the mathematics curriculum.



1.13 SIGNIFICANCE OF THE STUDY

There is an outcry from the South African community, the North West Province included, for improved learner performance in mathematics (Reddy et al. 2015). This study, therefore, sought to find lasting solutions to practically improve mathematics learner performance in the NMM District of the North West Province in South Africa. Mathematics learner performance in NMM District may significantly improve upon effective implementation of existing instructional leadership models.

In addition, the study developed hypothetical instructional leadership models based on instructional leadership practices outlined in the three predominant models and mathematics learner performance in NMM district. The hypothetical models that were developed would provide practical solutions to NMM District regarding the leadership and management of mathematics instruction and add to the existing body of literature on new instructional leadership models that spell out instructional leadership practices that are applicable to mathematics learners in NMM District secondary schools.

Finding a new useful instructional leadership model that suits the society, community or environment would put the North West Province, in particular, and South Africa, in general, on the map for contributing to social theory and practice in the field of educational leadership (McCleskey, 2014). This would also influence the educational policy and guide the teaching and learning of mathematics in South Africa. This can be achieved by implementing instructional leadership styles that are not one-size fits-all, but applicable to respective situations thus; leading to improved mathematics learner achievement (Marishane, 2015).

1.14 ETHICAL CONSIDERATIONS

Ethical considerations in research refer to the need by the researcher to ensure that no harm (psychological, financial or social) occurs to participants, communities or societies involved in the research study (APA, 2009). Ethical clearance letters for permission to carry out research in NMM District in the NWP were applied for from the Department of Basic Education. Informed consent copies were attached to questionnaires informing the participants of the confidentiality and privacy of the information that they could give to the researcher. Such measures were done to ensure that ethical principles were adhered to in this study.

In addition, codes (pseudonyms) were used in place of school and participants' names. The same also applied to the analysis of results reporting to ensure the privacy of participants. According to Burns and Grove, (2009:195), individuals have the right to determine how and under which circumstances should personal information be shared or withheld from others.

Finally, participants involved in this study had the right to be protected from harm and discomfort (non-maleficence) at all cost (Botma *et al*, 2010:20). The researcher ensured that there was no harm to the participants in the research and that they voluntarily participated, fully aware, and of their own volition. The researcher gave assurance to participants that whatever information they gave was between them and the researcher and that under no circumstance could their comments and opinions be identified with their names. Comments and opinions from this enquiry could be identified with pseudonyms. This was done to protect participants against victimisation by their superiors, as this study was done across all levels of the school management system.

1.15 MEASURES TO ENSURE RELIABILITY AND VALIDITY (TRUSTWORTHINESS)

In this study, methodological triangulation and member check were some of the measures that were taken to ensure reliability and validity. Member checking was done through testing data analysis categories, interpretations and conclusions with members from whom the data were originally obtained (Harper & Cole, 2012). To check feasibility of the study, study cost and reliability of the data collection instruments, a pilot study was used as a preliminary study and statistical variability and reliability were tested before implementing a full scale research project (Okeke & Van Wyk, 2016). Detailed theoretical definitions, background and procedures for implementing measures to ensure reliability and validity were presented and discussed in chapter 4.

1.16 CHAPTER ORGANISATION

The dissertation was organised into seven chapters with the following headings;

- introduction and background to the study,
- contextualisation of the study,
- theoretical perspectives,
- research design and methodology,
- quantitative data analysis results,
- qualitative data analysis results, interpretation and discussion of findings and
- summary of major findings, conclusions and recommendations.

Brief descriptions of what constitutes each of the chapters are given below;

- **Chapter 1: Introduction and Background to the Study**

In this chapter, the researcher gave a general outline of what was done in the study. The chapter gave a snapshot of the research design, data collection, data processing and analysis methods that were used. In addition, the target population and sampling procedures, sample and research instruments used in the study were also outlined in brief.

- **Chapter 2: Contextualisation of the Study**

Contextualisation of the study was done in this chapter to acquaint the researcher with current and up to date information on issues pertaining to problems in mathematics education globally and locally so that possible interventions can be implemented. The host of problems that hinder learner achievement in mathematics like learner, teacher and instructional leadership attitudes towards mathematics, teacher pedagogical proficiency levels and parental support were discussed in context in this chapter.

- **Chapter 3: Theoretical Perspectives**

This chapter gives a detailed exploration of the instructional leadership theory and its effect on mathematics teaching and learning. Details of instructional leadership practices presented in the form of three predominant instructional leadership models that have been used in the past two decades in educational leadership research were explored in this chapter. The theoretical framework adopted in the study was outlined. In addition, the effects of instructional leadership practices on the mathematics learner achievement were explored in this chapter.

- **Chapter 4: Research Design and Methodology**

This chapter described the research paradigms, research design and methodology, data collection methods and data collection instruments. It gives details of the target population and how it was chosen. It describes the sampling designs used, sample space and sample size. Data collection, validation and statistical data analysis procedures used in the research were also discussed in this chapter.

- **Chapter 5: Quantitative Data Analysis**

This chapter was concerned with quantitative data coding, cleaning, validation and statistical analyses and results presentation. A summary of the quantitative analysis results was given in this chapter.

- **Chapter 6: Qualitative Data Analysis**

This chapter was concerned with qualitative data cleaning, validation and thematic analyses and results presentation. A summary of the qualitative analysis was given in this chapter.

- **Chapter 7: Summary of Major Findings, Conclusions and Recommendations**

In this chapter, the analysis results from chapters 5 and 6 were triangulated, interpreted and summarised. Overall research findings were presented, conclusions and recommendations were made in line with the research questions and research objectives.

1.17 SUMMARY

This chapter has dealt with the following aspects; background to the study, problem statement, aims and objectives, research questions, research hypothesis, theoretical framework, literature review, research design and methodology, population and sampling, data collection, management and analysis methods, rationale of the study, ethical considerations, measures to ensure reliability and validity of the study and lastly chapter organization. The next chapter contextualises the study.

CHAPTER 2: CONTEXTUALISATION OF THE STUDY

2.1 INTRODUCTION

The purpose of this chapter is to contextualise the study on the correlation between the teaching of mathematics and instructional leadership in secondary schools, the conundrum of mathematics teaching in South African schools, teacher attitudes and pedagogical proficiency levels, learner attitudes and commitment towards mathematics learning and attitudes of instructional leaders towards mathematics teaching. In addition, the chapter contextualises the integration of behaviours, traits, processes and attitudes of leaders of instruction, instruction practitioners and learners in the cycle of mathematics teaching and learning with a goal to improve mathematics learner performance.

2.2 CORRELATION BETWEEN INSTRUCTIONAL LEADERSHIP AND MATHEMATICS TEACHING

The core purpose of instructional leadership is to improve instruction in the classroom, curricular, and assessment practices (Ng *et al*, 2015: 391-392). It is “shared” leadership among practitioners of instruction, heads of departments (HoDs), deputy principals, principals and district education officials (Ng *et al*, 2015). Its mandate is to communicate high expectations, monitor instruction and progress of learners and, at the same time, promote a more conducive climate for learning through creation of a supportive work environment (Reitzug *et al*, 2008).

To guide and lead instruction, instructional leaders must have very strong planning and instructional observation skills, pedagogy corrective expertise, and data analysis abilities. In the same light, the ability of instructional leaders to effectively lead mathematics instruction is enshrined in their levels of mathematical content, curriculum and current pedagogical expertise (Alberta Education, 2009). To be informed visionaries of instruction, instructional leaders need to possess a combination of mathematical content knowledge and instructional leadership skills (Donaldson, 2017). Being in possession of such qualities, instructional leaders will be in a better position to model good mathematics teaching techniques, have positive interaction and monitor mathematics instruction in the classroom and provide intervention strategies if there is no evidence of effective teaching and learning in the classroom.

The existence of informed instructional leadership in a school is a profound platform for teaching and learning that elevate teacher efficacy. It also engenders an encouraging environment for learners to enjoy learning mathematics. According to Elmore (2010), if instructional leadership in mathematics is to be effective, among other practices, ongoing and differentiated educators' professional mathematics learning should be ensured across the system. Continual support to promote leadership networking across all levels should be instituted. Leaders of mathematics instruction should also participate in co-learning, co-planning and co-teaching in order to learn what good mathematics teaching is thus providing opportunities to reflect on good teaching practices. Leaders should also encourage risk-taking and innovation by providing a safe environment for co-learning (Elmore, 2010).

In light of the above, it is evident that the teaching and learning of mathematics in secondary schools depends, one way or the other, on instructional leadership practices in schools. Effective instructional leadership practices can result in effective mathematics teaching and learning which, in turn, promote high learner achievement in the school.

Research findings by Jita (2010) show that most successful schools in mathematics had principals who could strike a balance between classroom responsibility and management - leadership responsibilities. In this research he found out that work distribution among leadership teams played a vital role towards learner success in mathematics education. In addition, the creation of elaborated structures that monitor curriculum delivery and learners' learning behaviour was also found to be a very important instructional leadership function that contributes towards learner achievement.

A study conducted in Singapore (Ng *et al*, 2015) shows that the country's leaders of instruction in a school effectively engage in almost all aspects of the instructional leadership model hence; Singapore's education system is regarded as the world's best performing (McKinsey *et al*, 2010). In a study done in Indonesia (Sofa *et al*, 2012), it is reported that the country experienced problems in its efforts to migrate to the school based management model by failing to implement effective instructional leadership. As a result, it failed to optimise student academic achievement.

It is not just instructional leadership that is crucial, but it is its effective implementation in the school system which matters most. Linear Regression analysis of a sample of 590 teachers in 37 elementary schools in the Intermountain West of the United States, by Shatzer, *et al* (2013), showed and concluded that instructional leadership explained more of the variance in student achievement. The analysis also finds out that the instructional leadership style of the principals influences learner achievement more than the school context and other demographics of the principals (Shatzer, *et al*, 2013:446).

In pre-independence South Africa, an instructional leader had no noticeable influence on the control of school finances, staffing and curriculum. The Bantu Education curriculum was crafted in such a way that black South Africans were provided limited instruction in mathematics and science. The resultant effect was the propulsion of almost all black people into the unskilled workforce (Asmal & James, 2001:186). Since then, the instructional leadership and management terrain has changed dramatically, following the inception of democracy.

In the new South Africa, the responsibility for managing teaching and learning (instructional leadership) is shared amongst classroom educators, school management teams (SMTs), HoDs and principals). However, repercussions of the Bantu Education system are still rooted in the former blacks only schools. Prior research work conducted in South Africa to date highlights certain loopholes that exist when school leadership endeavor to fully implement the instructional leadership models and in the school leadership practices. Fleisch (2008), cited by Bush *et al.* (2010) reports ineffectiveness of principals, SMTs and HoDs in managing instruction as one of the main factors for inhibiting learner achievement.

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2.3 THE CONUNDRUM OF MATHEMATICS TEACHING IN SOUTH AFRICA

South Africa has the worst education system of all the middle-income and most low-income countries the world over (Spaull, 2013). All the three main international tests of mathematical education achievement that South Africa participates in; TIMSS, PIRLS and SACMEQ reported lower performance levels by South African Learners (Spaull, 2013). Large proportions of South African learners are functionally illiterate and innumerate (Spaull, 2013). In the recent international tests sittings, the country performed second from the last on mathematics achievement as compared to other countries the world over (TIMSS Report, 2015).

Robertson and Graven (2017), report alarming low performance levels by South African learners in mathematics and numeracy results in national, regional and global assessments. In addition, beyond overall under-performance, it is reported that there are also some serious performance disparities that seem to parallel poverty lines, as evidenced by relatively poorer performance in rural schools and schools that are at the margins of the socio-economic spectrum (SACMEQ, 2010). The problem of low performance emerges from early years of mathematics learning throughout to matric. Research shows that out of a certain number of pupils that start school, only fifty percent will make it to Grade 12, forty percent will pass, and only twelve percent will qualify for university (Spaull, 2013). This is very strong evidence, showing the serious underperformance of the country's education system.

The reasons behind such underperformance are diverse. Researchers have cited a lot of factors contributive to South Africa's failing education system. Modisaotsile (2012) cites the absence of effective teacher development and empowering systems, following the closure of the country's teacher training colleges in the mid-1990s. Due to this reason, mathematics teachers grossly lack mathematics content proficiency and pedagogical knowledge. The 2012 National Education Evaluation and Development Unit (NEEDU) extensive investigation of school education in South Africa identified three major problems that hindered the country's school education system from fulfilling its expectations. These include; failing leadership, lack of effective system management and inadequate teacher capacity. Mensah, *et al* (2013), cite the attitudes of the teachers, the schools (as a whole) and the instructional leadership towards mathematics teaching and learning as playing a significant contributive role in underperformance of the education system. In addition,

2.3.1 Teacher Attitudes and Pedagogical Proficiency Levels

The fact that the success of mathematics instruction is contingent on a myriad of factors is irrefutable. Teachers' attitudes are also part of these factors. Attitude can be defined as a psychological tendency expressed by an individual by evaluating a particular entity with some degree of favour or disfavour (Mensah *et al*, 2013). It is concerned with one's way of thinking, acting and behaving (Mensah *et al*, 2013) in a particular social construct. This attitude can be positive or negative. Research shows that an attitude has very serious implications to the individual and the immediate social group with which the individual interacts. In mathematics

teaching, teachers' positive attitudes can radiate confidence in learners hence; can cause them to develop a positive attitude towards the learning of mathematics (Mensah *et al*, 2013).

In the South African context, CDE research and other studies expose mathematics teachers as being complacent and “having an unrealistic assessment of their own competence” (NEEDU, 2013). This may be viewed as some form of resistance towards government and other assisting organisations' possible attempts to reform mathematics teaching, since the teachers themselves do not accept their weaknesses.

The negative attitude also extends to the school instructional leadership (heads of departments and school principals) of underperforming schools who, according to Taylor (2011), systematically underestimate the subject knowledge needs of their teachers. Attitudes of this nature impact negatively on professional development efforts (Spaull, 2013) by the government and other concerned organisations, since the ambassadors of instruction and the instructional leadership would have failed to realise the seriousness of mathematics instruction problems plaguing the country. It is also reported that there is very limited teaching and learning time in schools due to persistent teacher absence (Taylor, 2008), an indication of negative attitude towards mathematics instruction and very low commitment to effective instruction delivery and curriculum coverage.

Mathematics pedagogical content knowledge refers to the integration of the content knowledge of mathematics and the pedagogical knowledge for teaching mathematics as a subject (König *et al*, 2011). Many research findings point out to mathematics teachers' poor pedagogical content knowledge as one reason for poor mathematics achievement by learners across all levels of mathematics learning (Bansilal, 2015). A report from Rasch analysis of a grade 12 test written by mathematics teachers reveals that grade 12 mathematics teachers' proficiency was located close to the mean of the item locations against the expectation that the teachers should be located beyond the difficulty level of the items as they are instructors of the mathematical content to the learners (Bansilal, 2015). The same results also show that levels of almost one-third of the teachers in that sample were below that of all the level 3 and 4 items in the test. An analysis of SACMEQ III results, when grade 6 learners and their educators were subjected to

write the same mathematics test, reveals that the top 5% of the learners scored higher marks than the bottom 12.5% of the educators in the sample (Spaull, 2011).

In a separate study, for grade 6 teachers who wrote a mathematics test on the curriculum they taught, 24% achieved less than 50% mark, none of them could achieve 100%, and on average, only 47% produced correct responses to each test item (Hugo *et al*, 2010). Analysis of SACMEQ 2007 mathematics teacher test data, which tested a nationally represented sample of 401 grade 6 mathematics teachers, revealed that 79% of grade 6 mathematics teachers showed content knowledge levels which were below grade 6 or 7 knowledge levels and that the few (21 %) teachers with higher-level content knowledge were highly inequitably distributed in the country (Venkat & Spaull, 2015).

In a CDE study to get a snapshot of teachers' subject content knowledge reported in 2014 CDE report, HoDs from the 124 sampled schools were interviewed and asked to complete a higher-order mathematics question within a time limit. It was reported that out of these sampled HoDs, as few as 16% supplied the correct answer to the word problem based on the grade 12 mathematics curriculum, 25% did not provide any answer, and some 58% gave an incorrect answer. This added to the growing concern regarding the ability of instructional leaders in schools to assist their mathematics classroom practitioners in providing the much-needed high quality and high-level mathematics instruction to learners in the classroom.

