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**ATTRIBUTES TO POOR RESULTS PERFORMANCE IN MATHEMATICS BY
KWAZULU- NATAL DEPARTMENT OF EDUCATION**

By

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i.

DECLARATION



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I Reginald Dumisani Cele declare that:

- (i) The research reported in this dissertation, except where otherwise indicated, is my original research.
- (ii) This dissertation has not been submitted for any degree or examination at any other university.
- (iii) This dissertation does not contain other person's data, pictures, graphs, or other information, unless specifically acknowledged as being sourced from other persons.
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Date: 17/11/2016

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ABSTRACT

The learner poor performance results in mathematics in schools are haunting everybody involved within the department of education in South Africa. Nationally there is a crisis for the deficit of mathematics skills needed in careers involving engineering, technology, medicine, and in education. Most programs that are in operation, in dealing with the crisis seem not to be adequate. No matter how good programs might be, but if there is a missing link, they will not be successful. In-depth research that focuses in digging deep to where the tyre hits the road i.e. challenges faced by educators in the classroom situation; curriculum management and support; and competency of educators involved in teaching Mathematics, might address the crisis that is haunting all the stakeholders. Thus providing the framework, that serves as a guide towards improving mathematics performance in KwaZulu-Natal department of education schools. In this study quantitative approach was adopted since it is more informative, logical and tends to use survey methods, which provide a measure of what participants think thus providing the possibility of summarising characteristics across groups or relationships. A survey was conducted from one-hundred and twenty participants selected from forty schools at ILembe district with one-hundred and twenty six schools in total. Survey research normally uses scientific sampling and questionnaire design to measure characteristics of the population with statistical accuracy. A questionnaire was used as a primary tool to collect data. There was a 92% response rate registered. The study revealed the following: that Mathematics is taught by unqualified and under qualified educators in high schools. They are challenged on content knowledge. This was revealed by the 62% of educators who were uncomfortable to teach Mathematics from grade 10 to 12; Curriculum management and support is poorly administered in schools hence it needs to be intensified; lack of parental support towards improving learner performance; and lastly, there are a number of unattended factors affecting the effective teaching and learning of Mathematics in class. All the stakeholders involved at a district level need to review refined their operations towards achieving better results. Programs in place are not landing on a fertile soil as a result they become fruitless expenditures. The study will benefit all stakeholders involved provided there is only one vision shared.

TABLE OF CONTENTS

Description	Page
Title Page	i
Declaration	ii
Acknowledgements	iii
Abstract	iv
Table of Contents	v
List of Figures	viii
List of Tables	ix

CHAPTER 1 - INTRODUCTION AND STUDY OUTLINE

Description	Page
1.1 Introduction	1
1.2 Motivation for the study	1
1.3 Background to the study	2
1.4 Focus of the Study	3
1.5 Problem statement	3
1.6 Objectives of the study	4
1.7 Research question	4
1.8 Dissertation structure	4
1.9 Limitations to the study	6
1.11 Conclusion	6

CHAPTER 2 -LITERATURE REVIEW

2.1 Introduction	7
2.2 Literature review	8
2.3 Educators attrition as contributory factor to the scarcity of Mathematics educators.	16

Description	Page
2.4 Mathematics educators' competency	18
2.5 Curriculum Management and Delivery strategy	21
2.6 Enrolment figures for Mathematics	25
2.7 Conclusion	27
CHAPTER 3 - RESEARCH METHODOLOGY	
3.1 Introduction	28
3.2 Aims and Objectives of the Research	28
3.3 Participants and Location of the study	29
3.4 Strategies of data collection	30
3.5 Research Design and Methodology	31
3.6 Conclusion	37
CHAPTER 4 – DATA PRESENTATION	
4.1 Introduction	38
4.2 The Sample Size	38
4.3 The Research Instrument	38
4.4 Participants' Data Description	39
4.5 Summary	50
CHAPTER 5 – DISCUSSION OF RESULTS	
5.1 Introduction	51
5.2 Participants' Data Description	51
5.2 Conclusion	65
CHAPTER 6 - RECOMMENDATIONS AND CONCLUSIONS	
6.1 Introduction	66
6.2 Were the objectives answered?	66

Description	Page
6.3 Research implications	72
6.4 Recommendations to solve the research problem	74
6.5 Recommendation for future studies	75
6.7 Conclusion	76
References	77
Appendix 1 Questionnaire	87
Appendix 2 Ethical Clearance	90

LIST OF FIGURES

Number	Description	Page
2.1	Mathematical Knowledge for Teaching model	19
2.2	KZN DoE Roles and Responsibilities of role players within the system	22
2.3	Conceptual Framework model	24
3.1	Research operation map	31
3.2	Methodology summary	33
3.3	Qualitative analytics	36
4.1	Meeting periods of educators for planning, curriculum discussions & Teaching approaches	41
4.2 & 4.3	Educators' levels of opinions on statements provided	45
4.4	Educators' highest qualification in Mathematics	46
4.5	Composition of qualifications	46
4.6 & 4.7	Educators' views on challenges in teaching and learning of Maths	49

LIST OF TABLES

Number	Description	Page
1.1	Mathematics performance in KZN Districts	2
1.2	Composition of high schools within local municipalities	3
2.1	Attrition rate per of 4%, 4.5%, & 5% for qualified educators needed in replacement of educators that have exited the system	16
2.2	Statistics for Foreign educators in DoE system	18
2.3	Unqualified and under-qualified educators per province& REQV as at the end of 2011	20
2.4	Mathematics enrolment figures	25
2.5	Comparing gr12 Maths enrolment and gr12 examination entrances	26
4.1	Educators' time spent on curriculum activities outside school hours	40
4.2	Educators' confidence levels in different sections of mathematics	42
4.3	Educators' degree of opinions on statements provided	44
4.4	Educators' views on challenges in teaching and learning of mathematics	47

CHAPTER 1

INTRODUCTION AND STUDY OUTLINE

1.1 Introduction

The poor performance of learners in Mathematics has created a national crisis. Hobden (2012) alluded to the fact that Mathematics is in reality everybody's problem. According to The Association for Mathematics Education of South Africa (AMESA) (2013), Mathematics has been, and will continue to be the focus of concern in South Africa and throughout the world. AMESA shared the same sentiment as Hobden. The report, according to the World Economic Forum (WEF) (2013), highlighted that South Africa's Mathematics and Science education ranked second last in the world, echoed by the Trends in International Mathematics and Science Study (TIMSS) (2011), which showed in their results that South African learners have the lowest performance compared to 21 middle-income countries that have participated in their event. There have been a number of efforts in trying to remedy the situation. Mudaly (2013) shared the same concern when highlighting that, despite the efforts of various stakeholders, there are no signs of achieving the results that are expected. There is a need therefore to survey closely in schools, factors that contribute towards poor performance results, so that efforts will be directed exactly to where needed, and hopefully this will make a difference.

1.2 Motivation for a Study

A remedy to poor performance results of Mathematics has become a nightmare to all principals of schools in KwaZulu-Natal. Their stresses are aggravated by the pressure that the district management is putting on them; with the performances targets to be reached on the results for their schools. The district management on the same token has their own targets set by the provincial management, which is also under pressure of the targets set for them by national department of education. The target-oriented kind of scenarios has frustrated everybody within the Department of Education.

The facts remain that by improving Mathematics results, the overall results will improve drastically.

According to the research note 16 (2010), in order to improve mathematics in low performing schools, a broad range of factors should be addressed systematically by educators. Among these factors are effective pedagogy, coherent curriculum, intensification strategy, deeper educator Mathematics knowledge, positive social factors and supportive organizational structures. It is hoped, therefore, that this study will provide the framework that will be informative in leading the way towards improvement of Mathematics results in schools.

1.3 Background to the study

The study was located in KwaZulu-Natal (KZN) province, composed of 12 districts. The focus was ILembe district. According to 2011 census, the majority (82%) of ILembe district, with the population of 606,809 speak isiZulu. Table 1.1 shows the performance in Mathematics in KZN department of education districts.

Table 1.1 Mathematics performance in KZN Districts.