Findings from a study carried out in Western Cape by Tachie and Chireshe (2013) revealed that in secondary schools, some mathematics teachers know just a few of the chapters in the mathematics curriculum they are teaching, cannot adequately discuss high level mathematical problems with the learners, are unable to create stimulating classroom environments and are unable to use appropriate teaching methods. Hence it becomes a mountain for them to effectively prepare learners to meet curriculum needs. This, in turn, triggers high absenteeism rates by teachers as they fear humiliation by learners as they grapple with mathematical problem solving in class. Teachers end up sticking to the few topics which they are well versed in, leaving other topics in the curriculum uncovered (Tachie and Chireshe, 2013:70-71). Most secondary schools have no qualified mathematics teachers since it is reported that the country

has very few mathematics teachers that can teach secondary school mathematics (Magano, 2014).

The above research findings present a shocking situation in our country, given how important mathematics, as a learning area, is for every nation (ASSAF report, 2010). Mathematics widens career choices for learners as they graduate from high school. It also provides a sound knowledge base for citizens to fully participate in the global technological competition and make informed decisions in the society (ASSAF report, 2010). This implies that this problem is in dire need of urgent action by the responsible stakeholders, if mathematics education is to be improved. Instructional leadership in the management and leadership of mathematics teaching and learning plays a significant role in promoting mathematics learner performance (Ng *et al*, 2015) and hence if it is effectively embraced in secondary schools, learners will have wider career opportunities as they graduate to tertiary education.

2.3.2 Learner Attitudes Towards Mathematics Learning

Whilst problems associated with teachers' attitudes and pedagogical proficiency levels are acknowledged, it is an irrefutable fact that learners' attitudes and commitment towards mathematics learning also influence the level of mathematics learner achievement. A learner's attitude towards mathematics can be described as a long-term positive or negative emotional disposition towards mathematics. According to Yasar (2016), it is reported that long time mathematics research showed that a high-level relationship exists between learners' mathematical success levels and learners' attitudes towards mathematics. It is, therefore, very important for practitioners of instruction to develop in learners a sense of positive attitude towards learning mathematics, since there is a strong positive correlation between pupils' attitudes towards mathematics and their mathematics performance levels (Marchis, 2013).

This translates to the fact that learners with higher positive attitudes towards mathematics also have higher levels of success in the subject. This is alluded to by many international and local researchers, for instance Goe and Croft (2009), Khatoon and Mahmood (2010), who point out that learners with positive attitudes toward mathematics exhibit better performance in the subject. Marchis (2013) highlights that teachers' attitude towards mathematics and the amount

of confidence and support the teacher gives to the learners influence their attitude towards mathematics.

Another important factor is how learners think about the utility of mathematics in their everyday life (Marchis, 2013:60). Self-efficacy and self-judgment are also influential to the learners' attitudes towards learning mathematics (LiuX & Koirala H., 2009). In this researcher's view, it is the mandate of the mathematics leaders of instruction to trigger intrinsic motivation in learners so that they become enthusiastic and committed to learn mathematics. This could allow learners to achieve high performance levels in the subject. Triggering intrinsic motivation can be an uphill task in the South African educational landscape due to the fact that teachers are grappling with high level mathematical problem solving in class (Tachie and Chireshe, 2013), lack pedagogical content and have questionable attitudes themselves towards the subject (Mensah *et al*, 2013).

Makgato and Mji (2004) in their research on factors associated with high school learners' poor performance in mathematics and physical sciences in District 3 of Tshwane North reveal that learners lack commitment to mathematics and that late coming to lessons, lack of learner participation in class work, homework and group activities and lack of concentration in class are indicators of such a lack of commitment to mathematics learning (Makgato & Mji, 2006:260).

A study carried out by Rikhotso (2015) in Limpopo, reveals that most learners in Groot Letaba Circuit of the Limpopo Province had negative attitudes towards learning mathematics. Sinyosi (2015), in her research on factors affecting grade 12 learners' performance in mathematics in Vhembe District in Limpopo Province, attributes learners' negative attitudes towards mathematics learning as one of the principal factors contributing to lower learner performance in mathematics in the province. Further, Sinyosi (2015) reveals that the reasons for such an attitude towards the subject given by learners were that mathematics is not a favourite subject, it is difficult and complicated to the learners, mathematics teachers are very unfriendly and that learners cannot understand the subject at all.

2.3.3 Attitudes of Instructional Leaders Towards Mathematics Teaching

Research has linked poor performance in mathematics in South African schools to poor-quality teaching which, in turn, can be attributed in part to lack of effective instructional leadership practices in schools (Seobi & Wood, 2016). According to policy, heads of departments (HoDs) are best placed to offer instructional leadership services to schools, but in many schools these services are not offered (Seobi & Wood, 2016). Their mandate, according to policy guidelines (Policy Guidelines; DBE 2000, 2002), is to assist and monitor teachers in setting and achieving personal and professional goals related to improvement of school instruction, to make sure that the goals are successfully achieved. An HoD is supposed to perform regular formal and informal classroom observations, do post-classroom observation meetings with teachers, focusing on improving instruction and providing constructive critical evaluations. Conducting these errands enables the HoD to subsequently make sound recommendations for personal and professional growth goals according to an individual teacher's needs.

On the other hand, effective school principals are no longer merely school managers but have increased responsibility for supporting instructional reforms in every learning area (Boston *et al*, 2016). Their functions include; shaping a vision of academic success for all learners, creating a climate hospitable to education, cultivating leadership in others, improving instruction and managing people, data and processes to foster school improvement (Wallace Foundation, 2013). They are no longer just building managers, who are tasked to adhere to rules of their districts, carry out regulations and avoid mistakes (Wallace Foundation, 2013). They have to be (or become) leaders of learning who can develop a team responsible for delivering effective instruction.

Boston *et al* (2016) also argue that principals must have the ability to distinguish between high and low-quality instruction within any specific learning area (mathematics included), when observing and assessing teachers' professional practices. Therefore, this calls for instructional leaders to do away with most of the traditional ways of running schools and centre their leadership on high quality instruction in mathematics (and other subjects) teaching and learning. As instructional leaders, principals should have high levels of knowledge and practices to support high-quality instruction in mathematics. As the driving force of school instructional programme, instructional leaders should, therefore, refrain from chronic absenteeism from duty as this can result in this kind of behaviour overflowing to teachers and, eventually, learners.

Taylor (2011), in a CDE report, reports that findings from the large majority of the eight case studies undertaken from the surveyed schools, revealed that principals systematically underestimate subject knowledge needs of mathematics teachers in their schools. The principals and HoDs as leaders and teachers as practitioners of instruction should first acknowledge the existence of low mathematics subject content proficiency levels and open doors for professional development programmes crafted by government and other organisations to reform mathematics teaching in schools.

Spaull (2013) views the belief by instructional leaders and their teachers that “they are doing a good job”, yet they are failing to deliver high quality mathematics instruction, as a complacent attitudinal behaviour that is likely to foster teacher resistance to mathematics teaching reform attempts. In addition, the (NSES report, 2011) reveals that principals (teachers included) lack a sense of intrinsic motivation and showed little understanding of the fact that mastery of mathematics subject content knowledge is the most important foundation for teaching the subject.

Principals turn a blind eye and act dumb on the devastating influence of trade unions in teacher appointments in schools. Trade unions often do not consider some important attributes like subject content competencies, merit, expertise and professional development (CDE Report, 2014) which are relevant for advancing high quality mathematics instruction and promoting accountability for learner achievement in the schooling system. Instructional leaders (principals, HoDs and the whole SMT) need to voice their concerns and not to fold their arms while dumbly staring at unforeseen practices unfolding in schools. It is their mandate to initiate, promote, implement and support a culture of effective mathematics instruction in schools that would, in turn, improve learner achievement (Donaldson, 2017). This, among other practices, can be achieved through effective implementation of instructional leadership practices (McKinsey *et al*, 2010).

2.4 SUMMARY

This chapter has contextualised the study on the problems associated with mathematics teaching, learners', teachers' and instructional leaders' attitudes towards mathematics in South African schools. The chapter contextualised the correlation between the teaching of mathematics and instructional leadership in secondary schools. The next chapter focuses on the theoretical perspectives on instructional leadership and their implications for mathematics teaching.

CHAPTER 3: THEORETICAL PERSPECTIVES

3.1 INTRODUCTION

This chapter outlines the theoretical perspectives on instructional leadership and their effects on mathematics teaching. The chapter gives an overview of the instructional leadership theory and how it helps in providing explicit guidance to learners to achieve the best in mathematics. A detailed exploration of the theory of instructional leadership and examination of associated prevailing models of instructional leadership are done. Particular attention is paid to how the theory and related models contribute to mathematics learner achievement. In addition, the chapter gives an overview of how the leaders of instruction would enforce effective leadership practices to assist subordinate teachers to learn, develop, teach effectively, maximise student learning, and increase learner achievement in mathematics.

3.2 INSTRUCTIONAL LEADERSHIP THEORY

This study is guided by the shared instructional leadership theory. In general, instructional leadership (IL) is viewed as a class of leadership functions directly related to supporting classroom teaching and learning (Murphy, 1988). IL theory originated during the late 1970s and early 1980s studies undertaken for schools in poor urban communities where learners succeeded despite all odds (Edmonds, 1979 in Robinson *et al*). Several researchers, including Day *et al* (2007), Bush *et al* (2010), cited in Kaparou & Bush (2015:323) argue that IL theory emphasises on the technical core of instruction, teaching and learning, focusing on leading teachers' professional learning and development to improve learners' achievements. The theory deals with the curriculum and assessment, fosters direction and influences the teachers' and learners' daily activities in the school (Aziz & Baba, 2011). Early accounts of IL emphasized a solo IL model, in which the principal was the only actor in IL of a school, but recent models have recognised the need for shared IL practices (Valliamah *et al*, 2016).

IL is shared leadership in that the leadership functions which are directly related to supporting classroom teaching and student learning are carried in partnerships with teachers, who are regarded as colleagues. The responsible leaders can achieve by spending more time in classrooms and engaging teachers in conversations (Mestry, 2017). In shared IL, both principals and teachers contribute to the school's curriculum, instruction, and assessment (the core business of schooling). It is no longer the duty of the principal alone, but principals and teachers

(together), craft a focused, coherent, and consistent school instructional leadership programme. In actual sense, shared IL is distributed across the whole school community, with classroom practitioners, SMT members, HoDs, vice principals, principals and policy makers having complementary responsibilities (Jita, 2010). It is not only the school principal who drives the school's core business. The IL role of principals in shared IL is that of overseeing the instructional leaders comprising the teachers, SMT members, HoDs and other members in the school setting.

In addition, the theory of IL does not see the principal as a model teacher, but as a leader with the capacity to create conditions in the school. The created conditions must be necessary and sufficient to build pedagogical capacity, increase innovative opportunities, provide resources, direct instruction, provide support to teachers, and cause them to have a sense of responsibility for instructional improvement (Darling-Hammond *et al.* 2009; Matthews, Moorman and Nusche, 2007 in Ng *et al.*, 2015). It is important to note that in this scenario, in order to improve teaching and learning in the classrooms, decision making is distributed throughout the school as an organisation (Ng *et al.*, 2015:392).

In discharging IL activities, there exist two general concepts, which are the narrow and broad concepts (Ng *et al.*, 2015:391). Teaching and learning, including carrying out classroom observations which directly affect student learning, belong to the narrow concept, referred to as the early (1980s) IL concept. The broad concept includes all leadership activities that indirectly affect student learning such as school culture, timetabling procedures and promotion of a positive learning environment (Hallinger, 2009). In this study, both the narrow and broad concepts were adopted in order to encompass comprehensive models developed by other scholars in the last two decades and establish new theoretical models.

3.3 INSTRUCTIONAL LEADERSHIP PRACTICES

What are the most ideal ways of managing instruction to improve mathematics achievement in South African schools? This is a question that researchers, for the past two decades, have failed to answer convincingly. There are quite a number of proposed instructional leadership frameworks (models) which are thought to be effective in managing instruction, but this study focused on the three most prevailing models of leadership (conceptualisations) that have been

elaborated during the past two decades: Hallinger and Murphy, Murphy and Weber's models of theoretical origins 1985, 1990 and 1996 respectively (Al-Mahdy & Al-kiyumi, 2015). According to Ng *et al* (2015), the Hallinger and Murphy model is the most fully tested among all existing models of instructional leadership. These instructional leadership models were developed by researchers using behaviours, traits and processes needed by leaders to effectively lead a school (Al-Mahdy & Al-kiyumi, 2015).

According to Boston *et al* (2016), the three models consist of dimensions that converge to the fact that instructional leaders must develop high-quality instruction in the school through distinguishing between low and high-quality curriculum and instruction, communicating to instruction practitioners and setting out goals for high-quality instruction through providing valuable support and accountability. Instructional leadership should be collaborative and personally engage themselves in instruction and dialogue (Boston *et al*, 2016). It is important to note that whilst one instructional leadership model works for one school in a particular environment, it may not work in some schools, hence the need to do a broad review, embrace IL theory and develop specific models in a broader spectrum of the school management system that adds to available theories.

3.3.1 Hallinger and Murphy's Instructional Leadership Models

Hallinger and Murphy, cited in Ng *et al* (2015) developed a model of instructional management by examining the instructional leadership behaviours of elementary principals and reviewing the literature on school effectiveness. From their analyses (empirical and theoretical), a framework of instructional leadership and management with three broad dimensions and eleven job descriptors was created. The three broad dimensions of instructional leadership were; defining the school's mission, managing the instructional programme and promoting a positive school-learning climate (Ng *et al*, 2015: 391). These dimensions were further subdivided into multiple dimensions (Ng *et al*, 2015: 391), as depicted in Table 3.3.1.

Unpacking the school mission was further elaborated to include shaping and communicating the school goals. Shaping school goals is the crafting of goals that ensure that the school's mission is accomplished unambiguously by emphasising on the academic development of learners (Rodzi & Mansor, 2016). Hallinger and Murphy emphasized that the crafted goals

should be shared with parents and the teaching staff so that areas within the school system that require improvement are identified (Al-Mahdy & Al-kiyumi, 2015:1506).

After the goals are formulated, they need be effectively and frequently communicated formally and informally to learners, parents, and teachers, thereby ensuring that the goals guide the daily activities of the school. The school leadership can achieve this through regularly conducting staff meetings, school assemblies, discussions with staff or learners, notice boards and teacher and parent meetings (Hallinger & Wang, 2015: 25). The reasons for the development of this leadership practice is to reflect on the instructional leader’s responsibility for building, in collaboration with other players in the school system, a suitable vision in context and making sure it is made known to all school stakeholders. It is also crucial to ensure that the instructional processes are conducted in line with the school vision (Al-Mahdy & Al-kiyumi, 2015:1506). A summary of Hallinger and Murphy model is shown in the table below (Figure 3.3.1).

Figure 3.3.1: Adapted from Hallinger & Wang (2015:28)

Defining the school’s mission	Managing the instructional programme	Promoting a positive school-learning climate
Shaping school goals Communicating school goals	Coordinates curriculum Monitors student progress Supervises and evaluates instruction	Protects instructional time Provides incentives for teachers Provides incentives for learners Promotes professional development Maintains high visibility

The management of instructional leadership programmes incorporates three leadership dimensions; coordinating curriculum, supervising and evaluating instruction and monitoring student progress (Hallinger & Wang, 2015:25). This instructional leadership function is concerned with leading and managing the technical core of the school. The instructional leader supervises, monitors and evaluates instruction and curriculum based activities in the school (Al-

Mahdy & Al-kiyumi, 2015:1506). Supervising, monitoring and evaluating instruction and curriculum comprises all activities that provide instructional support to the classroom practitioners. In this instance, the instructional leader monitors classroom instruction through conducting informal and formal classroom visits, monitoring the school master schedule, ensuring timely curriculum coverage and aligning classroom practice with the school goals (Hallinger & Wang, 2015:31).

Promoting a positive school-learning climate is the third dimension and it comprises five leadership functions; maintaining high visibility, protecting instructional time, promoting high quality staff professional development programmes that are consistent with the school mission and providing incentives for teachers and learners (Ng *et al*, 2015). Promoting a positive school learning climate is broader in scope and intent than the two dimensions discussed above (Al-Mahdy & Al-kiyumi, 2015). Hallinger and Murphy consider school-learning climate as school staff's and learners' norms and attitudes that influence learning in the school. When all members of the school community feel included, safe, accepted, and can actively promote positive behaviours and interactions, then a positive school learning environment is said to exist (Policy/Programme Memorandum No.145; 2012).

3.3.2 Murphy's Instructional Leadership Model

Murphy continued to refine and elaborate the model with a systematic and comprehensive review and integration of the research from the following four major sources;

- literature on school improvement,
- effective schools,
- organisational change and
- staff development.

Based on this review, he sketched and elaborated an instructional leadership framework that consisted of four basic dimensions of instructional leadership which were further broken down into sixteen different roles or behaviours (Mestry, 2017:258). Murphy's instructional leadership model is basically a modification of Hallinger and Murphy's model by adding one more dimension which was named developing a supportive work environment (Al-Mahdy & Al-kiyumi, 2015). This resulted in Murphy's model to have four dimensions.

The first three dimensions of Murphy's model are just like a duplication of the Hallinger and Murphy model (as in 3.3.1). The additional dimension of IL, developing a supportive work environment, has five IL roles;

- creating a safe and orderly learning environment,
- providing opportunities for meaningful student involvement,
- developing staff collaboration and cohesion,
- securing outside resources in school goals and
- forging links between the home and the school (Abdullah & Md Kassim, 2011: 3306).

A summary of Murphy's comprehensive instructional leadership framework is given below (Figure 3.3.2). In summary, developing a supportive work environment involves the establishment of organisational processes and structures to support teaching and learning. It also provides opportunities for important student involvement, collaboration and cohesion among staff; secures resources security in support of school goals and establishes important links between parents and the school (Magwaza, 2016).

Figure 3.3.2: Adapted from Magwaza (2016:31)

Developing mission and goals	Managing the educational production function	Promoting an academic learning climate	Developing a supportive work environment
Shaping school goals	Promoting quality instruction	Establishing positive expectations and standards	Creating a safe and orderly learning environment
Communicating school goals	Supervising and evaluating instruction	Maintaining high visibility	Providing meaningful student involvement opportunities.
	Allocating and protecting instructional time	Providing incentives for teachers and learners	Developing staff collaboration and cohesion
	Coordinating the curriculum	Promoting professional development	Securing outside resources in school goals
	Monitoring student progress		Forging links between the home and the school

3.3.3 Weber’s Instructional Leadership Model

The need for instructional leadership, regardless of the school’s organisational structure is addressed by Weber’s model. Weber concludes that even if an instructional leader was not packaged as a principal, such a leader was imperative. From his review of the research, Weber (in Magwaza, 2016), asserts that although it is powerfully appealing to have a leaderless team, it is still important to have a team leader to act as a point of contact in the school.

Weber’s model is based on a review of Hallinger and Murphy’s model and identified five main dimensions of instructional leadership (Al-Mahdy & Al-kiyumi, 2015:1506). His model is consistent with the two earlier models and incorporates many of the same elements but adds two dimensions to the Hallinger and Murphy model which are; observing and improving instruction and assessing the instructional programme (Magwaza, 2016). Since the first three domains of Weber’s model are consistent with the Hallinger and Murphy model, a description

of what constitutes the last two domains in Weber's model is therefore given in this section. Observing and improving instruction requires the instructional leader to have a healthy relationship with the teaching staff and other stakeholders. The spirit of trust, respect and good workmanship should prevail in the school. According to Weber, observation of instruction benefits both the observed and the observer and it is a good platform for a fruitful professional interaction. This experience is enhanced by the instructional leader through emphasizing research as the foundation for initiating teaching strategies, remediation, and differentiation of the lessons (Weber, 1996, as cited in Magwaza, 2016).

Assessing the instructional programme is very important for the improvement of the instructional programme. Planning, designing, administering and analysis of assessments are vital responsibilities of the instructional leader and are tailor made to evaluate the effectiveness of the curriculum. This will allow the instructional leader, through a collaborative approach, to craft possible intervention processes. In addition, continuous scrutiny of the instructional programme allows instructional practitioners to effectively meet the needs of learners through constant revision and refinement.

Research regards the Hallinger and Murphy model as the most fully tested of the existing models of instructional leadership (Ng *et al*, 2015). Up to 2005, over 110 empirical studies had been carried out and completed using this model (Hallinger, 2005 in Ng *et al*, 2015). Research has not yet proven that if an instructional leader employs behaviours from Murphy's or Weber's models then high levels of student achievement will result because none of them has been empirically tested. However, both models (Murphy's and Weber's), identify three major dimensions similar to those in Hallinger and Murphy. Therefore, behaviours from the two models can be employed in instructional leadership without much fear.

Figure 3.3.3: Adapted from Magwaza (2016:34)

Defining the school's mission	Managing curriculum and instruction	Promoting a positive learning climate	Observing and improving instruction	Assessing the instructional programmes
Collaboratively develops a common vision goals for the school with stakeholders	Monitors classroom practice. Alignment with the school's mission, Provides resources and support in the use of instructional best practices, and models. Provides support in the use of data to drive instruction.	Promotes a positive learning climate by communicating goals. Establishing expectations. Establishing orderly learning environment.	Observes and improves instruction through the use of classroom observation and professional development opportunities	Contributes to the planning, designing, administering, and analysis of assessments that evaluate the effectiveness of the curriculum

3.3.4 Theoretical Framework for the Study

The theoretical framework guiding this study is the Hallinger (2009) model extracted from the three models (Hallinger and Murphy, Murphy and Weber's frameworks) which essentially emphasise the importance of three fundamental instructional leadership functions;

- defining and communicating goals,
- managing the instructional programme (which focuses on the coordination and control of instruction and curriculum) and
- promoting a positive school learning climate (Mestry, 2017).

The dimensions summarised in Figure 3.3.4 are from a model suggested by Hallinger (2009) and are basically a summary of the three models, explained in 3.3.1, 3.3.2 and 3.3.3 in this chapter, which he assumed to be prerequisites for effective instructional leadership (Mestry, 2017). These three similarities are consistent with Locke and Latham's goal setting theory, which is one of most effective theories of motivation (Magwaza, 2016). The theory of goal

setting postulates that setting specifically defined, difficult and challenging goals helps to motivate individuals to increase performance towards the goals (Lunenburg, 2011).

Figure 3.3.4: Adapted from Mestry (2017:258)

Defining the School's Mission:	Managing the Instructional Programme	Promoting a Positive School Learning Climate
<p>Determining the central purposes of the school.</p> <p>The IL works with staff to ensure that the school has clear, measurable, time-based goals focused on the academic progress of learners.</p> <p>The IL communicates these goals so that these are widely known and supported throughout the school community.</p>	<p>Coordinating and controlling instruction and curriculum.</p> <p>Stimulating, supervising and monitoring teaching and learning.</p> <p>The IL has expertise in teaching and learning.</p> <p>The IL has school's improvement and effectiveness commitment.</p> <p>The IL involved 'hip-deep' in the school's instructional programme</p>	<p>Creating 'academic press' through development of high standards and expectations for learners and teachers.</p> <p>Developing a culture of continuous improvement in which rewards for learner and staff are aligned with purposes and practices.</p> <p>IL highly visible on school premises and in classrooms. Modelling values and practices that create a climate to support the continuous improvement of teaching and learning.</p>

In practice, it is not easy to directly pinpoint which model (or framework) and traits (dimensions) have, in particular, the greatest or total effect, directly or indirectly, on school success and learner achievement. There are as many opinions as there are research findings. Research findings by Setwong and Prasertcharoensuk (2013) on the influence of IL of school administrators on school effectiveness reveal that IL has direct, indirect and total effect on school effectiveness. It was revealed that, among other IL dimensions (practices), teacher professional development had the highest total effect on the school effectiveness. As a result, the two researchers recommended that IL should recommend professional development of teachers; encourage training and continuing education and strengthen teacher networking.

On the other hand, Hallinger and Lee (2014) reveal that promoting a positive school learning climate and defining school mission are emphasised more by some instructional leaders than some other dimensions of IL. They argue that promoting a positive school climate is more intent and overlaps with facets of other leadership theories, in particular, transformational leadership frameworks (Al-Mahdy & Al-kiyumi, 2015) hence; the most influential practice in IL theory. It is essential to observe that promoting a positive school learning climate is the third dimension of the Hallinger and Murphy model (section 3.3.1) and that teacher professional development is a sub dimension under that same main dimension. The two different research findings concur hence; many researchers emphasize on effective engagement of IL practices regardless of which model is most effective.

3.4 INSTRUCTIONAL LEADERSHIP AND MATHEMATICS LEARNER ACHIEVEMENT

The fact that the performance of an organisation depends on the effectiveness of its leadership is undeniable. Likewise, instructional leadership which focuses its relationships, work and learning on the core business of teaching and learning has greater influence on student outcomes (Robinson *et al*, 2008). Schools with typically strong IL, including a learning climate free of disruption, a system of clear teaching objectives, and high teacher expectations for learners are reported to succeeded very well, despite all other odds (Robinson *et al*, 2008). Effective instructional leadership guides teaching and learning through modeling effective strategies, building positive collaborative relationships, and supporting the classroom practitioners as they implement new strategies in the classrooms and, as a result, positively influence performance (Barrett & Breyer, 2014).

Many research findings, for example Stein et al (2009) and Boaler and Staples (2008), as cited by Melissa (2016) among others, associate effective instructional leadership practices with high mathematics student achievement. Persistent mathematics learning and teaching monitoring systems that provide continuously consistent practices and develop deeply-rooted understanding of concepts in mathematics, result in high learner achievement levels. This can be achieved, not because the IL has proficiency in mathematics content, but that is knowledgeable about the latest trends in education, innovative teaching strategies, suitable useful resources, and excellent assessment methods (Hoy & Hoy, 2009). This implies that IL

must be acquiescent to innovative theories, modern teaching practices and be willing to motivate teachers to model their classrooms accordingly (Mestry, 2017:264).

According to Jita (2010), the way instructional leadership practices are conducted matters most on its impact on school success and learner achievement. In successful schools, there was clear evidence that instructional leaders clearly took instruction as one of their daily priorities; principals became an integral part of strategising and developing structures and practices to encourage mathematics teaching and learning, whereas in the less successful schools, school leaders tended to delegate responsibilities Jita (2010). More successful schools were those that could distribute their work among teams of leaders, not relying on a single leader. In addition, successful schools were also those that constantly created elaborate structures to monitor the instructional and learning processes. A system of collaboration among teachers enabled them to observe their colleagues and give feedback to one another. The principals of successful schools were not the only custodians of high standards and good performance in terms of classroom instruction, but thrived on collaborative work (Al-Mahdy & Al-kiyumi, 2015), thus shouldering the responsibility (formal and informal) together with other leaders.

Leithwood and Louis (2011) emphasise on core leadership practices such as setting direction, developing staff, organisational culture development and effective management of the instructional programme as very influential traits to high learner achievement. IL that encourages and develops the above variables in the learner achievement equation seems to give more of a direct effect on learner performance. This correlates positively to the fact that learner achievement is a product of a host of activities and traits in the school as an organisation.

As discussed in chapter two, teachers' content and pedagogical knowledge of mathematics (Bansilal, 2015), teachers' knowledge of learners, the learning environment, teachers' approach to instruction, teacher and learner attitudes towards mathematics (Mensah *et al*, 2013), the collaborative approach to the management of instructions and research-based instruction practices are very important variables in the learner achievement model. This might be achieved through effective instructional leadership practices that emphasise on engaging teacher professional development and life-long training and networking.

3.5 SUMMARY

This chapter has outlined the instructional leadership theory by presenting it in the form of three predominant instructional leadership models that were developed over the past two decades. It further expanded on the prevailing concepts of instructional leadership and presented it as a simplified (hypothetical) model that was then used (in chapter 5) to develop new theoretical models that best suit the educational needs of the North West Province in particular. Finally, the chapter gave an overview of how effective instructional leadership affects mathematics learner achievement. The next chapter deals with the research design and methodology.

CHAPTER 4: RESEARCH DESIGN AND METHODOLOGY

4.1 INTRODUCTION

This chapter outlines the research design and methodology used for the study. It gives details of the target population and sample. It explains how the sample was chosen and describes the sampling procedures used, sample space and sample size. The chapter also gives a description of the research paradigms, data collection and analyses methods as well as the data collection instruments. In addition, data collection, validation and analysis procedures are discussed in this chapter.

4.2 RESEARCH PARADIGM

A paradigm, as defined by Guba and Lincoln (2010), is a basic belief system (worldview) that guides the investigator in choosing a method for carrying out a study in ontological and epistemological fundamental ways. It is a social construct and not a theory on its own. However, it is the foundation of a theory (Husseini, 2009). A pragmatic research paradigm was adopted in this study since it was a sequential explanatory mixed method design. A pragmatic research paradigm is a research philosophy that accepts concepts to be relevant only if they support action (Subedi, 2016). It recognises that there are many different ways of interpreting the world and undertaking research, thus holding that a single point of view can never give conclusive results (Thornhill, cited in Subedi 2016).

4.3 RESEARCH DESIGN

The instructional leadership team that is referred to in this study includes practitioners of instruction, heads of departments (HoDs), deputy principals, principals and the whole school management team (SMT) in a secondary school setting. The cornerstone of the exploration was to unearth the significance of instructional leadership in the management and leadership of mathematics teaching and learning in enhancing learner performance in secondary schools. An explanatory sequential mixed methods design was used for this study to explore how instructional leadership duties were discharged by the team. The design was also used to analyse whether this execution of leadership duties was effective in improving learner performance. In this design, quantitative data were first collected and analysed, followed by qualitative data collection and analysis (Clark, 2011 cited in Subedi, 2016). The results of qualitative data

analysis were used to elaborate on the quantitative results by refining, extending or explaining the general picture of the research findings (Subedi, 2016), as summarised in figure 4.3 below:

Figure 4.3: Adapted from Subedi (2016:573)



4.4 DATA COLLECTION METHODS

To collect quantitative data, a survey design genre was used because it allowed the researcher to judge behaviour and then present the findings in an accurate way. In addition, a survey allowed further exploration of the research problem by means of a qualitative methodology (Creswell, 2013). The data collection instrument used under this genre was a self-administered closed ended questionnaire (Appendix B) targeted for the instructional leadership. A self-administered questionnaire is designed to be completed by the respondent without the intervention of the researcher (Lavrakas, 2008) and a closed ended questionnaire (also called structured questionnaires) is one which has predetermined questions with answers (Mathers *et al*, 2007). The questionnaire consists of three sections. Section A is for demographic information, Section B consists of closed ended questions on instructional leadership functions and Section C consists of closed ended questions assessing learner achievements. The questionnaires were distributed to participants who were asked to complete them in a time frame of 25 minutes.

A case study design genre was used to collect qualitative data because of its strength in generating in-depth data (Yin, 2009). Under qualitative data collection, two structured interview guides were used; one for instructional leadership (Appendix C) and the other for learners (Appendix D). Both consist of mainly open ended questions and have two sections; Section A for demographic information and Section B consists of open ended questions.

Open-ended questions allow respondents to give spontaneous responses and provide detailed information which includes their feelings, attitudes and understanding of the subject of concern. This provides better access to the true feeling of the respondents (Reja *et al*, 2003). The bias

that may result from suggesting responses to individuals will be avoided (Reja *et al*, 2003). Face to face interviews were conducted by the researcher, who first explained to participants that their participation in the research was voluntary, their responses, names of their schools and their district would be kept confidential and anonymous (Burns & Grove, 2009:195).

The researcher also clearly explained to the participants that the data collected would not be used to evaluate the schools or the district in terms of performance in comparison with others or be used to evaluate academic results or school instructional leadership team performance in their specific schools. For those who agreed (Botma *et al*, 2010:20), a voice recorder was used for data collection during the interviews, but with the majority of the participants, the researcher resorted to writing down the responses. In the face to face interviews, the researcher was the interviewer and the respondents were the interviewees.

In the first stage of data collection, the questionnaires were given to the selected participants in schools and collected on the same day. Secondly, after three days, a follow up was conducted with the interviewees after data from questionnaires were captured, validated and analysed (Clark & Creswell, 2011).

4.5 ETHICAL CONSIDERATIONS AND MEASURES TO ENSURE RELIABILITY AND VALIDITY (TRUSTWORTHINESS)

In this study measures to ensure ethical principles were adhered to by sorting and obtaining an ethical approval certificate (Appendix C) from the North West University ethical clearance committee and consent letter from department education and sport development for permission to carry out research in NMM district in the NWP, attaching consent letters, to questionnaires informing the participants of confidentiality and privacy of the information that they gave (Appendices E and F). Pseudonyms were used in analysis results reporting to ensure the privacy of participants (Burns & Grove, 2009:195). Under no circumstance would participants comments and opinions be identified with their names. This was to protect participants against victimization by their superiors as this study was across all levels of the school management system. The researcher also ensured that people voluntarily participate fully aware of their own

volition to participate and that they had right to be protected from harm and discomfort (non-maleficence) at all costs (Botma *et al*, 2010:20).