Number	District	Mathematics	
		No. wrote	% achieved
1.	Amajuba	3675	44.8
2.	ILembe	4422	25.9
3.	Pinetown	7579	50.0
4.	Sisonke	2646	34.6
5.	UGu	4152	43.0
6.	UMgungundlovu	5388	48.8
7.	UMkhanyakude	5322	37.4
8.	Umlazi	11065	48.8
9.	UMzinyathi	4812	32.2
10.	UThukela	4363	43.1
11.	UThungulu	9234	33.9
12.	Zululand	8976	37.1

1.4 Focus of the study

The main center of attention of the study as alluded earlier on, was ILembe district. It is located towards the north of eThekweni metropolitan area and south of uThungulu district municipality. The district starts at about 75km north of eThekweni metro boundary and stretches about 25km beyond the mouth of Tugela River. ILembe district is made up of 4 local municipalities as illustrated in Table 1.2:

Table 1.2 Composition of high schools within local municipalities

Number	Local Municipality	Number of High Schools
1.	KwaDukuza	20
2.	Mandeni	21
3.	Maphumulo	43
4.	Ndwedwe	42
Total		126

1.5 Problem statement

Bansilal (2012) reported that the results of the Southern and Eastern Africa Consortium for Monitoring Educational Quality (SAQMEQ) tests that are administered to students in 15 African countries indicate that South African Grade 6 students performed poorly in Mathematics when compared to students from poorer countries such as Botswana and Zimbabwe. It is a concern that the scenario where learners are scoring low marks or performing poorly in Mathematics, has never changed since van der Berg and Low's findings (of South African students scoring very low levels in Mathematics as compared African countries' students) in 2006, instead the situation has become worse.

The focuses for most researchers seem to be the outcomes versus the state under which those results are obtained. There is a lack of pre-dominantly rural school focused research biased on attributes as elaborated by implementers, including the support system and its efficiency.

Hence, this research is expected to complement the over-sight by most researchers. Therefore, there is a need for more research towards learner poor performance in Mathematics, especially in identifying barriers and progress in Mathematics teaching, as experienced by educators themselves. There is a need for all stakeholders to identify key learning targets relating to learner barriers hindering good performance in Mathematics, thereafter devising suitable intervention activities that will lead to the attainment of good results.

1.6 Objectives of the study

- To establish an assessment on the availability of Mathematics educators
- To measure and examine competency of Mathematics educators
- Evaluating mathematics curriculum management and support
- Analyses of barriers in the effective teaching and learning of Mathematics

1.7 Research Questions

The research questions were formulated from the objectives of the study stipulated in Section 1.6.

- Is our Education system producing enough Mathematics educators?
- What are underlying factors contributing to the lack of content knowledge to our Mathematics educators?
- What are fundamental factors that are challenging curriculum management and support?
- Are there any barriers affecting effective teaching and learning of Mathematics in schools?

1.8 Dissertation structure

There are six main chapters structuring the dissertation as the following indicates:

Chapter 1: This chapter introduces the study. It further gives the background of the study, problem statement, objectives of the study, research questions, brief research methodology and limitations to the study.

Chapter 2: This chapter focuses to the literature review on the following: Assessment on the availability of Mathematics educators, Assessment on competency of Mathematics educators, Evaluating Mathematics curriculum management and support, as well as on Analyses of barriers in the effective teaching and learning of Mathematics.

Chapter 3: This chapter discusses the Research methodology and design. It further discusses the following aspects: research aims and objectives, participants and location of the study, data collection strategies, pre-testing and validation, and data analysis.

Chapter 4: Presented in this chapter, are the findings of the study. The primary tool from which findings are extracted is the questionnaire. Furthermore, the presentation looks into aspects such as sample size, reliability of the instrument and participants' data description according to the objectives of the study.

Chapter 5: Entailed in this chapter are the discussions, interpretations, and explanations of the research findings. This was done in conjunction with literature review that was presented, and again in line with the objectives of the research.

Chapter 6: The final chapter in this section presents study recommendations and conclusions.

It seeks to discover whether the research problem has been solved, discuss implications of the study, recommendations to solve the research problem as well as making recommendations for future studies and limitations to the study.

1.9 Limitations to the study

Vast geographical challenge of ILembe district and availability of resources had an effect on information accessing. Only 40 schools participated during the study, taking 10 schools in each of four circuits and most of these schools are from deep rural areas, which dominate the district. Dominating the study, are the schools that are servicing the black African communities in disadvantaged areas.

1.10 Conclusion

The state of Mathematics education in South Africa stresses the Department of Education and stakeholders in the country because it is a key subject for the economic development of the country (Phakeng, 2015). Professor of Mathematics Phakeng as well as Unisa's Vice Principal of Research and Innovation (2015), went on to say that the quality and quantity of learners of Mathematics and sciences, expected to be the next generation need to be increased. According to Ramaila, (2014), poor mathematics education in South Africa have resulted into sluggish economic growth due to the lack of critical skills. A lack of well-structured, long-term teacher professional development programs, as well as a lack of a coherent incentive scheme to retain skilled and committed teachers, contribute to the poor quality of mathematics and science education in South Africa, (Ramaila, 2014). In order to fight poor performance in Mathematics there is a need for further research in schools so that a wide range of information and resources will be drawn to support schools and in identifying Mathematics difficulties which can inhibit learners' progress. The resources need to be informative on planning and intervention strategies to support learners to overcome their difficulties in the teaching and learning of Mathematics.

CHAPTER 2

LITERATURE REVIEW

2. 1 INTRODUCTION

Mathematics results have posed a serious threat, which shows that there is a challenge in the teaching and learning of this subject in our schools. The crisis which is being signaled by the results seem to be across the board in Further Education and Training (FET) band, as well as in General Education and Training (GET) band. This challenge appears to be escalating each year. AMESA (2013) shared the same sentiment when they pronounced that Mathematics has been and will continue to be the focus of concern in South Africa and throughout the world. Mudaly (2013) shared the same concern when highlighting that despite the efforts of various stakeholders, there are no signs of achieving the results that are expected. According to Salisas (2016) report on Monterey Herald, the shortage of teachers in California was getting worse. This has resulted into a local school district to offer \$10,000 signing bonus for its Mathematics teachers. Mathematics educators are canvassed through signing on fees just like in football, this is a scary situation. Furthermore, Oriere (2016), alluded to Abuja crisis, whereby Professor Solarin who is the Director-General and Chief Executive Officer for National Mathematics Centre complaining about the shortage of Mathematics and Science teachers at different levels of education in Nigeria. Professor Solarin further announces an urgent international symposium on ‘Current trends in Mathematical science and applications’, as an endeavor to deal with the crisis. He further implicated the death of teachers as contributing to the crisis and poor performance of students in mathematics. The issue of insufficient supply of Mathematics educators was further highlighted by Sani (2016), of Plymouth University when he sensitized about limited supply of Mathematics educators versus the demand. He further acknowledges that there are very few Mathematics educators available, in such a way that the situation has led the United Kingdom government to review their current plan so that instructions are improved in the Teacher Subject Specialism Training (TSST) program. Seemingly, if the school-based research is not conducted, the challenges will remain unresolved.

These challenges leave much to be desired about: the quality of our education system, the quality of Mathematics educators produced by the system, and conditions under which the teaching and learning takes place in our schools. The main question that follows is whether the Department of Education is doing enough to address these challenges or strategies and efforts are misdirected, hence this study is hoped to bridge that gap. The worst alarming scenario for an urgent intervention was that of the Annual National Assessment (ANA) results which registered a pass rate of 14.4% for grade 9 in KwaZulu-Natal province. This leaves much to be desired about the background that mathematics learners receive in the GET band. The education curriculum monitoring body Umalusi council chairperson Prof Volmink (2014), on the press conference statement (14 December 2014), revealed the dimension that there were context major changes that have been effected in Mathematics, by the inclusion of Euclidean Geometry and Probability. He further agreed that the curriculum would prove a challenge to most pupils. On the same token, the challenge could prove to be a mammoth task to educators who are also struggling to teach these sub-topics or sections (Euclidean geometry and probability). They are struggling since these are new topics, which were not covered in their modules of their studies.

2.2 LITERATURE REVIEW

The literature review will examine through, investigating and unpacking factors that attribute to poor performance of Mathematics at KZN DoE focusing at ILembe district. The study was further directed to the following secondary objectives:

- Assessment on the availability of Mathematics educators
- Assessment on competency of Mathematics educators
- Evaluating Mathematics curriculum management and support
- Analyses of barriers in the effective teaching and learning of Mathematics

It is be hoped the results will assist in providing ideal practices for the stakeholders involved in order to overcome poor performances in Mathematics. Thus providing the framework on which the Department of Education management needs to refer to, for the benefit of improving the education system in our province.

2.2.1 Assessment on the availability of Mathematics educators

Retention of qualified Mathematics educators in rural and poor schools is a problem since such conditions remain a disadvantage in attracting quality teachers (Magano, 2014). The research will unpack and reveal the situation that is faced by ILembe district; concerning the instability that is brought about by educators leaving disadvantaged schools after a short period of appointment to the post, leading to Mathematics educator-searching struggle. It takes more than two months to find other Mathematics educators; sometimes the replacement is a foreign national or merely a grade 12 certified person with Mathematics. Sometimes the replacement is an engineering-qualified person without teaching skills, but who will be utilized simply because there is Mathematics on his or her qualification, irrespective of the relevancy of Mathematics on the qualification to the DoE curriculum. According to Smithers and Robinson, (2013), the shortage of Mathematics and Science educators in the United Kingdom specifically in England, was because of too low graduate production in these subjects. Furthermore, Sani (2016) cited the findings from Ofsted (2012), that in the United Kingdom there was a serious shortage of mathematics specialists' educators in schools and colleges, and this was impacting negatively on learners' learning experiences.

Mji and Makgato (2006) further highlighted another version of the crisis that outdated teaching practices and lack of basic content knowledge have resulted in poor teaching standards. A large number of under-qualified or unqualified teachers who teach in overcrowded and non-equipped classrooms has also exacerbated the poor standards. The poor teaching standards might again be as a result of the Department of Education closing down the in-service centers. According to the KZN DoE service delivery charter, (2012), the service center it's where educators used to gather during school vacations or week-ends to receive refresher courses or empowerment with respect to their subject areas, thus becoming capacitated. Magano (2014) further emphasized that inappropriately qualified teachers imply a shortage of educators in the subject. Shortage therefore should not lead to a function of filling a post-establishment with educators but rather determining whether those teaching the subject are adequately trained and supported to offer the subject (Magano 2014).

Teacher shortage in the education system in South Africa as it currently occurs may be the result of increased demand emanating from reduced supply (DoE, 2006) but also the result of continued growth in learner numbers (Magano 2014). The shortage in mathematics is even worse.

According to News24 (2015), Basic Education Minister Angie Motshekga confirmed this disaster that, one in four schools around the country does not offer Mathematics for Grades 10 to 12, for the simple reason that Mathematics educators are scarce. The studies have revealed that the current supply of educators is not adequate to replace teachers who are leaving the system (Arends & Phurutse, 2009; Cosser, 2009; Diko & Letseka, 2009), as cited by (Magano 2014).

2.2.2 Assessment on competency of mathematics educators

According to The Education For All (EFA) 2000 assessment's (2005) report cited by Makgato (2006), alluded to the fact that in spite of approximately 85 percent of Mathematics educators being professionally qualified only 50 percent have specialized in Mathematics in their training. The 50 percent who have specialized in Mathematics are not willing to teach in deep rural or rural communities. They normally got posts in these rural areas and then after two or three months, re-position themselves in urban areas, as shortage of Mathematics educators is prevalent everywhere including urban areas. Hence, disadvantaged communities like Ndwedwe and Maphumulo at ILembe district are left without competent Mathematics educators.

Rebora (2012) reported that Simons, the CEO of Renaissance Technologies and great mathematicians in New York, while in Teaching and Learning Conference highlighted that the number of qualified Mathematics teachers is too limited. The limited number of such educators contributes negatively to the performance outcome in Mathematics.

Sharing the same sentiment is Pia (2015) findings, in which he highlighted that the main major problems of Mathematics in secondary levels were the lack of subject trained, qualified educators in Bangladesh. The Department of Education (DoE) (2001a) cited by Makgato (2006), estimated that 8000 Mathematics educators needed in-service training to address their shortcomings in the subject.

Learners with poor results in Mathematics at their exit point further illustrate the competency of educators, which is grade. The poor results or under-performance is partly indicative of educators not being adequately trained and resourced to support their teaching and learning that takes place in a classroom situation. Magano (2014) emphasizes that poor performance in Mathematics will exist as long as teachers who are unqualified or under-qualified teach this subject.

The South African Institute of Race Relations (SAIRR) representative Frank Nxumalo (2013) reported that only 20 percent of pupils writing matric Mathematics examinations achieve a pass mark of more than 50 percent. The situation is self-explanatory in terms of alerting the system about the challenge that needs to be addressed immediately.

If only 20 percent of learners writing grade 12 Mathematics, achieve a pass of more than 50 percent that sends a message about the Quality of educators in a system; learners' Mathematical background; resources to be utilized; and many other aspects incurred in a line functioning system.

Sally Hobden (2013) in her paper indicated that many students entered with extremely limited Mathematical proficiency and a crippling lack of confidence and disposition to learn the subject. Seemingly, all researchers are reporting about Mathematics learners who are found wanting, with limited or poor Mathematics background. Competency of educators is challenged as well as all the stakeholders and systems involved in producing the desired results.

Bansilal, et al (2010), indicated that Moodley (2008) conducted a study on learners' attitudes and beliefs about Mathematics with a sample of 32 Grade 11 Mathematics learners. Most of the learners in her study indicated that their Mathematics teachers displayed a negative attitude towards them.

For example, 91% of her sample indicated that the teacher ignored them when they asked questions and 93% indicated that the teacher made them feel silly when they asked questions in the Mathematics class. It is possible that the responses of the educator to learners asking these questions are that the educator is engaging defense mechanism strategy. The educator, himself or herself, might be in a dilemma of being challenged by the content itself, and running out of ideas to help learners.

According to Mji & Makgato (2006), problems of under-qualified teachers as well as too few students taking Mathematics subject, has resulted in a number of initiatives and programs that have been developed at national and provincial levels, as well as by higher education institutions. From the government side, a typical example is the setting up of Dinaledi schools, which are to be increased to about 400. The Dinaledi Focus Schools Project as cited by Mji & Makgato (2006) is described as part of the National Strategy for Science, Mathematics and Technology. It is aimed to increase the number of learners studying Mathematics and Physical Science in Grades 10 –12. Furthermore to increase the number of higher grade learners in these subjects — especially girls and formerly disadvantaged learners; increase the pass rate and achievement in Mathematics and science in these grades; to develop the capacity of Mathematics and Physical Science teachers (Western Cape Department of Education, 2005), as cited by (Mji & Makgato 2006). There are other projects as well that are an initiative to address the competency of Mathematics educators as well as to inculcate a love for the subject to the learners. Projects like Funza Lushaka bursary fund is funding students who wants to pursue teaching carrier. After completing their degrees, students are placed in schools that are without Mathematics educators, especially in challenged communities. Another project will be the CASME, which is a non-profit education development organization. CASME advances the teaching and learning of Mathematics and Physical Science. They assist educators and learners to different approaches in Mathematical-problem solving skills.

2.2.3 Evaluating Mathematics curriculum management and support

The curriculum management in the context of mathematics paper by Ponte (2009) cited by France (2010), highlights a number of gaps in curriculum management that researchers need to research about. Few questions that highlighted the grey areas were: “How teacher’s practices and curriculum management influence students’ learning of mathematics? What conditions are necessary at schools, and more widely in the social context, so that this kind of collective curriculum management takes place, very much in line with current curriculum orientations?” (France 2010).

According to The KZN DoE Curriculum Management Delivery Strategy (2014), the district intervention team's report as well as KZN education MEC oversight visits report, indicate that the monitoring of curriculum delivery in the province lacks common and effective strategy. The document highlights four core curriculum elements that need to be managed and supported, namely: teaching, learning, assessment and resources. In addition to the four curriculum elements there are six curriculum management elements outlined by the same document, these elements are referred to by the document as a guide.

According to KZN DoE Curriculum Management Strategy (2014), curriculum management and support involves the following:

- Supervising the curriculum that is being taught at the classroom level.
- Monitoring and evaluating the curriculum implementation in schools.
- Providing support services and resources to teachers
- Providing skills development training through in-service education and training for teachers
- Developing exemplars and demonstration programs of quality learning activities
- Quality assuring the assessment for learning and assessment for learning

Explicit as it may be, the document does not implement itself. The challenges on implementation, surfaces in poor curriculum management and support. The KZN DoE Curriculum Management Delivery Strategy (2014) document highlights the challenge of curriculum management and support.