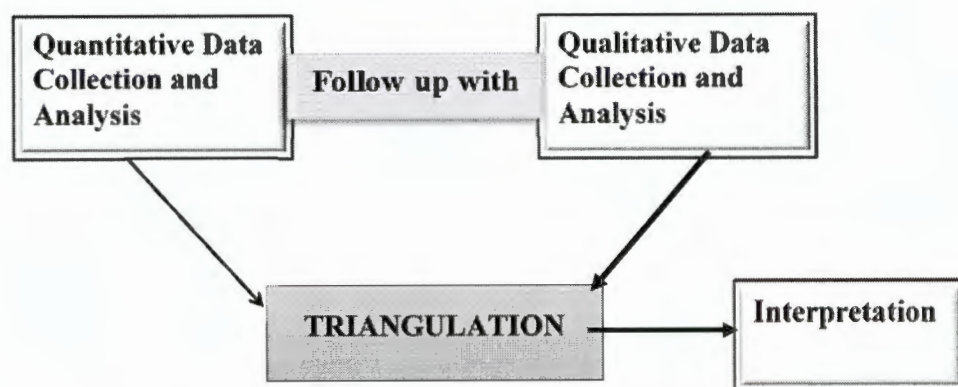
Validity refers to the extent to which an empirical measure adequately reflects the real meaning of the concept under consideration (Babbie, 2010:153). It implies that the instrument actually measures the construct that it intends to measure (Du Plooy-Cilliers, *et al*, 2014:256). In qualitative research, validity is the appropriateness of the tools, processes and data, whether the choice of methodology, design, sampling procedure and data are appropriate and whether the results and conclusions are valid for the sample and context (Leung, 2015). Reliability, on the other hand, is a measure of a measurement (instrument) testing whether it reflects mostly true scores, relative to the error (Creswell *et al*, 2016:238). It is important to note that there are basically three types of reliability in quantitative methodology which are; stability, homogeneity and equivalence reliability. In qualitative methodology, reliability is a measure of whether a researcher's approach is consistent across different researchers and projects (Creswell, 2014:201).

In this explanatory sequential mixed methods study, reliability and validity (trustworthiness) was done through conducting a pilot study before the actual survey, triangulation and member check. A pilot study, is used as a preliminary study conducted prior to the main (actual) study (Polit *et al*, 2010) so that the researcher can evaluate feasibility, study cost, reliability of the data collection instruments. On the data collected through the pilot study, statistical variability and reliability were tested before implementing a full scale research project (Okeke & Van Wyk, 2016). Triangulation is a combination of two or more theories, data sources, methods or investigations in one study of a single phenomenon to converge on a single construct and can be employed in both quantitative (validation) and qualitative (inquiry) studies (Yeasmin & Rahman, 2012:158). It is in four forms which are; data, theoretical, investigator, and methodological triangulation (Hussein, 2009).

A sub sample size of 12% of the actual study sample (Johanson & Brooks, 2009) was randomly selected for the pilot study. The researcher administered one questionnaire and conducted two interviews in each of the five schools as a pilot study. Cronbach's alpha statistical analysis was used to test for homogeneity reliability of data from the pilot survey, by testing internal consistency of the scales in the questionnaire (Creswell *et al*, 2016). Data, analysis categories,

interpretations and conclusions were tested with members (member checking) of those groups from whom the data were originally obtained (Gunawan, 2015) to ensure validity and reliability of the data collection instruments. In addition, reliability was assured through carefully following document procedures and steps taken in the research work (Yin, 2009, cited in Creswell, 2014: 204), cross checking codes developed by different researchers through comparing independently produced results (Creswell, 2014: 204). Methodological triangulation (combining quantitative and qualitative methodologies) was also used to ensure both reliability and trustworthiness (Figure 4.5) by decreasing the deficiencies and biases that come from either qualitative or quantitative methods. The assumption behind the methodologies used is that the strengths of one method may compensate for the weaknesses of the other (Yeasman & Rahman, 2012).

Figure 4.5: Adapted from Yeasman & Rahman (2012:156)



4.6 POPULATION AND SAMPLING

The population for this study consisted of all secondary schools in the North West (NW) Province (247 secondary schools in total). One district, Ngaka Modiri Molema, was conveniently sampled from the province (Creswell *et al*, 2016). From the district, a systematic random sample of representative schools (U, V, W, X, Y and Z) was selected (Elsayir, 2014). From each school, 3 grade 12 learners, mathematics teacher and HoD, SMT member, a deputy principal and/or principal were purposively sampled.

Convenience sampling is a type of non-probability (non-random) sampling where members of the target population are selected due to their practical easy accessibility, geographical proximity, data richness availability or practical willingness to participate (Dörnyei, 2007).


From the NW Province map (Figure 4.6), there are four districts and Ngaka Modiri Molema (NMM) District was chosen because the NWU is within this district. The NMM District was easily accessible, geographically closer to the university hence; low costs (Creswell *et al*, 2016) in terms of time and travelling expenses during the research.

The number of secondary schools in the NMM District is 124 (NMM District office statistics) and a systematic sample of five schools was selected as follows. First, all schools in the NMM district were listed and consecutive numbers (1 to 124) were assigned to the schools. An every k -th systematic sampling procedure was used to select a systematic sample of five schools as follows (Banning *et al*, 2012:30); the 124 schools in the NMM District were divided into 5 groups of 25 (k) schools (k is the number of schools determined from the sampling fraction) and then the first school out of the first 25 (k) schools in the NMM district was randomly selected by generating random numbers between 1 and 124 inclusive. In the process, the smallest random number was 6 hence; the first school to be selected was school number 6 on the list below (Table 4.7). Thereafter, randomly selecting the first element, every 25th school was selected until a sample of 5 schools was selected (Elsayir, 2014:112). From the list of schools (S1–S124), the following schools were selected; S6, S32, S57, S88 and S113, as indicated in Table 4.7.

Figure 4.6: NMM map. Adapted from Google Maps



Figure 4.7: Adapted from NMM District director’s office



S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13
S14	S15	S16	S17	S18	S20	S21	S22	S23	S24	S25	S26	S27
S28	S29	S30	S31	S32	S33	S34	S35	S36	S37	S38	S39	S40
S41	S42	S43	S44	S45	S46	S47	S48	S49	S50	S51	S52	S53
S54	S55	S56	S57	S58	S59	S60	S67	S68	S69	S70	S71	S72
S73	S74	S75	S76	S77	S78	S79	S80	S81	S82	S83	S84	S85
S86	S87	S88	S89	S90	S91	S92	S93	S94	S95	S96	S97	S98
S99	S100	S101	S102	S103	S104	S105	S106	S107	S108	S109	S110	S111
S112	S113	S114	S115	S116	S117	S118	S119	S120	S121	S122	S124	

The purposive sampling procedure was used to choose participants in the study from each school. Purposive sampling (judgment sampling), is when the researcher deliberately chooses participants due to the qualities they possess (Ertkan et al, 2015). It is also a non-probability (nonrandom) sampling technique. People were selected based on the criteria that they were proficient and well-informed with instructional leadership functions and could provide accurate information by virtue of their knowledge and experience (Palys, 2008:697).

The people who are within the instructional leadership team were selected. Hence, from each school, one principal, deputy principal, mathematics HoD, all mathematics teachers (in that school) and one SMT member (who is not in any of the already selected groups of leadership) were chosen. These people, based on their level of expertise in the school system, can communicate their experiences and opinions in an articulate, expressive, and reflective manner (Cresswell & Clark, 2011). Three grade 12 learners from each school were selected, based on the criteria that they have been at the school much long and could communicate their experiences comparatively better than juniors or newcomers.

4.7 DATA CAPTURING AND VALIDATION

The data collected by means of interviews and questionnaires were captured on Microsoft Excel for data cleaning and validation. The audio clips were translated to text using google voice to text translation application. Data from closed ended questions in the questionnaires were

assigned scores (coded) to responses (Creswell & Clark, 2005). The assigned scores generated quantitative data and were then captured in SPSS 24.0 statistical software. Data from the structured two interview guides were accordingly captured into Atlas-ti software (Okeke & Van Wyk, 2016: 469).

Quantitative data cleaning was done by checking and deleting duplicate data entries. Descriptive statistics were also performed to see whether the scores (data) in the spreadsheet were within the accepted range in the code book (Creswell, 2014). The descriptive statistics were done through generating (using SPSS 24.0) frequency tables for categorical variables, histograms for Likert variables, scatter plots for write-in continuous variables to check for duplicate entries, outliers and missing values (Merson & MacHale, 2010). Missing data arising from unanswered sections or subsections of the research instruments were accounted for by assigning missing response codes (Creswell, 2014) to unanswered sections and subsections. In addition, trial runs of data analysis to check whether responses tally with items and sub items of the research instruments were done using SPSS 24.0, while continuously comparing with originally completed questionnaires or interview responses (Merson & MacHale, 2010).

4.8 DATA ANALYSIS

Data from this explanatory sequential mixed methods design study were analysed in two phases: first was the analysis of quantitative data and, secondly, analysis of qualitative data (Creswell, 2012). Analysis of quantitative data consisted of exploratory analysis, structural equation modelling and inferential statistical data analysis using SPSS 24.0. The analysis of qualitative data was done using thematic analysis aided by Atlas-ti software (Creswell, 2013). The results from the two analyses (quantitative and qualitative analyses) were triangulated (Creswell & Clark, 2003) and combined to explain their meaning in relation to instructional leadership and effect on mathematics learner performance.

During the quantitative data analysis phase, descriptive statistical analysis was done; frequencies, percentages, skewness, kurtosis, standard deviations and the results were summarised in frequency tables, bar graphs and pie charts (Ali & Bhaskar, 2016). Analysis of variance (ANOVA) was done to compare mathematical achievements across schools in the district (Seong, 2013). Structural equation modeling (analysis of covariance structures) was

also done to study direct, indirect and total effect (Luo, 2008: 603) of instructional leadership practices on mathematics learner performance. The results from this modeling were summarised in the form of hypothesised (structural) models and path diagrams (Setwong & Prasertcharoensuk, 2013: 2860). The structural modeling exercise was done by integrating multiple linear regression and factor analyses. These structural models were developed based on the Hallinger and Lee model, which is a revised version of the Thai-form of PIMRS, to which Hallinger and Lee (2013) made some modifications to the PIMRS instrument to reduce the number of items from fifty to twenty, as discussed in chapter 3 (section 3.3). This was done by examining the causal effects (routes and size, whether directly or indirectly) of the dimensions of the models. It is important to recall that in every statistical analysis method there are assumptions to be met. Likewise, before reasonably inferring some causal relations among variables, assumptions associated with analysis of covariance structures (Kline, 2010) were validated.

During the thematic analysis of the data from qualitative methodology, responses from the participants were analysed for themes (patterns) that related to the data (Ibrahim, 2012). It is important to know that a theme is a coherent and meaningful pattern in the verbatim relevant to the research question which captures important issues and represents some sort of response pattern in the data set (Braun & Clarke, 2006:82). Thematic analysis was chosen over other qualitative analysis methods like grounded theory, interpretive phenomenological, and discourse analyses because it is theoretically flexible and applicable to a range of theoretical and epistemological approaches (Braun & Clarke, 2006). Secondly, it works with a wide range of research questions: about people's experiences or understandings, about representation and construction of phenomena in particular contexts and others (Braun & Clarke, 2012). Thirdly, it could be used to analyse different types of data from secondary sources, such as media and transcripts of focus groups or interviews. Fourthly, it can, with both large and small data-sets, be applied to produce data-driven or theory-driven analyses (Braun & Clarke, 2012).

A six-phased thematic analysis approach, outlined in Figure 4.8, was followed (Braun & Clarke, 2006). The themes (patterns) that were generated in the analysis were then used to further explain and elaborate the findings of the quantitative analysis.

Figure 4.8: Adapted from Braun & Clarke (2006:87)

Thematic analysis phases	Familiarizing with data	Transcribing data
		Reading & re-reading the data
		Noting down initial ideas
	Generating initial codes	Coding interesting features of the data
		Collating data relevant to each code
	Searching for themes	Checking if themes work in relation to the coded extracts
		Generating a thematic “map” of the analysis.
	Reviewing themes	Checking themes
		Generating a thematic “map”
	Defining and naming themes	Ongoing analysis to refine the specifics of each theme
		Generating definitions and names of each theme
	Producing the report	Final analysis
Producing a scholarly report		

4.9 SUMMARY

This chapter has given a detailed outline of the explanatory sequential mixed methods research procedure designed to explore the significance of effective instructional leadership in the management of mathematics education. It elicited details of the research paradigm, design and methodology, sampling procedures and data collection methods. It also explained the data analysis procedure that the researcher used in this study. The next chapter looks at data cleaning, validation and statistical and non-statistical analyses of data and analysis of results presented.

CHAPTER 5: QUANTITATIVE DATA PRESENTATION, ANALYSIS AND DISCUSSION

5.1 INTRODUCTION

The purpose of this chapter is to present statistical data analysis results from the quantitative section of the study. It outlines the descriptive statistical analysis and results of the demographics, views of the extent to which instructional leadership embraces the core instructional leadership practices: defining the school mission, managing the instructional programme and promoting a positive mathematics learning environment. Furthermore, the chapter presents exploratory factor analysis (EFA) results to reduce the data dimensionality and confirmatory factor analysis (CFA) and structural equation modelling results, which explore whether the instructional leadership practices in the selected schools fit the Hallinger model of instructional leadership.

5.2 DEMOGRAPHICS

A descriptive statistical analysis was done on the data collected from the schools by means of a questionnaire to explore the extent to which instructional leadership practices were embraced in managing mathematics teaching and learning in the secondary schools. From Figure 5.1, it was observed that most of the respondents were males (55.4%) and minorities were females (44.6%). The majority (more than 70%) of the instructional leaders had experience of at least 5 years in their respective designations of operation in the schools. From this, it was assumed that most of the people interviewed had reasonable experience and hence could give information that could be relied upon since they were fully conversant with their duties as instructional leaders.

Figure 5.1 Demographics Summary

CHARACTERISTICS	ITEM	RESPONSE	FREQ (n)	%TAG
GENDER	A1	1	33	44.6
		2	41	55.4
INSTRUCTIONAL LEADERSHIP	A2	DP	5	6.8
		HOD	5	6.8
		P	5	6.8
		SMT	28	37.8
		TCR	31	41.9
EXPERIENCE	A3	1 – 4	29	39.2
		5 - 9	31	41.9
		10 -14	10	13.5
		15+	4	5.4
SCHOOLS	A4	A	15	20.3
		B	13	17.6
		C	14	18.9
		D	16	21.6
		E	16	21.6

5.3 EMBRACING INSTRUCTIONAL LEADERSHIP PRACTICES

Section B of the questionnaire (Appendix A) was an exploration of the extent to which instructional leadership (IL) embraces instructional leadership practices (dimensions) in their respective schools. The three main dimensions explored were: defining the school’s mission, managing the instructional programme and promoting a positive school learning climate with sub-dimensions explained in chapter 3, section 3.3.4. So each of these main dimensions coupled with their respective sub-dimensions were assessed whether they were implemented in the schools using closed questions (Item B1- B40, section B of the questionnaire).

5.3.1 Defining the school mission

To determine whether IL defines school mission to learners and other stakeholders in the teaching and learning of mathematics in the schools, three sub-dimensions were explored; IL determine the central purpose of the school, work with staff to develop goals and communicates goals. For each sub-dimension, specific questionnaire items (closed-ended questions) were crafted as indicators and responses to such items were summarised in the form of frequency tables (Figure 5.2.1a) and descriptive summary statistics (Figure 5.2.1b) that was used to gather evidence as to what extent does the school IL defines the school mission on mathematics teaching and learning in a given secondary school.

In order to find out whether IL determines the central purpose of the school, two questions (ItemB1 and ItemB2) were designed to explore this (Figure 5.2.1a). The distribution of response results showed that most (41.9%) of the respondents disagreed and quite a number strongly disagreed (20.3%) that IL in their schools avails mathematics performance goals to the whole school (ItemB1). Quite a number (25.7%) were not sure, very few (25.7%) respondents agreed and none of them strongly agreed that the leadership avails mathematics performance goals to the whole school. While responding to whether IL develops school goals that promote high standards and expectations for all students (Item B2), most respondents disagreed (36.5%), were not sure (36.5%), quite a number strongly disagreed (10.8%), very few agreed (16.2%). Based on the statistics shown in this paragraph, the researcher assumed that determining the central purpose of the school as a leadership practice was not done as effective to be recognised by instructional leaders in the sampled schools.