The document alludes to the findings that were discovered during monitoring, assessment and evaluation of curriculum delivery processes in KZN DoE.

According to the KZN DoE Curriculum Management Delivery Strategy (2014), among other important findings was the lack of monitoring in schools. The absence of an instrument to inform the system at an early stage an extent to which learners are achieving learning objectives, was a departmental downfall on curriculum management and support. Again, the number of unfilled posts of subject advisors was a contributory factor to poor curriculum management and support. Subject advisors play a significant role in curriculum management and support.

In a district they are supposed to monitor and support schools on challenges in the teaching and learning of their subject areas; Furthermore, to capacitate educators on challenging subject areas and to support the School Management Team (SMT) in monitoring the curriculum. The document further refers to the poor supervision by School Management Teams. As stated in the document, SMT's seem to lack the strategy to monitor the implementation of curriculum policy at classroom level and to translate the importance of effective teaching and learning into classroom excellence. The document outlines that the roles and responsibilities are not clear among the members of the SMT. The document highlights the vacuum at school level in ensuring school functionality, which is the role of the Principal. Hence, the curriculum management and support to the schools become neglected.

2.2.4 Analyses of barriers in the effective teaching and learning of Mathematics

There are number of barriers to effective teaching and learning of Mathematics that are identified in the report of the National Commission on Special Needs in Education and Training (NCSNET), and the National Committee on Education Support Services (NCESS). Among identified barriers are: medium of instruction and communication; inappropriate and inadequate provision of support services; lack of access to basic services; attitude; as well as lack of human resource development. According to Ismaila et al (2014), as they put it, that the prerequisites for an effective Mathematics lesson, they would suggest that teachers must be competent in the subject content knowledge. Furthermore the teacher must possess good pedagogical skills especially questioning, and have a good relationship with their students (Kani et al., 2014; Omar et al., 2014; Salam & Shahrill, 2014; Shahrill, 2009, 2013a, 2013b; Shahrill & Clarke, 2014; Shahrill, Kani & Nor, 2013; Shahrill & Mundia, 2014). If Mathematics educators are lacking subject content knowledge and does not have pedagogical skills expected, that create a learning barrier for learners as they kept on being misled. A number of learners seem to have a challenge in understanding instructions in Mathematics, thus failing to compute relevant, expected Mathematical operation. Language barrier plays important role in obstructing learners' progress in understanding Mathematical instructions.

According to Allsop (2007), making Mathematics concepts understandable is a challenge that is more complex, especially in a class of learners who are experiencing learning difficulties and challenges. Among the difficulties that could be highlighted are: taught by under-qualified educators; lack of resources; poor curriculum management and support; coming from disadvantaged communities as well as language barrier difficulty. In most cases, learners from disadvantaged communities experience these difficulties.

Sao (2008); alludes to educators who are teaching instrumentally in the way they were taught, and as a result could constitute a barrier to the learning process. An example will be an educator who was taught through corporal punishment in order to advance subject matter to learners. Currently corporal punishment has been abolished, therefore an educator who believes in it will find himself or herself limited of skills or methods to advance the subject matter. The interaction of educators with learners only takes place in the classroom situation and therefore limited. This situation leads to learners experiencing difficulties in comprehending Mathematical texts. The situation becomes worse when learners experienced lack of support in their home environments. Most parents from disadvantaged communities cannot read or write; as a result, they are limited in assisting their children with schoolwork.

The only option learners have to explore is to find assistance from their schoolmates nearby their homes. They therefore exposed to misleading each other.

According to Pia (2015), there are different categories of barriers in Mathematics teaching and learning, the categories are as follows:

- Teacher related barriers – teachers themselves have poor Mathematical backgrounds and are dependent on training provided by the Department of Education. Educators have to teach Mathematics, and in addition are given the duty loads of teaching other subjects.
- Tuition related barriers – most teachers have resolved to open private tuition education businesses, knowing that Mathematics is in demand, thus paying less attention to the classroom teaching and putting more effort where he/she is making a lot of money.

- Teaching material related barriers – inability of educators to use available material to the benefit of learners, as well the lack of the DoE to provide support material to educators.
- Classroom physical facilities related barriers – overcrowding of learners in classrooms, vandalism and poor classroom furniture for learners.
- Attitude towards Mathematics related barriers – syndrome of Mathematics regarded as a failing subject; even other educators who are teaching other subjects discourages learners by referring to the subject as being difficult, thus an element of fear is being developed. According to Pia (2015), many students develop fear towards Mathematics due to their misunderstanding, non-understanding and failure during previous lessons.

All barriers mentioned above contribute negatively to the teaching and learning of Mathematics.

2.3 Educators’ attrition rates as contributory factor to the scarcity of Mathematics educators.

Table 2.1 below highlight the projected number of qualified educators needed to replace educators that have exited the system through retirement; deaths; resignations based on attrition rates of 4 percent, 4.5 percent and 5 percent.

Table 2.1 Attrition rate of 4 percent, 4.5 percent, 5 percent for qualified educators needed in replacements of educators that have exited the system.

Province	Production	4% Attrition	Shortfall	4.5% Attrition	Shortfall	5% Attrition	Difference Between output and attrition
KwaZulu-Natal	1415	3479	2064	3914	2499	4349	2934

Source: Integrated Strategic Planning Framework for Teacher Education and Development (2011 – 2025).

According to the Integrated Strategic Planning Framework for Teacher Education and Development (2011 – 2025) document, the attrition rate of educators is estimated at 3.8 percent to 6 percent. Table 2.1 reflects three different attrition rates: 4 percent, 4.5 percent and 5 percent, that are between the estimates.

KwaZulu-Natal with an output of 1415 qualified educators per annum, at 4 percent attrition rate the shortfall becomes 2064.

As the attrition rate increases, the shortfall also increases. There is a huge gap between the number of educators joining the DoE system and the number of educator leaving the DoE system. Among educators joining the system very few are Mathematics educators as against those who have exited the system due to resignations, deaths, and retirements. Bearing in mind that attrition rate occurs under the situation whereby Mathematics educators are a struggle to secure. According to Magano 2014, there are numerous reports alluding to the great shortage of Mathematics and science educators, mostly affected were the rural areas (ELRC, 2005; DoE, 2006; DoE, 2008b; Grayson, 2009).

Chisholm (2009) highlighted the grey area in terms of no match between supply and demand based on attrition. The rate at which educators are supplied by different institutions does not match attrition percentage or rate. According to Magano (2014), a DoE internal survey conducted in 2008, based on information produced by Principals, indicated a total need of 5000 more qualified Mathematics educators, based on the number of learners taking Mathematics (DoE, 2008b).

Mathematics educator shortages will always haunt the Department of Education until a new strategy is engaged, hopefully consideration of opening closed colleges of education. The DoE again have to re-visit the issue of re-opening inn-service centers in which educators were capacitated during vacations and over long weekends.

A number of foreign Mathematics educators that the DoE have appointed also confirms the shortage. The following Table 2.2 will highlight the spread of Mathematics foreign educators from African countries in our provinces.

Table 2.2: Statistics for Foreign educators in DoE system

Province	Foreign Educators statistics				Increase in Percentage Since Dec 08
	December 2008 stats	September 2009 stats	February 2010 stats	June 2011 stats	
Eastern Cape	802	1065	1138	975	22%
Free State	28	37	39	32	14%
Gauteng	638	1194	1183	1286	102%
KwaZulu-Natal	391	529	495	709	81%
Limpopo	347	743	618	934	169%
Mpumalanga	295	629	382	567	92%
North West	279	311	321	458	64%
Northern Cape	45	65	63	77	71%
Western Cape	32	188	529	133	316%
Totals	2857	4761	4768	5455	91%

Source: DBE, 2012c

The foreign educators who are appointed by the DoE are specifically those with critical subject specialization, including Mathematics and Physical Science. The 81 percent increase of foreign educators since December 2008 in KwaZulu-Natal expose the true reflection of the shortage of educators with critical subject skills or qualifications. There is impediment in process of appointing such educators again. The verification process and alignment of their qualifications with South African Qualification Authority (SAQA), is another process (Magano, 2014).

2.4 Mathematics educators' competency

The competence of Mathematics educators is another challenge that has been alluded to earlier on; Figure 2.1 (Mathematical Knowledge for Teaching), synergizes Mathematical knowledge and the classroom learning environment as developed by Ball, Thames and Phelps (2008), cited by Gonzalez (2012).