Three questions (ItemB3, B4 and B5) were used to explore whether the IL work with staff to develop goals (Figure 5.2.1a). Statistics from the responses showed that most (43.2 %) respondents disagreed, some (14.9 %) strongly disagreed and quite a number (28.4 %) were not sure that IL meet with teachers and work out mathematics performance goals (ItemB3). Very few (12.2 %) showed a positive response to the question. On enquiring whether IL meet on their own to discuss and create subject matter goals (ItemB4), the following distribution of responses was observed: overall, the majority (55.2 %) could not agree, quite a number (35.1%) were not sure and very few (9.5%) agreed that IL meet on their own to discuss and create subject matter goals. A similar pattern of responses was observed when the respondents responded to

the question of whether or not IL meets with all school staff to draft goals (ItemB5). Most of the respondents (43.2%) disagreed, fewer (18%) strongly disagreed, quite a number (25.7%) had no idea and very few (12.2 %) were quite positive that IL in their schools does work with staff to develop goals. Based on the statistical results (Figure 5.2.1a) in this paragraph, it may be assumed that the practice “IL work with staff to develop goals” was not that recognised by the sampled secondary schools, instructional leaders.

Figure 5.2.1a: Frequency distribution on defining the school mission

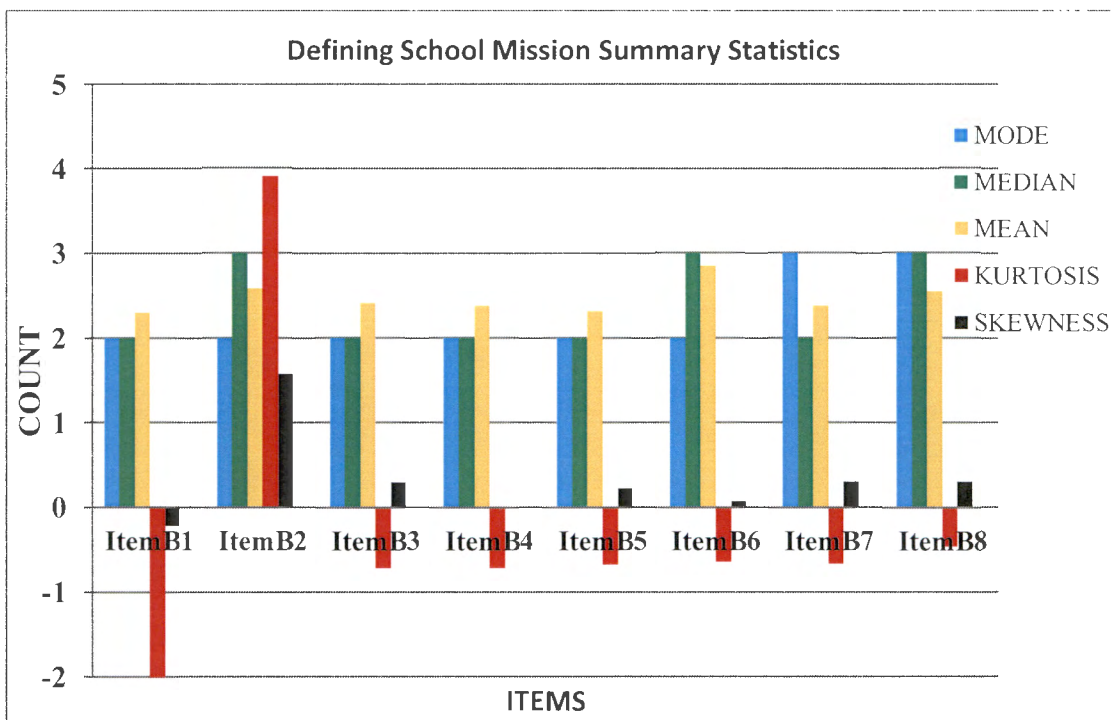
DIMENSION	SUB-DIMENSION	ITEM	RESP	FREQ	%tage	ITEM	RESP	FREQ	%TAGE	ITEM	RESP	FREQ	%TAGE	
DEFINING SCHOOL MISSION	Determine Central Purpose of the school	B1	1	15	20.3	B2	1	8	10.8					
			2	31	41.9		2	27	36.5					
			3	19	25.7		3	27	36.5					
			4	9	12.2		4	12	16.2					
			5	0	0		5	0	0					
	IL work with staff to develop goals	B3	1	11	14.9	B4	1	12	16.2	B5	1	14	18.9	
			2	32	43.2		2	29	39.2		2	32	43.2	
			3	21	28.4		3	26	35.1		3	19	25.7	
			4	10	13.5		4	7	9.5		4	9	12.2	
			5	0	0		5	0	0		5	0	0	
	Communicates goals	B6	1	4	5.4	B7	1	14	18.9	B8	1	14	18.9	
			2	26	35.1		2	24	32.4		2	18	24.3	
			3	25	33.8		3	30	40.5		3	31	41.9	
			4	15	20.3		4	6	8.1		4	9	12.2	
			5	4	5.4		5	0	0		5	2	2.7	

Analysis of responses to the questionnaire Items B6, B7 and B8 (Figure 5.2.1a) used to assess whether IL communicates goals to the whole school showed an interesting pattern. The largest numbers of respondents were not sure whether this was happening. Many (38.8%) were not sure, quite a number (35.5%) disagreed, not many (20.3 %) agreed and very few (5.4%) strongly agreed that IL emphasizes school goals to teachers and parents in meetings, newsletters or memos (ItemB6). Similarly, it was observed that on checking whether or not IL conduct teacher and parent meetings regularly to discuss instructional matters (ItemB7), most respondents (40.5%) were not sure, quite a big number (32.4%) disagreed and as many as 18.9% of respondents to this question strongly disagreed. Very few (8.1%) agreed that IL conduct teacher and parent meetings regularly to discuss instructional matters (ItemB7). Likewise results from respondents when asked whether IL use school goals when making academic decisions, showed no much different pattern. Most (41.9%) were not sure, quite a number (24.3%) disagreed and as many as 18.9% of respondents to this question strongly disagreed. Very few (12.2%) agreed

that IL use school goals when making academic decisions. Results reported above might also show us an indication that not all or none of the selected schools adhere to this practice (communicating goals to the whole school) in their IL practices.

Summary statistics (Figure 5.2.1b) showed generally that the modal, median and mean responses were all at 3 and below. There was negative kurtosis for all the responses data, except for Item B2, which was an indication of the platykurtic distribution of responses (distribution has light tails). The statistics also showed positive skewness values which were an indication that the average response was generally more than the median response. On unpacking all the statistics presented in this paragraph it was deduced that the majority of the respondents had an opinion that defining a school mission as a leadership practice did not exist in the selected schools (Figure 5.2.1b). Further enquiry was done in chapter 6 using interviews

Figure 5.2.1b: Summary Statistics on defining the school mission



5.3.2 Managing the instructional programme

The sub-dimensions associated with this main dimension were: coordinating and controlling instruction and curriculum, expertise in teaching and learning and deeply involved in school instructional programme. Like in section 5.2.1, evidence to the implementation of these leadership practices from the sampled secondary school was gathered using questionnaire items B9 -B20. Figure 5.2.2a is a frequency table that summarised the distribution of responses across the questionnaire items.

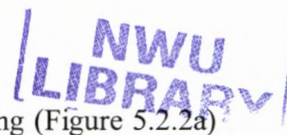
Figure 5.2.2a: Managing the instructional programme

DIMENSION	SUB-DIMENSION	ITEM	RESP	FREQ	%tage	ITEM	RESP	FREQ	%TAGE	ITEM	RESP	FREQ	%TAGE	
MANAGING THE INSTRUCTIONAL PROGRAMME	Coordinating and controlling instruction and curriculum	B9	1	7	9.5	B10	1	7	9.5	B11	1	8	10.8	
			2	22	29.7		2	19	25.7		2	16	21.6	
			3	27	36.5		3	24	32.4		3	22	29.7	
			4	17	23		4	24	32.4		4	23	31.1	
			5	1	1.4		5	0	0		5	5	6.8	
		B12	1	5	6.8									
			2	27	36.5									
			3	25	33.8									
			4	15	20.3									
			5	2	2.7									
	Expertise in teaching and learning	B13	1	17	23	B14	1	11	14.9	B15	1	14	18.9	
			2	26	35.1		2	23	31.1		2	30	40.5	
			3	17	23		3	25	33.8		3	21	28.4	
			4	14	18.9		4	13	17.6		4	9	12.2	
			5	0	0		5	2	2.7		5	0	0	
	Deeply involved in school instructional programme	B16	1	7	9.5	B17	1	10	13.5	B18	1	4	5.4	
			2	20	27		2	27	36.5		2	26	35.1	
			3	21	28.4		3	22	29.7		3	27	36.5	
			4	26	35.1		4	10	13.5		4	13	17.6	
			5	0	0		5	5	6.8		5	4	5.4	
		B19	1	13	17.6	B20	1	8	10.8					
			2	23	31.1		2	24	32.4					
			3	26	35.1		3	22	29.7					
			4	11	14.9		4	18	24.3					
			5	1	1.4		5	2	2.7					

On exploring whether IL coordinate and control instruction and curriculum (Figure 5.2.2a), it was observed that a large number of respondents (36.5%) were not sure of whether IL encourage teachers to use data analysis of learners' academic progress (B9). Quite many of the respondents (39.2%) disagreed and strongly disagreed. Some but fewer (23%) agreed and very few strongly agreed that IL encourage teachers to use data analysis of learners' academic progress. On responding to the question on whether IL use student achievement data to guide discussions on

mathematics instructional program (B10), it was observed that quite a reasonable number of respondents (32.4%) agreed and the same proportion of respondents were not sure (32.4%) that this practice existed in their schools. A few numbers of respondents disagreed (25.7%) and very few strongly disagreed (9.5%). Almost a similar pattern was observed for the questionnaire item “IL recommends resources in areas in which teachers need” (B11). Most of the respondents agreed (31.1%) and quite a number (6.8%) strongly agreed. For this item (B11) quite a number of respondents (29.7%) indicated that they are not sure whether IL recommends resources in areas in which teachers need or not. The last question on this sub-dimension was to gather evidence on whether IL guides teachers in using instructional resources (B12). It was observed a fewer number of respondents (20.3% agreed and 2.7% strongly agreed) were positive, a larger number (36.5% disagreed and 6.8% strongly disagreed) were on the negative side. There were more responses from those who were not sure (36.2%) than those who were positive that IL guides teachers in using instructional resources in the sampled schools. This indicated that in general many schools do not honour coordination and control of instruction and curriculum as IL practice even though positive indications to items B11 and B16 were observed.

The second sub-dimension was that IL had expertise in teaching and learning (Figure 5.2.2a) and evidence of its existence in schools was gathered using questionnaire items B13, B14 and B15. It was observed that most (58.1%) respondents disagreed, very few (18.9%) agreed and quite a number of respondents were not sure that IL checks teacher challenges for some sections in mathematics (B13). On analyzing responses to whether assessment tasks are done before district moderation commences (B14). Almost a similar pattern was observed that most respondents did not agree (46%), fewer agreed (20.3%) and quite a number (38.6%) were not sure that assessment tasks were done before district moderation commences. Evidence of the existence of expertise in teaching and learning was also gathered through analyzing responses to Item B15 which was on whether curriculum coverage in the school at term end was at par with the school master schedule. The evidence gathered showed that the majority (58.4%) disagreed, very few (12.2%) agreed and quite a number were not sure. This again may indicate that IL most of the sampled schools could not give an assurance that IL have *expertise in teaching and learning* in their way of practice.

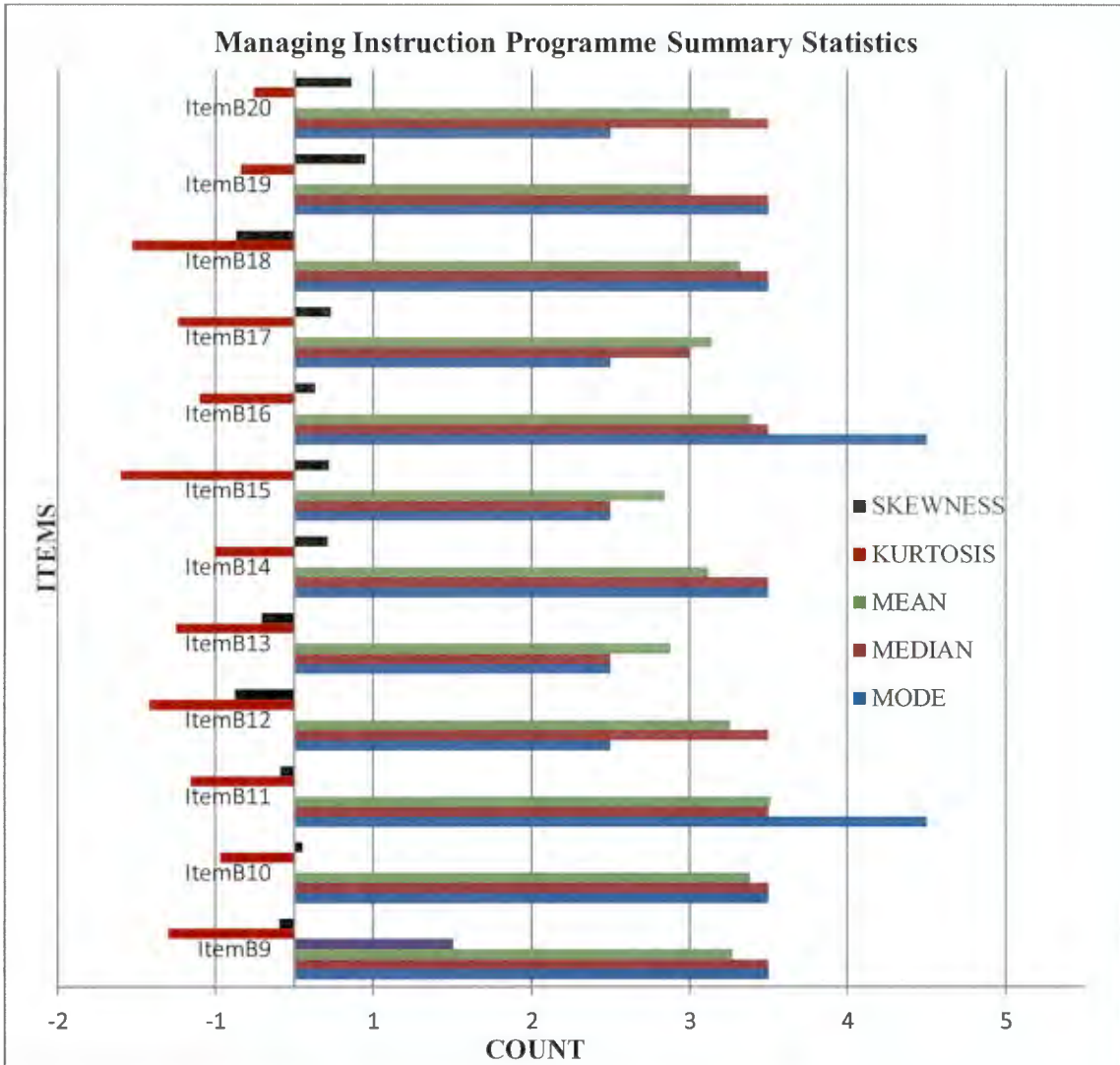


The third sub-dimension was that IL was deeply involved in school instructional programme. Evidence of its existence was gathered through having IL responding to five questionnaire items (Items B16, B17, B18, B19 and B20). Almost equal numbers of respondents (35.1%) agreed as disagreed (36.5%) and quite a number were not sure that IL work with teachers to interpret assessment data for instructional implications (B16). A large number of respondents (50%) disagreed, a few (20.4%) agreed and quite a number (29.7%) were not sure that some IL has mathematics classes (B17). A large number of respondents disagreed (40.5%), a fewer agreed (23%) and quite a number were not sure that peer supervision among mathematics educators in the school is done.

Responses to items B19 and B20 exhibit almost equal pattern to the above-discussed items. Most respondents disagreed (48.7%), fewer were not sure (35.1%) and very few agreed (35.1%) that IL often check progress on curriculum coverage (B19). Many of the respondents who responded to the Item B20 were negative (42.8%), fewer were positive (27%) and as much as 29.7% of the respondents were not sure that IL attend to co-curricular activities of the school. Based on these statistics, there is not enough information to conclude that IL was deeply involved in school instructional programme. Further enquiry was done in chapter 6.

Generally (Figure 5.2.2b) the modal, median and mean responses were less than 4 for all items except for Items B11 and B16. Items B11 and B16 showed modal responses of more than 4 which indicate that there were some reasonable high responses which were positive. There were negative kurtosis values for all responses data, an indication that the data follows a platykurtic distribution (light tails distribution). There was negative skewness for Items B9, B11, B12 and B13 which means the mean response for these items were less than the median values. For the rest of the items, there were skewness values, an indication that the average response was generally more than the median response. On unpacking, all the statistics presented in this paragraph showed that the general idea displayed in this analysis is that the majority of the respondents had an opinion that not much of the sub-dimensions are embraced by the IL to fully manage the instructional programme.

Figure 5.2.2b: Managing Instruction Programme Summary Statistics



5.3.3 Promoting a positive learning environment

Four sub-dimensions were associated with promoting a positive learning environment and the evidence to ascertain the existence of each of them in the schools was gathered through questionnaire items B21 – B40. There were four sub-dimensions in this regard and these were; creating academic press, modelling values, developing a culture of continuous improvement, and high visibility of IL. A frequency table (Figure 5.2.3a) showing the distribution of responses was presented to summarise the outcomes.

Figure 5.2.3a: Promoting a positive learning environment

DIMENSION	SUB-DIMENSION	ITEM	RESP	FREQ	%tage	ITEM	RESP	FREQ	%TAGE	ITEM	RESP	FREQ	%TAGE
PROMOTING A POSITIVE SCHOOL LEARNING CLIMATE	Creating academic press	B21	1	11	14.9	B22	1	11	14.9	B23	1	10	13.5
			2	25	33.8		2	22	29.7		2	24	32.4
			3	25	33.8		3	27	36.5		3	23	31.1
			4	12	16.2		4	14	18.9		4	16	21.6
			5	1	1.4		5	0	0		5	1	1.4
		B24	1	1	1.4	B25	1	4	5.4	B26	1	4	5.4
			2	31	41.9		2	26	35.1		2	27	36.5
			3	22	29.7		3	28	37.8		3	24	32.4
			4	17	23		4	14	18.9		4	18	24.3
			5	3	4.1		5	2	2.7		5	1	1.4
	Modelling values	B27	1	5	6.8	B28	1	13	17.6	B29	1	8	10.8
			2	29	39.2		2	30	40.5		2	14	18.9
			3	27	36.5		3	27	36.5		3	24	32.4
			4	13	17.6		4	4	5.4		4	28	37.8
			5	0	0		5	0	0		5	0	0
		B30	1	0	0	B31	1	7	9.5				
			2	3	4.1		2	23	31.1				
			3	21	28.4		3	34	45.9				
			4	37	50		4	9	12.2				
			5	13	17.6		5	1	1.4				
	Developing a culture of continuous improvement	B32	1	14	18.9	B33	1	1	1.4	B34	1	7	9.5
			2	29	39.2		2	13	17.6		2	32	43.2
			3	27	36.5		3	27	36.5		3	31	41.9
			4	4	5.4		4	31	41.9		4	4	5.4
			5	0	0		5	2	2.7		5	0	0
		B35	1	1	1.4								
			2	13	17.6								
			3	18	24.3								
			4	34	45.9								
			5	8	10.8								
	IL highly visible	B36	1	12	16.2	B37	1	0	0	B38	1	2	2.7
			2	30	40.5		2	13	17.6		2	20	27
			3	28	37.8		3	19	25.7		3	32	43.2
			4	4	5.4		4	26	35.1		4	17	23
			5	0	0		5	16	21.6		5	3	4.1
		B39	1	3	4.1	B40	1	2	2.7				
			2	27	36.5		2	12	16.2				
			3	28	37.8		3	29	39.2				
			4	14	18.9		4	24	32.4				
			5	2	2.7		5	7	9.5				

To gather evidence on whether IL practice in the schools could encompass the creation of an academic press in the schools, six items B21-B26 were used and a summary of responses was presented in Figure 5.2.3a. In general, it was observed that most respondents disagreed and a few numbers of respondents agreed that such a practice existed in their schools. Some of the respondents had no idea to whether or not such a practice existed in their schools. The distribution of results was as follows. Most (48.7%) disagreed, very few (17.6%) and quite a number of respondents (33.8%) were not sure that IL review learners' work when evaluating

classroom instruction (B21). On the item that IL meet teachers individually to discuss issues of learner progress (B22), a similar pattern of results existed; most (44.6%) disagreed, very few (18.9%) and many respondents (36.5%) were not sure. Likewise, the largest number of respondents disagreed (45.9%), a large number (31.1%) were not sure and fewer number (23%) agreed that IL ensure that teachers teach the required curriculum (B23). More than 40% of the respondents disagreed to the facts that IL encourages a lesson plan for making curriculum effective (B24), encourage teachers to engage learners in activities (B25) and they give Learners feedback on completed assessments (B26). Quite a number of respondents (averaged 35%) were not sure and few (about 25%) agreed that to items B24-26. This was an indication that there is no evidence that IL create an academic press as one of their leadership practices in schools

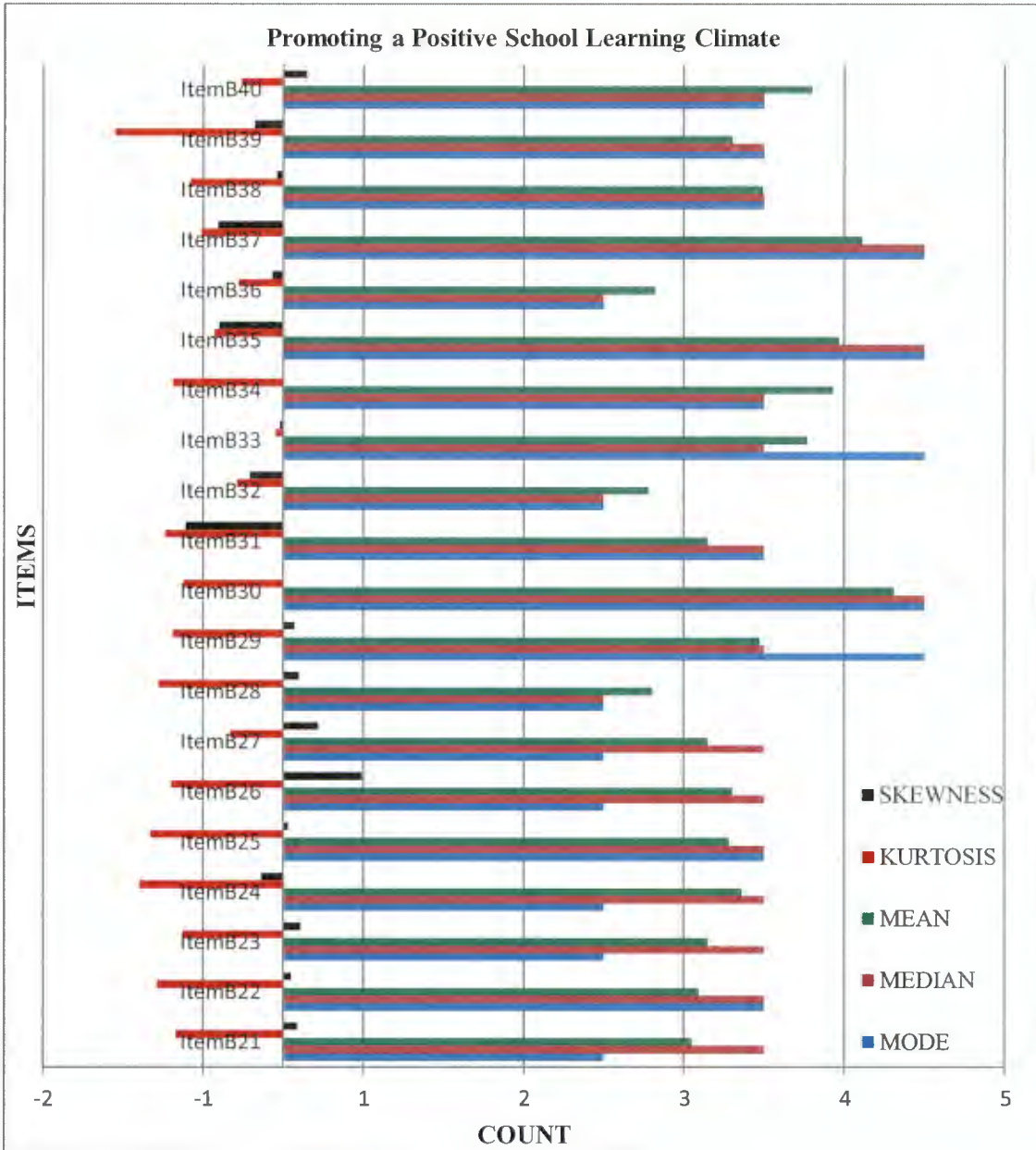
The second sub-dimension to be explored was modelling values. Five items B27-B31 were used to investigate the school instruction leaders' opinions on this leadership practice. The majority (46%) of the respondents disagreed, very few (17.6%) agreed and quite a big number (36.5%) were not sure that IL supports and individualised professional development plan for mathematics teachers (B27). Likewise, the largest number of respondents (58.1%) disagreed, very few agreed (5.4%) and quite a number were not sure (36.5%) were not sure that IL furnishes useful professional mathematics materials and resources to teachers (B28). A large number of respondents (37.8%) agreed, a smaller number of respondents (29.7%) disagreed and quite many (36.5 %) were not sure that mathematics teachers are encouraged to go for professional development activities in their respective schools (B29). The majority of the respondents agreed (67.6 %), very few disagreed (4.1 %) and there were some who were not sure (28.4 %) that IL are encouraged to go for mathematics teachers to go to district workshops (B30). The largest number of respondents were not sure (45.9%), quite a big number (40.6%) disagreed and very few (13.5 %) agreed that IL in their respective schools provides for in-house professional development opportunities on mathematics instructional best practices (B31). Overall there is an indication that the sampled schools' IL embraces "modelling values" as a leadership practice.

Developing a culture of continuous improvement was the third sub-dimension to be looked at in this section. The investigation was done using four items (B32 – B35). Quite encouraging results were observed on items B33, B34 and B35. Most of the respondents to these items were positive; many agreed (44.6%) and very few disagreed (19.1%) that Learners are given awards for excelling in termly assessments. Most agreed (47.3%) and as many as 36.5% disagreed that teachers are given incentives on acquiring new academic qualifications. The majority of the respondents agreed (51.7%) and very few respondents disagreed (19%) that IL give public praise to those teachers who perform well. There were very few respondents who were within the “not sure” position for B34 (16.2%) and B35 (24.3%) items. On items B32, the largest number of respondents (58.1%) denied, quite a number (36.5%) were neutral and very few (5.4%) agreed that maths educators are awarded for high learner performance. Based on response results presented in this paragraph it may be concluded that IL develop a culture of continuous improvement in the sampled schools.

The fourth sub-dimension was IL highly visible in schools, and the evidence for its existence was gathered using items B36-B40 (refer to Figure 5.2.3a). Responses to B37 and B40 showed an almost similar pattern that the largest number of respondents were positive that maths curriculum advisor always visits the school to supervise/support (B37) and that IL visit classes regularly to observe teaching and learning (B40). The majority agreed (56.7%), very few disagreed (17.6%) and some (35.1%) were not sure that maths curriculum advisor always visits the school to supervise/support. Responses to items B36, B38 and B39 showed that most respondents were more on the negative (were in disagreement) that maths teachers are available all the time for learners, maths teachers are punctual for their mathematics lessons and that IL protect classroom instructional time from outside interruptions. Most respondents disagreed (56.7%), quite a number of respondents were not sure (37.8%) and very few agreed (5.4%) that maths teachers are available all the time for learners (B36). The analysis also showed many (43.2%) were not sure, fewer disagreed (29.7%) and very few agreed (27.1 %) agreed that maths teachers are punctual for their mathematics lessons (B38). A large proportion respondent (40.6%) disagreed, very smaller proportion agreed (21.6%) and quite a large proportion (37.8) were not sure that IL protect classroom instructional time from outside interruptions(B39). Based on the evidence gathered from the respondents there seem to be high visibility of IL in the schools in certain practices like class visits.

In generally (Figure 5.2.3b) the modal, median and mean responses were less than 4 for all items except for Items B37, B35, B33, B30 and B29. Maths curriculum advisor always visit the school to supervise/support (B37), IL were said to give public praise to those teachers who perform well (B35), learners are given awards for excelling in termly assessments (B33), there are maths teacher district workshops available for the teacher/s (B30) and that mathematics teachers are encouraged to go for professional development activities were a few indicators which were responded to positively in the questionnaire. Hence according to the respondents, these IL practices do exist in the schools. There were also negative kurtosis values for all responses data, an indication that the data follows a platykurtic distribution (light tails distribution). There was negative skewness for Items B39, B38, B37, B35, B32, B31 and B24 which means the mean response for these items were less than the median values. For the rest of the items, there were skewness values, an indication that the average response was generally more than the median response. From the evidence gathered from the statistics reported above, instructional leaders who participated in the study seem not to recognise much of the sub-dimensions of IL, so we may conclude that there is promotion positive learning environment in the schools.

Figure 5.2.3b: Promoting a Positive School Learning Climate Summary Statistics



5.3.4 Learner performance in Mathematics

Section C of the questionnaire dealt with the general performance of grades 10, 11 and 12 mathematics learners as seen by the IL in respective schools. Summary statistics of the average performance of learners were given in Figure 5.3.4. For all grades 10, 11 and 12, it was observed that very few respondents (0 - 2.7%) indicated a level 6 – 7 performance. The majority (at least 50% of respondents) indicated that the yearly average learner performance in mathematics in

the three respective classes was within the level 3-5 category. About 40% of respondents indicated learners performed at most level 2. Reasons indicated to such performance were mainly teacher availability (45.9% of the responses) and curriculum coverage (25.7% of the responses). This implies that teachers are not often available in class, limited curriculum coverage and hence poor mathematics.

Figure 5.3.4: Performance Frequency distribution

DIMENSION	SUB-DIMENSION	ITEM	RESP	FREQ	%tage	ITEM	RESP	FREQ	%TAGE	ITEM	RESP	FREQ	%TAGE
LEARNER PERFORMANCE IN MATHS	10YM	1	1	28	37.8	11YM	1	37	50	12YM	1	30	40.5
		2	44	59.5	2		37	50	2		42	56.8	
		3	2	2.7	3		0	0	3		2	2.7	
	C2	1	31	41.9	C3	1	19	25.7					
		2	43	58.1		2	34	45.9					
		3	0	0		3	11	14.9					
		4	0	0		4	10	13.5					

5.4 INSTRUCTIONAL LEADERSHIP PRACTICES AND LEARNER PERFORMANCE

Exploration of the relationship between instructional leadership practices and learner performance in mathematics was done using structural equation modelling (SEM Analysis). Firstly, exploratory factor analysis (EFA) was done to reduce the dimensionality of the data, followed by confirmatory factor analysis (CFA) to establish the measurement model which demonstrated the relationship between response variables and their latent constructs. Finally, structural equation modelling (SEM) to demonstrate interrelationship among constructs in the study.

5.4.1 The measurement model

Firstly, exploratory factor analysis (EFA) was done on the questionnaire items to reduce the data complexity (Appendices I, J, K, L and M) using SPSS 24.0 software. In this EFA, an “orthogonal” solution criterion was used since factors were not highly correlated with each other. The correlation matrix showed very low, correlations were all less than 0.4 (Appendix I). A total of 16 factors (also called summary scales) were extracted based on the cut –off criterion. The cut- off criterion was based on the fact that extracted factors had eigenvalues greater than 1 (Appendix J). It was also observed that the 16 extracted factors accounted for

73% total variability (in all the variables together) can be accounted for by each of these factors. In addition, each of the extracted factors accounted for variability within the range of 3.85% - 5.85% of total variability. Many of the factors accounted for less than 30% of total variability. To further reduce the dimensionality of the data, a second CFA was done through changing the cut-off criterion to eigenvalues greater than 1.7. This reduced the factors to 9 (Appendices L and M) and these 9 factors accounted for 50.5 % of total variability. 31 remaining summary scale accounted for 45.5% of total variability. In addition, each of the extracted factors accounted for variability within the range of 4.36% - 7.52 % of total variability. Although the variability accounted for by the extracted factors here was low, the researcher moved on with EFA. A summary of final extracted latent constructs and items associated with them are summarised in Appendix M.