This model is also known as Mathematical Knowledge for Teaching (MKT), (Ball, et al., 2008).

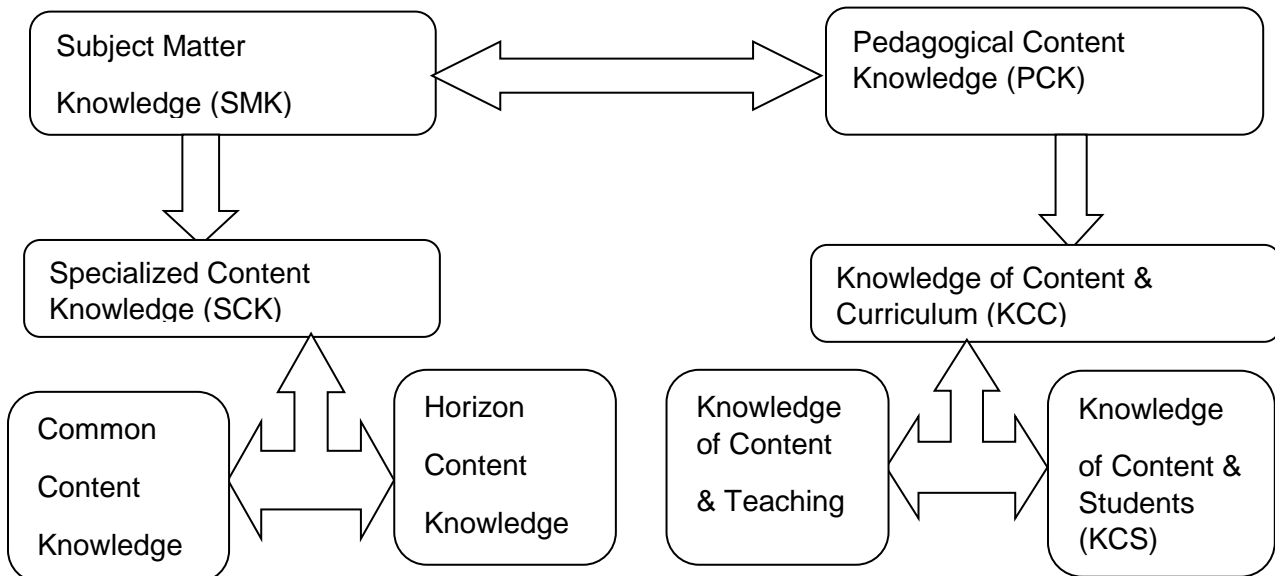


Figure 2.1 Mathematical Knowledge for Teaching

Figure 2.1 models according to Ball et al. (2008), Mathematical Knowledge for Teaching (MKT) should be based on Subject Matter Knowledge (SMK) and Pedagogical Content Knowledge (PCK). Furthermore, they (Ball et al.) sub-divided SMK into Specialized Content Knowledge (SCK), which in itself is divided into Common Content Knowledge (CCK) and Horizon Content Knowledge (HCK). PCK is further divided into Knowledge of Content and Curriculum (KCC), which is divided into Knowledge of Content and Teaching (KCT) and also Knowledge of Content and Students (KCS).

Therefore, the competency of a Mathematics educator is dependent on the exposure to the model as suggested by Ball et al. (2008), based on Mathematical Knowledge for Teaching. The exposure is believed to bring positive impact towards improvement in educators' Mathematics competency. SMK forms the basis or background towards effective teaching in the classroom.

Poor subject matter knowledge results in the development of the misconceptions on perceiving the content, (Ball, 2008).

Similarly, PCK assist the educator in teaching the subject matter in line with the requirements and expectation of curriculum. In short, subject matter knowledge and pedagogical content knowledge are like the two sides of a coin, which are inseparable.

2.4.1 Unqualified and under-qualified educators

Another factor that contributes to poor Mathematics results in KZN is the high percentage of unqualified and under-qualified educators on the system. Table 2.3 gives the outline of the statistics of educators who are unqualified and under-qualified, according to Relative Education Qualification (REQV) value, cited by Magano (2014).

Table 2.3 Unqualified and under-qualified educators per province and REQV

Province	REQV 10 Unqualified	REQV 11 Under-qualified	REQV 12 Under-qualified
Eastern Cape	216	71	1380
Free State	354	261	320
Gauteng	98	11	546
KwaZulu-Natal	8738	10	312
Limpopo	25	3	250
Mpumalanga	187	32	100
North West	24	23	220
Northern Cape	335	23	149
Western Cape	242	202	873
Totals	10214	636	4150

Source: DBE 2012b

The DBE; refer to under-qualified educators as those educators with academic qualification but without professional qualification, while unqualified will be those without academic or professional qualification, excluding grade 12.

REQV 10 educators fall under the category of being unqualified at the salary level 10 and are without teaching qualification or a degree. REQV 11 and 12 are those educators with old qualifications, with teaching certificate or a diploma, prior to 1994 qualification.

Looking at the number of unqualified educators in KwaZulu-Natal, which is 8738 the highest for all provinces. With such a high shocking statistics for unqualified educators in KZN, one can expect poor results. Three hundred and twenty-two (322) under-qualified educators sensitizes hundreds of learners taught by educators without teaching methods, again undesirable results are expected. The higher percentages of unqualified and under-qualified educators are teaching Mathematics.

2.5 Curriculum Management and Delivery strategy

According to the DoE Curriculum Management and Delivery Strategy, (2014), roles and responsibilities of role players within the system play the most important part towards achieving desired results.

Curriculum Management and Implementation Strategy depend on the effectiveness functioning of Top Management and Head Office, District Directors and Curriculum Coordinators as well as School Management Team and educators.

Figure 2.2 outlines the roles and responsibilities of the KwaZulu-Natal Department of Education role players within the system as stipulated by KZN DoE Curriculum Management and delivery Strategy (2014).

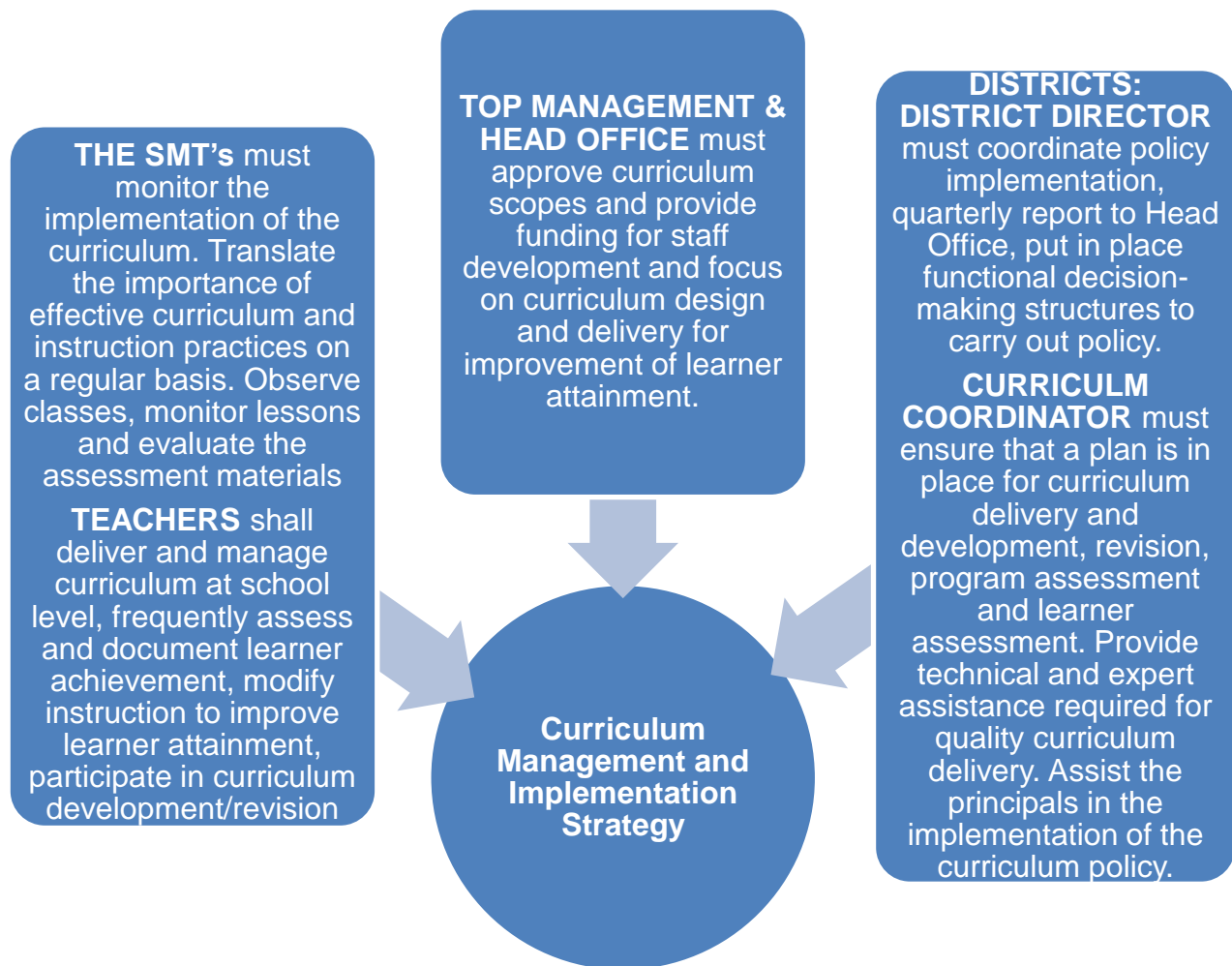


Figure 2.2: KZN DoE Roles and Responsibilities of role players within the system
 (Source: KZN DoE Curriculum Management and delivery Strategy, 2012)

Figure 2.2 above represents the expectations by the DoE of the role players for the effectiveness of curriculum management in KZN DoE. Effective curriculum management will result in improvement of the pass rate in mathematics and across the board.

The reflection on the diagram shows the links, duties and expectations right from the top management and head office, to the districts' directors and curriculum coordinators; and at the schools' level whereby School Management Teams (SMT) and educators takes the responsibilities. The non-functional entity in the hierarchy affects the whole system. That is why it is important for each unity on the hierarchy to play its role perfectly. Each hierarchy need to have an understanding in terms of where to find assistance of what, so that it is able to report as expected, as to what was the stumbling block that hindered the delivery.

Top management and head office need to deal thoroughly with curricula issues and provide funding in terms of the staff development. The district directors will adhere to policy implementation issues while curriculum coordinators put systems in place for curriculum delivery processes and provide assistance. School management teams will be expected to monitor curriculum implementation practice and teachers expected to deliver and manage curriculum at school level.

According to Hillage and Aston (2011), Noor and Majid (2009), cited by Pia (2015), they have agreed on the conceptual framework highlighting the barriers in the teaching and learning of Mathematics which is outlined in Figure 2.3.

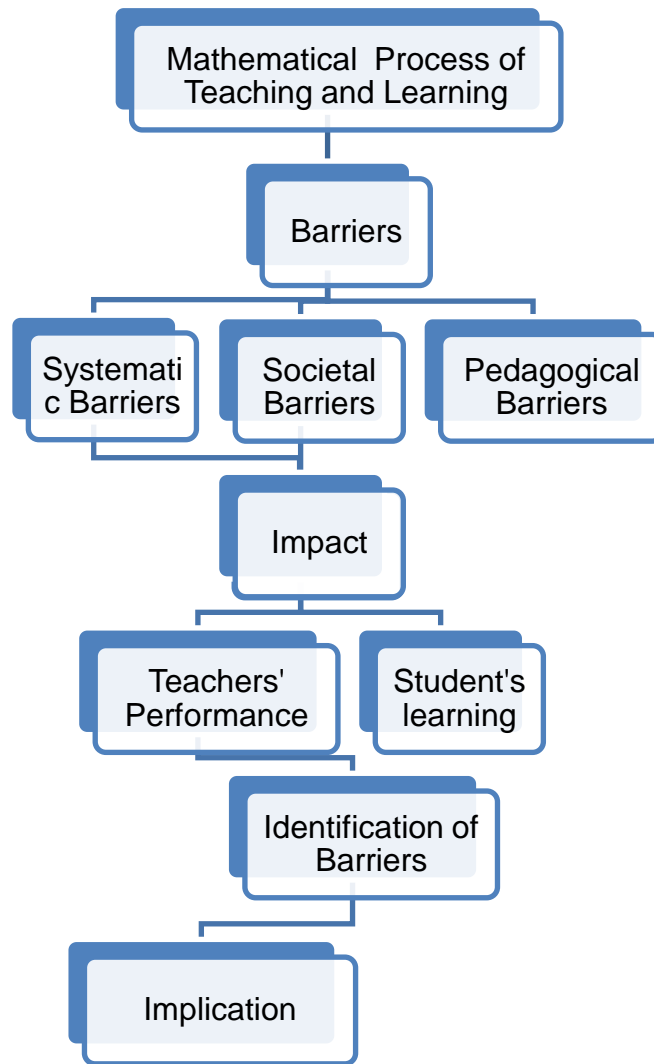


Figure 2.3: Conceptual Framework (Source: Hillage et al, 2011)

A number of barriers as reflected on the above diagram challenges mathematical process of learning and teaching. Pedagogical related barriers are those that have to do with pedagogical content knowledge, knowledge of content and curriculum, as well as knowledge of content and teaching.

Another barrier that hinders the process of Mathematics teaching and learning is the societal barrier. Challenges affecting the communities in which schools are built have an impact in the teaching and learning of Mathematics.

In rural areas, faction fights, instability, poor infrastructure, as well as geographically challenged remote areas, impact negatively in the teaching and learning of the subject.

The same will apply to the schools that are surrounded by informal settlements and which are dominated by hooliganism.

There are also systematic barriers. The late appointments of Mathematics educators impact negatively on the results. The delays to resolve bottlenecks and challenges reported by educational officials to higher management are failing the system to produce desired outcomes.

All of these barriers have got an impact on both educators and learners, which can lead to poor performance.

2.6 Enrolment figures for mathematics

According to Equal Education (EE), the following Mathematics key indicators are in existence in our education system for the Department of Basic Education (DBE). Table 2.4 outlines Mathematics enrolment figures in the DoE system from 2011 to 2014.

Table 2.4 Mathematics enrolment figures

Year	Total Enrolment: Gr12 start	Gr 12 Maths Enrolment	Gr 12 Percent age Enrolment	Gr 12 Total Exam. entrances	Maths Exam. Entrances	Maths Entrances percentage	Achieved at 30% and above	30% and above percentage
2011	534.498	229.371	43%	496.090	224.635	45.3%	104.033	46.3%
2012	551.837	230.022	42%	511.152	225.874	44.2%	121.970	54%
2013	576.490	245.344	43%	562.112	241.509	43%	142.666	59%
2014	550.127	231.180	42%	532.860	225.458	42.3%	120.535	53.5%

Source: Equal Education On the 2014 Matric results, (2015).

On looking closer at the percentage of registered Mathematics learners for examination, which is at the range of 43 percent since 2011 to 2014, the situation signals a challenge that needs to be addressed.

This percentage is too low, when considering the demand of the subject in most carrier advancement courses.

Learners achieving from 30 percent and above was 53.5 percent in 2014, while in 2011 it was 46.3 percent; a 7.2 percent improvement after 3 years. Discouraging improvement when considering the period.

Table 2.5 will reflect the grade 12 Mathematics enrolment versus actual entrances as well as showing the differences, which are actual dropout figures.

Table 2.5: Comparing gr12 Maths enrolment and gr12 examination entrances:

Year	Gr 12 Maths Enrolment	Maths Exam. Entrances	Difference
2011	229.371	224.635	4736
2012	230.022	225.874	4148
2013	245.344	241.509	3835
2014	231.180	225.458	5722

Source: Equal Education On the 2014 Matric results, (2015).

Another challenge is the dropout rate for learners in Mathematics. Noticing the difference of figures since 2011 to 214, which was in the range of 4000 plus, worse was experienced in 2014 in which the dropout was more than 5000. This scenario again sensitizes the system that there is a problem in the teaching and learning of Mathematics, hence results are poor.