After EFA, Confirmatory Factor Analysis (CFA) was used with the aid of SPSS 24.0 AMOS software to explore the relationship between response items and their underlying latent constructs. From the EFA extracted factors, using CFA, path diagrams and accompanying statistics were produced to test the hypotheses stated in chapter 1 (section 1.6) resulting in the construction of the measurement models (Appendix H. path diagrams A- I). It was evident from path diagram A that the five items B5, B8, B22, B23 and B30 related to the latent construct X1 all loaded on the common factor. ItemB30 loaded the strongest (standardized regression weight = -.67) and the squared multiple correlation coefficients were quite encouraging ($R^2 = .45$), meaning that 45% of the variance in the observed variable (ItemB30) was accounted for by the common factor (X1). ItemB5 loaded fairly (standardized regression weight = .50) and $R^2 = .25$. The remaining items related to the latent construct X1 loaded poorly to the hypothetical factor. The Chi-Square statistic (Chi-Sq) of (=) 3.496, degrees of freedom equal to 5 ($df = 5$) was small and therefore based on this, we failed to reject ($p > .05$) the null hypothesis that the model was a good fit to the data. ItemB30 loaded the strongest. ItemB5 loaded fairly (SRW = .50) and 25% of variation in ItemB5 ($R^2 = .25$) was accounted for by X1.

Referring to Appendix H, path diagrams B-F, it could be summarised that Items B15, B28, B34 and B37 were related to the latent construct X2. B37 loaded strongly (SRW = 0.75) and 56 % of variance in item B37 ($R^2 = .56$) was accounted for by X2. ItemB34 was ranked second in

loading X2, it loaded fairly strongly and negatively (SRW = -0.45) on X2 with $R^2 = .20$. Items B14, B27, B31, B35 and B38 were related to latent construct X3 and among these items, B31 loaded X3 strongly (SRW = .63) and 40% of its variation ($R^2 = .40$) was explained by X3. On the same latent construct, B35 loaded fairly strongly and negatively (SRW = -.53), $R^2 = .28$ and B38 loaded fairly (SRW = .48), $R^2 = .23$). B1, B2, B4, B33 and B34 were latent construct X4. In this construct, 2 items B2 and B33 loaded fairly strongly; SRW = .52, $R^2 = .28$ for B2 and SRW = .44 and $R^2 = .20$ for B33. Six items B24, B20, B25, B26, B39 and B40 loaded on the common factor (X5) but only B24 (SRW = .48, $R^2 = .23$) and B26 (SRW = .49, $R^2 = .24$) loaded fairly strongly. The hypothetical factor, X6, was related to the items B3, B18 and B19 and only B3 (SRW = .49, $R^2 = .24$) and B19 (SRW = -.57, $R^2 = .32$) loaded fairly strongly to X6. Items B9, B11 and B16 loaded on the hypothetical factor X7 but only items B11 loaded negatively and very strongly to X7 (SRW = -.88, $R^2 = .78$) with 78% of variance of item B11 explained by the hypothetical factor X7. The common factor X8 was loaded by items B7, B10, B17 and B21 but only item B17 loaded the latent construct X8 very strongly (SRW = 0.88, $R^2 = .78$). The construct X9 was loaded by items B6, B12, B13 and B32 and only item B32 loaded very strongly (SRW = -.87, $R^2 = .76$).

On checking the test statistics for fitness of the models (Appendix H, diagrams A-1), it was observed that for the first model (Latent Construct X1), the Chi-Square statistic (Chi-Sq.) of 3.496, degrees of freedom equal to 5 ($df = 5$) was small and therefore based on this, we failed to reject the null hypothesis at 5% level of significance ($p > .05$) that the model was a good fit to the data. Almost similar pattern of statistical tests results were observed for latent construct X2 (Chi-Sq. = 2.055, $df = 2$ and $p > .05$), X3 (Chi-sq. = 3.590, $df = 5$, $p > .05$), X4 (Chi-sq. = 4.203, $df = 5$, $p > .05$), X5 (Chi-sq. = 3.791, $df = 9$, $p > .05$) and X8 (Chi-sq. = .336, $df = 2$ and $p > .05$). These results showed small Chi-sq. values and $p > .05$, hence in each case we failed to reject the null hypothesis at 5% level of significance ($p > .05$) that the model was a good fit to the data. For latent construct X9, Chi-square statistic (Chi-sq. = 8.625, $df = 2$, $df = 2$ and $p = .013$) was very large hence the null hypothesis that the model was a good fit to the data can be rejected ($p < .05$) at 5% level of significance. The other 2 models for latent variables X6 and X7 test statistics could not be determined due to having a lot of items with constant responses.

5.4.2 Structural Models

The models were then assessed for unidimensionality, validity, and reliability prior to modelling the structural models. Unidimensionality was achieved through the item-deletion process for those items with almost zero factor loadings. The left out items in the models were the items that gave the optimal results. On fitting the structural models (Appendix H, SEM1, SEM2 and SEM3), it was observed that on adding the performance indicators (Items10ym, 11ym,12ym, c2 and c3) in the models, the factor loading could drop to zero hence these indicators were excluded from the models. It was also observed that there was non-significant ($p > .05$) correlation between each of the performance indicators and each of the other items (items B1 – B40). In appendix H, SEM1, SEM2 and SEM3 are structural models of instructional leadership practices from the sampled secondary schools. Appendix M is a table which provides an outline of the latent constructs together with the indicators for such hypothetical factors (X1 –X9). Four factors X1, X2, X3 and X4 constitute first model (SEM1). Based on the available statistics (Chi-Sq.=166.305, df= 146, $p = .120$,) we fail to reject the null hypothesis at 5% level of significance ($p > .05$) that the model is a good fit to the data. This means that at probability levels indicated, the instructional leadership practices can be modelled by the constructed models, SEM1, SEM2 and SEM3. It is however observed that the correlations among the latent variables and some standardized regression coefficients (in SEM1) were not as large, which was an indication that not much of variation in the items was explained by the extracted hypothetical factors (X1, X2, X3 and X4). The same behaviour was seen in the other two models (SEM2 and SEM3). All the two models were fairly good fit to the data based on the observed statistics.

5.5 SUMMARY

This chapter has outlined the descriptive statistics, exploratory factor analysis, confirmatory factor analysis and structural equation modelling results for quantitative research data. The data was presented in the form of graphs and path diagrams. The next chapter deals with the thematic analysis of data from qualitative research.

CHAPTER 6: QUALITATIVE DATA PRESENTATION, ANALYSIS AND DISCUSSION

6.1 INTRODUCTION

The purpose of this chapter is to present a thematic analysis of the results from the qualitative section of the research. It outlines identified themes, codes and common quotes from opinions aired by participants from the interviews to further enquire whether or not the main instructional leadership (IL) practices: defining the school mission, managing the instructional program and promoting a positive mathematics learning environment, were practised in the sampled schools.

6.2 THE ENQUIRY

Some follow up interviews were conducted to further inquire about the implementation of instructional leadership practices in secondary schools in the Ngaka Modiri Molema district in Mafikeng. A total of 15 instructional leaders were interviewed. Different opinions surfaced pertaining to instructional leadership practices.

6.2.1 IL's perceptions: defining and communicating shared goals.

The interview responses (Figure 6.2.1) were regarding the IL's perceptions on defining and communicating shared goals as a leadership practice in their schools. Upon analysing the data from the interviews, the following themes concerning IL's perceptions on defining and communicating shared goals as a leadership practice in their schools were identified:

- Setting performance targets;
- On time curriculum coverage;
- Availing instruction program to teachers;
- Evaluation of instruction;
- Learner promotion policy;



Figure 6.2.1 presents themes, codes and some of the quotes for the data categorized in the perceptions of IL on defining and communicating shared goals' family. A discussion based on the identified themes, codes and quotes (Figure 6.1.1) was therefore conducted to give more insight on the findings of the interviews.

- Setting performance targets

Most of the IL interviewed indicated that their schools do not set pass rate targets. In their view, IL only emphasizes in most schools the fact that learners must pass without setting out their own targets. Some revealed that targets are set but not emphasized. One Instructional leader had this to say; *"Targets are set in January when no one talks about it anymore"*. This was an indication that though performance targets are talked about, there is no seriousness in emphasizing the implementation of measures necessary to achieve the targets.

Figure 6.2.1: Themes, codes and quotes defining and communicating shared goals.

Family	Theme	Codes	Some Quotes
Perceptions of IL on defining and Communicating Shared Goals.	Setting performance targets	Pass rate targets not set No emphasis on pass rate targets	<i>"Never set our pass rate target"</i> <i>"No, not at all only told learners must pass"</i> <i>"Targets are set in January when no one talks about it anymore"</i>
	On time curriculum coverage	Timeline Content	<i>"Yes, we have goals set by the SMT and H.O.D to cover some sections in specified time"</i> <i>"We are told to cover required content thoroughly for learners not to miss out"</i>
	Availing instruction program to teachers	Availed in the form of subject work schedule	<i>"We are given work schedules at the beginning of the term"</i> <i>"the work schedule is our program of instruction, the H.O.D gives as we start a term"</i>
	Evaluation of instruction	H.O.D in charge Principal in charge	<i>"My H.O.D and principal take a turn to quiz us on whether work schedule is adhered to".</i> <i>"Principal is hot on instruction schedule"</i>
	Learner promotion policy	Grade 9 maths final pass Grade 11 to 12 promotion	<i>"Learner need 50% pass in Maths to do grade 10 Mathematics in our school"</i> <i>"No promotion to grade 12 if not having the average performance of 50% in final grade 11 pass"</i>

- On time curriculum coverage

Most of the interviewed IL indicated that the SMT and H.O.D for relevant subject set their targets on curriculum coverage within a specified period of time. The majority of the IL also indicated that whilst there must be timely coverage of the curriculum, only the required helpful content must be covered for the benefit of the learners.

- Availing instruction program to teachers

The majority indicated that at the beginning of every term, they are given subject work schedules as the school's instructional program. According to their responses, these work schedules are availed to subject teachers by the school IL team.

- Evaluation of instruction;

Most of the IL indicated that the H.O.D and the principal are responsible for instruction evaluation. One of the respondents had this to say, "*Principal is hot on instruction schedule always. ... Doesn't give us space*" and the other respondent had this to say, "*the H.O.D and principal take turns on giving us trouble on schedules*". This is an indication that the H.O.D and principal are in charge of the evaluation of instruction in most schools.

- Learner promotion policy

Most of the IL indicated the Grade 9 maths final pass mark and grade 11 to 12 promotion mark as learner performance policies available in the schools

6.2.2 IL's perceptions regarding monitoring and providing feedback

The interview responses reported in this section (Figure 6.2.2) were on the IL's perceptions regarding monitoring and providing feedback on the teaching and learning process as an IL practice in their schools. Upon analyzing the data from the interviews, the following themes were identified:

- C. A gives advice on challenges
- C. A and Maths H.OD strictly follow up
- The principal always checks master work schedule coverage
- H.O.D and grade 12 teacher were coordinators of instruction
- Price giving to encourage learner performance

- Extra classes for slow learners
- Divisions among IL leaders

Figure 6.2.2 presents themes, codes and some of the quotes for the data categorized in the perceptions of IL regarding monitoring and providing feedback on the teaching and learning practice in their schools. A discussion based on the identified themes, codes and quotes (Figure 6.2.2) was therefore conducted to give more insight into the findings.

- C. A gives advice on challenges

Most of the IL interviewed indicated that curriculum advisor gives them advice on problem-solving, helpful teaching methods, gives resources like examiners' report and other useful study guides for learners' revision of work. One has to say this *"Each time he comes, he gives some staff, past papers that we must use for revision, examiners' reports, study guides..."* Quite a number also indicated that the C.A workshops them on problem-solving techniques.

- C. A and Maths H.OD strictly follow up

Most of the interviewed IL indicated that curriculum delivery is supervised by the H.O.D and the C.A. The checking of class work and content coverage is done often. The C.A is always available in the school supporting the mathematics teachers. One IL team member had to say this, *"It's like he advises our school only in the district"*. It was further indicated that the H.O.D gives teachers pressure, needs content to be covered in time and quality work in the workbooks. One teacher had to say this *"H.O.D checks on pace on curriculum coverage all the time"*.

- The principal always checks master work schedule coverage

Most IL indicated that the principal gives pressure on teachers to always move with a good pace on curriculum coverage as guided by the work schedule. It was further indicated that the principal delegates H.O.Ds to ensure that teachers are not behind work schedule. One SMT member said, *"The principal always asks for work coverage reports every fortnight"*.

- H.O.D and grade 12 teacher were coordinators of instruction

Many of the interviewees reported that the coordination of mathematics instruction is done by the H.O.D. Quite a number of IL indicated that the grade 12 teacher is the one coordinating instruction. One IL said *"H.O.D runs around always on issues of teaching and learning mathematics"*

- Price giving to encourage learner performance

The majority of the IL indicated that price giving (subject level prices and school-based prices) to encourage learner performance to learners is done in their schools on a price giving day. It was further indicated that learners, teachers and parents do value this event and all strive to be part of it. One IL said *"It's a big day, learners, teachers and parents like this day so they try by all means to be part of it"*

- Extra classes for slow learners

It was further indicated that in the schools, teachers conduct catch up extra lessons to cater for slow learners. One leader had this to say *"Our school offers free extra lessons to cater for those lazy learners who need more time with the teacher"*.

- Divisions among IL leaders

The majority of IL indicated that there is no teamwork among IL. It was further indicated that camps exist, principal works with H.O.D and H.O.D has no communication with the teachers. One IL had this to say *"There is no team H.O.D and Principal are friends yet H.O.D is not of mathematics.... We know that"*

Figure 6.2.2: Themes, codes and quotes: Monitoring and providing feedback

Family	Theme	Codes	Some Quotes
Monitor and Provide Feedback on the Teaching and Learning Process	C. A gives advice on challenges	<p>Advises on problem-solving</p> <p>Advises on helpful teaching methods</p> <p>Gives lots of resources</p> <p>Workshops</p>	<p><i>"Our Maths C.A always gives us tricks to solve challenging problems"</i></p> <p><i>"He encourages giving learners in-class problems to solve"</i></p> <p><i>"Each time he comes, he gives some staff, past papers that we must use for revision, examiners' reports, study guides,, too many resources hey"</i></p> <p><i>" We attend 2- 4 workshops each term on maths teaching methodology and problem-solving"</i></p>
	C.A and Maths H.OD strictly follow up	<p>C.A checks class workbooks</p> <p>C.A asks for the countless amount of work</p> <p>C.A is ever at our school</p> <p>H.O.D gives us too much pressure.</p> <p>H.O.D needs content covered in time</p> <p>H.O.D needs quality work in workbooks</p>	<p><i>"Any time he comes he wants classwork books for learners"</i></p> <p><i>"He expects too much work in learners books, homework, class activity and group work every day....., it's a lot"</i></p> <p><i>"He comes any time without telling us"</i> <i>"It's like he advises our school only in the district"</i></p> <p><i>"Sometimes you just enter the class you see him sitting there...."</i></p> <p><i>"H.O.D checks on pace on curriculum coverage all the time".</i></p> <p><i>"Quality work is his expectation, he wants teachers to give learners quality problems to solve"</i></p>
	The principal always checks master work schedule coverage	<p>Gives pressure on teachers</p> <p>Delegates H.O.Ds to ensure</p>	<p><i>"The principal always asks for work coverage reports every fortnight".</i></p> <p><i>"Meet H.O.D always to discuss issues of work coverage."</i></p> <p><i>"H.O.D comes in class and collects 5 books at random for checking together with the principal"</i></p>
	H.O.D and grade 12 teacher were	H.O.D coordinates	<i>"H.O.D runs around always on issues of teaching and learning"</i>

	coordinators of instruction	Grade 12 teacher coordinate	<p><i>"Our grade 12 teacher takes charge of instructional issues"</i></p> <p><i>"Our grade 12 teacher puts our teachers together on instructional issues..."</i></p>
	Price giving to encourage learner performance	<p>Subject level prices</p> <p>School-based prices</p>	<p><i>"Teacher and learners are given prizes when excelling in mathematics"</i></p> <p><i>"During our price giving day, learners are given lots of academic prizes in front of their parents".</i></p> <p><i>"It's a big day, learners, teachers and parents like this day so they try by all means to be part of it"</i></p>
	Extra classes for slow learners	<p>Remedial work</p> <p>Catch up lessons</p> <p>Group activities</p>	<p><i>"A lot of maths learners come for Saturday extra classes."</i></p> <p><i>"Our school offers free extra lessons to cater for those lazy learners who need more time with the teacher"</i></p> <p><i>"Our group activities are mostly done during extra time lessons because that's when we have more time".</i></p>
	Divisions among IL leaders	<p>Principal works with H.O.D</p> <p>No H.O.D to teachers dialogue on instruction matters</p>	<p><i>"There is no team H.O.D and Principal are friends yet H.O.D is not of mathematics.... We know that"</i></p> <p><i>"H.O.D cannot talk about maths instruction when he doesn't know it"</i></p> <p><i>"He is just there as office bearer... nothing else"</i></p>

6.2.3 IL’s perceptions: promoting the school-wide professional development

The interview responses reported in this section (Figure 6.2.3) were on the IL’s perceptions regarding promoting a school-wide professional development as an IL practice in their schools. Upon analyzing the data from the interviews, the following themes were identified:

- Less support
- Nonexistence of in-service professional development
- Workshops and intervention program attendances
- Teaching resources sourced by the teachers

Figure 6.2.3 presents themes, codes and some of the quotes for the data categorized in the perceptions of IL on promoting school-wide professional development. A discussion based on the identified themes, codes and quotes (Figure 6.1.3) was therefore conducted to give more insight on the findings of the interviews.