2.7 CONCLUSION

The fact that Mathematics is a requirement in many tertiary level courses, e.g. in medical; business; management; and engineering courses, the challenges therefore experienced in the teaching and learning of the subject should be addressed especially if the consequences of the results have a negative impact on our education system, whereby the results for grade 12 are poor. Umalusi have pointed out an important change in our education curriculum system; the introduction of Euclidean geometry and probability. In terms of preparing for a change the DoE need to go an extra-mile otherwise the results will not improve. The changes have been implemented but training of educators is behind schedule. As a result, the outcome will not be the desired one, including that of Mathematics. A number of barriers towards the effective teaching and learning of Mathematics should be given the attention it deserves, and should be prioritized. This study will therefore look at the in-depth views of educators, which will inform or highlight the attributes to poor results performance in KZN DoE. A quantitative approach methodology will be adopted.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

In this study, a quantitative approach was adopted since according to Rhodes (2014), this approach surveys a large number of individuals and applies statistical techniques to recognize overall pattern in the relations of processes. Using survey methods across a large group of individuals facilitates generalization. Lowhorn (2013) further confirmed and agreed with Rhodes that quantitative research establishes statistically significant conclusions about a population by studying a representative sample of the population.

The expectation was to find what attribute to poor performance in Mathematics specifically in KwaZulu-Natal Department of Basic Education (KZNDBE), focusing mainly at ILembe District. This approach appears to be absolute, since it is aiming to capture comprehensive views of the educators, bearing in mind that among the educators there were those who are in management as head of Mathematics and Science departments in their schools.

Therefore, indirectly the study was also providing in-depth views of the management on school's poor performance in Mathematics. Optimistically, those views would give the picture under which the teaching and learning of Mathematics takes place at ILembe district. In addition, the opinions would provide a pragmatic basis of what could be done to counter the contributory factors to poor performance of Mathematics in KwaZulu-Natal department of education (KZNDoE).

To find answers, the data was collected from educators, analyzed and interpreted so that appropriate answers will be provided for the research question. This could be the long awaited initiative on whose outcomes; the KZNDoE was expected to look into as building towards the solution of improving Mathematics results.

3.2 AIMS AND OBJECTIVES OF THE RESEARCH

This research was aimed at investigating and unpacking attributes to poor results performance of Mathematics in KZN department of basic education.

The research was also focusing on developing an inference framework leading to an understanding of all stakeholders involved, thus implementing a turn-around strategy that will improve the performance of results for Mathematics. The framework was based on attributes to poor results performance outcomes. Thus chanting the framework on which the Department of Education management needs to refer to, for the benefit of improving education system in our province.

Sampling from a population of interest for the research to fairly, generate informative results about the study, was done. Questionnaires were administered as well as interviews conducted during the research. The data extracted from these instruments was analyzed descriptively and interpretively. Collected data were projected to be explanatory to the following objectives:

- Assessment on the availability of Mathematics educators
- Assessment of competency of Mathematics educators
- Evaluating mathematics curriculum management and support
- Analyses of barriers in the effective teaching and learning of Mathematics

Therefore, formulation of research questionnaires was undertaken.

3.3 Participants and Location of the study

The target population for the study was the schools at ILembe District, under the KwaZulu-Natal Department of Education. ILembe district is predominantly rural. It has four municipalities: Ndwedwe, which is 100% rural; Maphumulo also 100% rural; KwaDukuza and Mandeni are semi-rural. The numbers of high schools taking Mathematics in the above-mentioned municipalities were Ndwedwe = 42 schools, Maphumulo = 43 schools, KwaDukuza = 20 schools and Mandeni = 21 schools. Hence in total there were 126 schools taking Mathematics in their subject packages.

In these municipalities there were educational circuits; servicing the schools within the municipality, with the exception of Mandeni. There was Ndwedwe Circuit, Maphumulo and KwaDukuza circuit. Schools under Mandeni were being serviced at KwaDukuza.

Therefore, Mathematics educators, who were expected to be the targeted participants, were have within the municipalities at ILembe district, which were mentioned above.

Both males and female Mathematics educators were approached.

Only General Education and Training (GET), as well Further Education and Training (FET) bands were targeted; in short, only high school educators. Some of the participants teaching Mathematics in GET or FET bands were expected to be the Heads of Departments (H.O. D's) within their schools in Mathematics and Sciences. Therefore, it was expected that part of the data collected would have the contribution of the management side, from a School Management Team (SMT) member. This was hoped to have a greater impact in terms of striking the balance in views about poor performance of Mathematics in KZNDoE.

Mathematics educators are hands-on in terms of the teaching and learning of Mathematics in schools around the district. Managing the implementation of the curriculum and teaching as well, will be the H.O. D's responsibility. Therefore, the data that was collected was hoped to be relevant and from educators themselves.

3.4 Strategies of data collection

In chapter two it was highlighted that ILembe district is a deep rural district. Hence ten schools from each circuit were randomly chosen in order to sample from the entire district. Each municipality has its own circuit, with the exception of Mandeni, which was serviced in KwaDukuza circuit. Forty schools at ILembe was targeted. Three educators in each school were expected to participate, giving the total of 30 educators per circuit and 120 in total for a district.

Presentations were done to all the selected participating schools. Furthermore, volunteers availed themselves during Mathematics cluster meetings, grades 10 – 12 continuous assessment moderations, workshops and during school visits at ILembe district. During those sessions, educators who were eager to volunteer in participating were given information letters and consent form of invitation to participate. Research questionnaires were then distributed. Follow-ups were done to arrange the collection of questionnaires as well as conducting a few interviews.

The following framework Figure 3.1 serves as an operation map during the research:

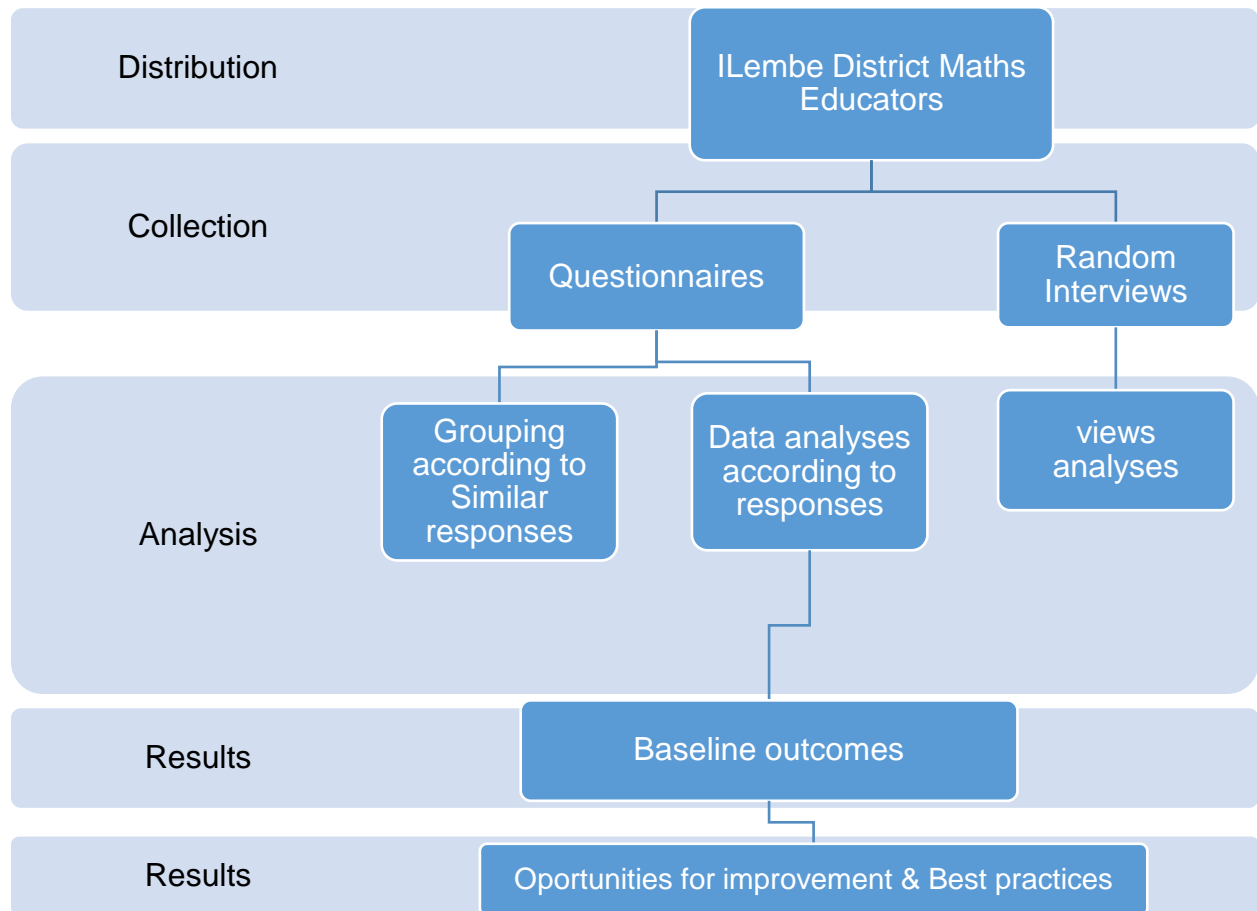


Figure: 3.1 Research operation map

Research questionnaires were collected from the participants after a week of distributions, and random interviews were conducted, where educators can express themselves, further elaborating from the guidance of a questionnaire. The data responses were then grouped according to similarities, and analyses were done according to the groupings discovered. The outcomes were then providing the way forward in terms of opportunities for improvement and best practices.