Figure 6.2.3: Themes, codes and quotes: School wide professional development.

Family	Theme	Codes	Some Quotes
Promotes school-wide professional development	Less support	Complains about teachers using teaching time for their own studies. Teacher attends the workshop at his expense No good reward for obtaining extra qualification	<i>“These people use too much teaching time for their, teachers get qualifications before enrolling for work ”</i> <i>“They don’t give us transport money to attend workshops... sometimes I will be broke...”</i> <i>“Even when you attain your extra professional qualifications, these people don’t give you anything...except refunding the expenses.... ”</i>
	In service professional development not existing	Not talked about Not existing	<i>“Don’t know about it. No one talks about professional development”....</i> <i>“Everyone thinks he knows better so I have never heard about it.”</i>

			<i>"You just go to your class and teach what you know."</i>
	Workshops and intervention program attendances advised by the C.A	C.A communicates to the teacher directly No emphasis on workshops and interventions	<i>"For me, as a teacher, the C.A communicates directly to me." "These people do not emphasize this, they say that learners will be left without teachers." "Workshops finish teaching time a lot, but they do them after"</i>
	Teaching resources sourced by the teachers	Teacher sources teaching resources Teacher advises on rightful material for school to buy Teacher selects material of choice	<i>"No, these people go to the teacher and ask the kind of books he/she wants to use....." "They don't know which resources to use so the teacher chooses a material and give them the list to buy." "The teacher selects he is the subject specialist".</i>

- Less support

The majority of the IL indicated that promotion of school-wide professional development has less support. It was further indicated that IL in schools complains of teachers using teaching time for their own studies at the expense of learners' learning time. One instruction leader had this to say *"These people use too much teaching time for their, teachers get qualifications before enrolling for work"*. Quite a number of IL indicated that teachers attend workshops to his expense and the reward for obtaining extra qualification is not that valuable. One teacher interviewed said *"They don't give us transport money to attend workshops... sometimes I will be broke..."*

- Nonexistence of in-service professional development

Most of the interviewees indicated that in-service professional development doesn't exist in the sampled schools. It was further indicated that no one talked about it in the schools. One SMT member had this to say *"Everyone thinks he knows better so I have never heard about it."*

- Workshops and intervention program attendances

Most of the IL indicated that workshops and intervention program attendances were advised and emphasized by the C.A but school-based leadership complain of teachers wasting teaching time attending workshops. One H.O.D had this to say "*Workshops finish teaching time a lot, but they should do them outside teaching time always*".

- Teaching resources sourced by the teachers

Most IL indicated that professional teaching resources are sourced from the teachers themselves. It was further revealed that IL doesn't have much knowledge about professional resources for mathematics teaching hence they relay with the teacher. One SMT member had to say this "*They don't know which resources to use so the teacher chooses the material and give them the list to buy.*"

6.3 SUMMARY

This chapter gave an outline of results from an enquiry by identifying themes, codes and common quotes representing participants' perceptions of the existence and use of instructional leadership practices in the sampled secondary schools. The next chapter will present a summary of major findings, conclusions and recommendations from this mixed methods study.

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CHAPTER 7: SUMMARY OF MAJOR FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

7.1 INTRODUCTION

In this chapter, a summary of major findings, conclusions regarding the research aim and research objectives were presented. Some recommendations drawn from the research finding are presented. Firstly, major findings from the exploration and enquiry on the three main instructional leadership (IL) practices: defining the school mission, managing the instructional programme and promoting a positive learning environment were presented. Secondly, conclusions to both the exploration and the enquiry were drawn from the findings and presented. Thirdly some recommendations were made based on the findings and conclusions.

7.2 MAJOR FINDINGS

Chapter 3 described a body of knowledge regarding the theory of instructional leadership. Quite a number of theories were addressed but this study was based on the Hallinger (2009) model which essentially emphasizes the importance of three fundamental instructional leadership functions: defining and communicating goals, managing the instructional programme and promoting positive school learning. In the process of addressing the research objectives, the researcher explored the extent to which IL embraces the instructional leadership practices in schools based on the Hallinger (2009) theory of instructional leadership.

7.2.1 Defining the School's Mission

Three theoretical practices were used to find out to what extent do IL define the school goals. The three theoretical practices were determining the central purpose of the school, work with staff to develop goals and communicate goals. Analysis results from quantitative research gave an indication that most instructional leaders were not sure if this was happening and many were quite sure that these practices did not exist in the schools even though there were some IL who ascertained that such practices existed in the schools.

Further enquiry in qualitative research showed that limited goals were set in the schools and it's done by the SMT, the H.O.Ds and the principal. It was further indicated, from this enquiry, that mainly curriculum coverage goals are set out by these IL without working with all the staff

to develop this, a deviation from recent models which recognise the need for shared IL practices (Valliamah et al, 2016). The curriculum coverage targets are in the form of work schedules but performance targets don't exist yet according to the goal-setting theory, setting specifically defined, difficult and challenging goals will motivate individuals to increase performance (Lunenburg, 2011). In that regard improving learner performance in mathematics can be difficult. In addition, it appeared from this enquiry that the only learner performance policy that was being remembered is the Learner promotion policy. This shaded more light that for the few goals that are set, the staff is not consulted and no much emphasis is done on implementation hence the overall school mission is at stake.

7.2.2 Managing the Instructional Programme

From the exploration, there were some indications that not much of the sub-dimensions of this practice were embraced by the IL to fully manage the instructional programme. The exploration was characterized by too many respondents either not knowing or disagreeing with the facts that IL coordinate and control instruction and curriculum, have expertise in teaching and learning and that IL deeply involve themselves in the school instructional programme. Those on the agreeing part were very few. In essence, based on the statistics from quantitative analysis it can be said that IL's practices in managing the instructional program are not done according to the Hallinger (2009) model in most of the schools.

It was revealed from the enquiry (qualitative analysis) that although there were some practices that IL saw as not being practised like failing to work with mathematics teachers as a team towards learner achievement, there are some practices which they saw as being embraced by the IL. It was further revealed that the principal do much of the management of the instructional programme without involving the practitioners of instruction which is a deviation from the yet the principle of shared instructional leadership models emphasises a collaborative IL, who personally engage themselves in instruction and dialogue (Boston et al, 2016)

7.2.3 Promoting a positive learning environment

It was established from theoretical perspectives (chapter 3) that promoting a positive learning environment can be achieved through practising the following; creating academic press, modelling values, developing a culture of continuous improvement, and high visibility of IL. It

was established from respondents' perceptions that IL from the sampled schools, develops a culture of continuous improvement, are highly visible in the schools and do model values, therefore, promotion of a positive learning environment is a practice that is embraced by the IL in the sampled schools although creation of academic press was not revealed to exist in the schools. Analysis results from qualitative research established that although it was revealed in quantitative research (chapter 5), that IL does promote a positive learning environment, there were still some shortfalls in that practice and the following were the shortfalls; less support because of IL who complain of teaching time which is wasted when teachers attend to their own studies, workshops and seminars.

Furthermore, it was revealed that in-service professional development does not exist anymore and that it is mainly curriculum advisors who encourage teachers to attend this and provide some of the professional resources that teachers and learners need otherwise the teacher have to source the resources on their own. According to Darling-Hammond et al. 2009; Matthews, Moorman, and Nusche 2007 in Ng et al, 2015, the principal must create necessary and sufficient conditions to build pedagogical capacity, increase innovative opportunities and provide resources for instructional improvement which according to the findings of the study, this is not happening in the schools. Further, IL should foster teacher professional development, networking, continued training and education because this, according to Setwong and Prasertcharoensuk, 2013, has the highest total effect on the school effectiveness

7.3 LEARNER PERFORMANCE

Exploration of learner performance revealed that quite a large number of learners were said to have performed below achievement (level 2) in mathematics. Most learners were said to be at a mediocre level of performance (Level 3-5). If IL effectively engage in almost all aspects of instructional leadership (Ng et al, 2015), the school become successful in terms of mathematics achievements. It is therefore important to note that instructional leaders in the sampled schools do not effectively practice all aspects of IL and therefore it is not surprising to see such performance of learners.

7.4 INSTRUCTIONAL LEADERSHIP AND LEARNER PERFORMANCE

Findings from CFA analysis (in a quantitative analysis) revealed that most of the finally extracted factors (Appendix F: Table 5.4.6) were associated with managing the instructional programme and promoting a positive learning environment with some slight deviations. This was in agreement with the results from descriptive statistics and qualitative results that IL in the sampled schools seemed to embrace these two main instructional leadership practices based on the responses from the questionnaires and the interviews. Performance indicators (Items10ym, 11ym, 12ym, c2 and c3) were modelled neither in the measurement model nor SEM because loading them could drop factor loadings to zero hence such indicators were excluded from the models.

A closer look at the extracted factors was done in Appendix E: Tables 5.4.6, structural equation model one (SEM1) and it was shown that there were some correlations among extracted latent factors, the correlations between X1 and X2, X2 and X3, X3 and X4 being .35, .36 and .39 respectively. Coordinating and controlling instruction and curriculum (X1) correlated positively with meeting instructional targets (X2), meeting instructional targets (X2) correlates positively with developing a culture of continuous improvement (X3). In addition, developing a culture of continuous improvement (X3) positively correlates with determining the central purpose of school and develop goals (X4). This was an indication that these instructional leadership practices do not operate in isolation, but interdepend on each other. This pattern was not seen in models SEM2 and SEM3. Although correlations among latent variables existed, the correlations were very weak. This exhibited the idea that the latent factors involved in these two models were less likely depend on each other.

7.5 MAJOR FINDINGS REGARDING THE FOUR OBJECTIVES

The aim of this study was to explore the use of instructional leadership (IL) in the management and leadership of mathematics teaching and learning in promoting and enhancing mathematics learner performance in NMM district in the North West province in South Africa. In an attempt to answer this aim, the following objectives were formulated:

- i. To examine how IL practices, promote the management, teaching and learning of Mathematics in secondary schools in NMM district of NWP;
- ii. To establish how IL in the management of mathematics education in secondary schools contributes to improved learner performance;
- iii. To determine to what extent does mathematics performance of learners in secondary schools depend on IL practices;
- iv. To establish whether IL in the management of mathematics learning can be used as a benchmark to mathematics learner performance in secondary schools in the NMM district of the NWP.

A discussion of the major findings regarding the four sub-aims (objectives i-iv) will be done individually in this section.

7.5.1 How IL practices promote the management, teaching and learning of maths

Major findings from the exploration and the enquiry revealed that IL from the sampled schools engages in some of the IL practices leaving out some practices that are believed to be fundamental to the researchers. Ng *et al*, 2015, reiterate that IL should effectively engage in almost all aspects of IL for the school to succeed in mathematics achievements. If all aspects of leadership are engaged, the core business of teaching and learning in the school will be executed and this according to Robinson *et al*, 2008, has a greater influence on student outcomes. So it can be deduced that IL practices positively promote successive teaching and learning of mathematics.

7.5.2 How IL contributes to improved learner performance

As discussed in 7.4.1, if IL effectively engages in all aspects of IL the mathematics achievements would improve. The practices themselves do not directly influence achievement but the practices that would be done as a result of effective leadership practices.

7.5.3 Extent to which maths performance of learners depend on IL practices

Melissa (2016), cited quite a number of research findings (Stein et al. 2009, Boaler & Staples, 2008; Stigler & Hiebert, 2004) which associate effective IL practices with high achievement. Jita (2010) reiterates that it is the way instructional leadership practices are conducted that matters most in impacting on the success of the school and of learner achievement. From this literature, it can be deduced that the extent of dependence of learner performance on IL practices is also dependent on how the IL practices are engaged.

7.5.4 Whether IL practices can be used as a benchmark to performance.

From the body of literature gathered in chapters 2 and 3, it was learnt that mathematics learner achievement is dependent on a spectrum of factors. Teacher attitudes, teacher pedagogical proficiency levels, learner attitudes, learner commitment towards mathematics learning, attitudes of instructional leaders towards mathematics teaching and the list of factors goes on. So, it is quite clear that we cannot use IL in the management of mathematics learning a benchmark to mathematics learner performance even though the majority of the factors are dependent of the way instructional leadership practices are executed.

7.6 CONCLUSIONS

It was concluded from the study that quite a number of key instructional leadership practices are missing the action from the sampled secondary school hence improved learner outcomes in mathematics is hindered. Instructional leadership practices are not fully engaged and those which are adopted, they are not effectively adopted in the secondary schools in Ngaka Modiri Molema (NMM) district of Mafikeng in the North West Province in South Africa. A mediocre level of adoption of instructional leadership practices resulting in a mediocre level of mathematics learner performance in the district, hence it can be concluded that if learner performance is to effectively improve then there should be effective implementation of instructional leadership practices. From this study, the researcher's main conclusion is that unless and until the relationship between a sound instructional leadership and the extent to which the mathematics educators and learners are encouraged to be focused is upheld, performance standards in mathematics will remain a cause for concern for South Africa.

7.7 RECOMMENDATIONS

Improve teacher pedagogical proficiency levels by introducing a sound teacher education programme through re-opening of teachers' colleges. The department must rejuvenate the teaching profession by improving remuneration to the classroom practitioners to curtail the mathematics teacher brain drain. Change learner attitude towards mathematics by giving them more career-oriented workshops. Instructional leaders must fully engage effective instructional leadership practices so that significant improvement in mathematics achievement can be realised in South African schools. Further studies need be done involving large sample sizes over a longer period of observation time so that more information can be gathered.

8. REFERENCES

- Alberta Education. 2009. Principal quality practice guideline: Promoting successful school leadership in Alberta. <http://files.eric.ed.gov/fulltext/ED506090.pdf>.
- Alig-Mielcarek, J.M. 2003. A Model of School Success: Instructional Leadership, Academic Press, and Student Achievement. Ohio State University (Dissertation - DPhil).
- Alig-Mielcarek, J.M. & Hoy, W.K. 2005. Educational Leadership and Reform, 29 - 51. Information Age Publishing.
- Al-Mahdy, Y. F.H. & Al-kiyumi, A.R. 2015. Teachers' Perceptions of Principals' Instructional Leadership in Omani Schools. *American Journal of Educational Research*. 2015; 3(12):1504-1510. doi: 10.12691/education-3-12-4.
- Asmal, R. & James, W., 2001. Education and democracy in South Africa today. *Daedalus*, 130 (1):185-204.
- ASSAF report, 2010. Critical Issues in School Mathematics and Science: Pathways to Progress. University of Pretoria. ISBN: 978-0-9869835-1-1.
- Baker, T.L. 1994. *Doing Social Research* (2nd Edn.), New York: McGraw-Hill Inc.
- Bansilal, S. 2015. A Rasch analysis of a Grade 12 test written by mathematics teachers. *S Afr J Sci*. 2015;111(5/6), Art. #2014-0098, 9 pages. <http://dx.doi.org/10.17159/sajs.2015/20140098>.
- Bernard, H. R. 2002. *Research methods in anthropology: Qualitative and quantitative approaches* (3rd ed.). Walnut Creek, CA: Alta Mira Press.
- Boston, M. D., Henrick E.C., Gibbons, L.K., Berebitsky D & Colby G.T., 2016. Investigating How to Support Principals as Instructional Leaders in Mathematics. *Journal of Research on Leadership Education* 1–32 © The University Council for Educational Administration 2016.
- Braun, V. & Clarke V. 2006. Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3: 77-101.
- Bush, T., Joubert, R., Kiggundu, E & Van Rooyen, J. 2009. Managing teaching and learning in South African Schools. *International Journal of Educational Development*, 30 (2010) 162–168.
- Cochran, W. G., 1977. *Sampling techniques*.
- Creswell, J. W., & Plano Clark, V. L., 2011. *Designing and Conducting mixed method research* (2nd ed.). Thousand Oaks, CA: Sage.