3.5 Research Design and Methodology

According to Burns and Grove (2003), on defining a research design they refer to it as “a blue print for conducting a study with maximum control over factors that may interfere with the validity of the findings”, cited by Klopper (2008).

This research was hoped to be the overall response to the research questions thus replying to the hypothesis echoed in a research topic.

This research focused on the opinions of Mathematics educators on attributes to poor results performance in mathematics, by KZNDoE. The expectations were that the findings would form the framework for KZNDoE on which to refer, in order to improve the subject results.

According to Myer, (2003) the research method is a strategy of enquiry, which moves from the underlying assumption to research design, and data collection, cited by Iacono (2009). A quantitative method was adopted in this research as eluded earlier. According to Sukamolson (2007), "quantitative research is also useful to quantify opinions, attitudes and behaviours and find out how the whole population feels about a certain issue". In quantitative research, the emphasis is on objective measurement and the statistical, mathematical, or numerical analysis of data collected through polls, questionnaires, and surveys, or by manipulating pre-existing statistical data using computational techniques (Labaree, 2009).

The situation that seems to raise a challenge, in KZNDoE and even nationally, was the poor performance in mathematics results. Therefore, this research will look into attributes to poor results performance, in Mathematics by KZNDoE.

According to Siyepu (2013), the poor performance of learners in Mathematics is a global out-cry. It seems as if there are limited endeavors in trying to fight the situation or there are gaps in the implementation processes of responding to the challenge. Van der Walt, Maree and Ellis (2008:490) state that "researchers agree that the subject matter knowledge of the majority of learners in South Africa is parlous" cited by Siyepu (2013). Van der Walt et al. further explains that limited technical vocabulary of Mathematics is affecting South African learners, cited by Siyepu (2013). This challenge is further worsened by the situation of schools and learners being in disadvantaged community areas. The reasons for the poor performance of South African learners in Mathematics include the poor socio-economic background of learners (little incentive to study at home). Again, the lack of appropriate learner support materials, including general poverty of school environment.

Furthermore, the general poor quality of teachers and teaching (including poor subject knowledge and poor motivation), language of instruction (often not the same as learners' mother tongue) and an inadequate study orientation, (M. van der Walt, K. Maree and S. Ellis, 2008; & M. Ndlovu, 2011), cited by Siyepu.

Therefore, the research questionnaires took into consideration the views from participants on the issues raised by Van der Walt et al. and Ndlovu. Participants freely indicated by ticking a relevant box next to information given. Figure 3.2 below represents methodology summary adopted from Polhill, (2010):

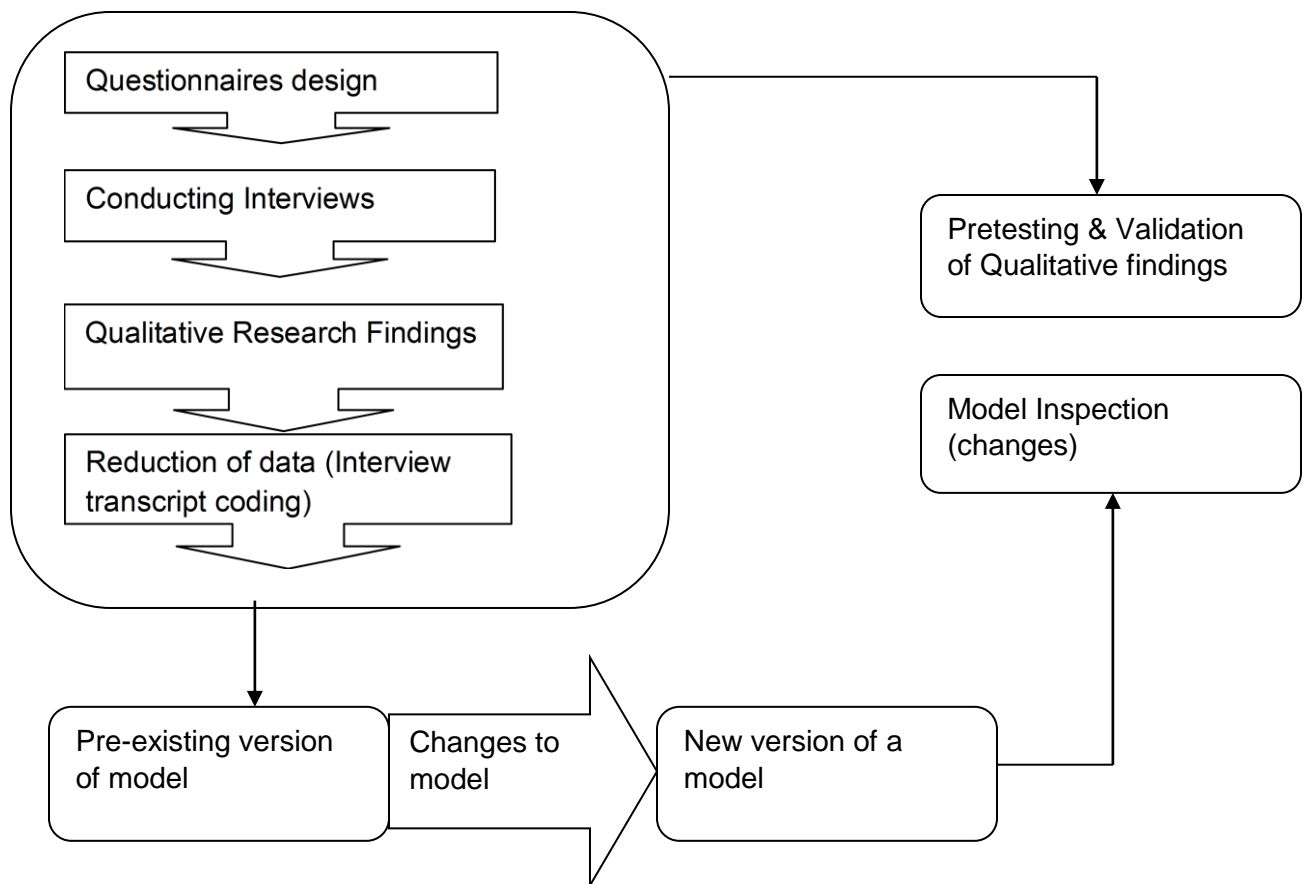


Figure 3.2 Methodology summary (Source: Polhill, 2010).

The methodology summary by Polhill, (2010) indicates the initial level as questionnaire design that also covers testing and validation. Targeted group was utilized during this level. The actual conducting of interviews was the next stage, in which distribution and collection of data were executed. This was followed by data reduction process, then grouping of similar data responses and differences.

From this process, quantitative data analyses and findings surfaced. This will then result in the framework of re-modeling the pre-existing model of practice thus providing the new version. The inspection was expected thereafter.

3.5.1 The Research Instrument's Reliability

Reliability can be viewed as consistency. The instrument must maintain consistency in terms of measuring for what it was intended. According to Venkitachalan (2015), a questionnaire can be reliable but invalid but a valid questionnaire is always reliable. Validity is therefore defined as an extent a test measures to what it was intended to measure. According to Mason and Bramble (1989), there are three fundamental approaches to the validity of tests and measures. They are: Content validity, Construct validity, and Criterion-related validity.

In this research, the basic approaches were engaged for the purpose of validity and reliability of the research instrument. The systematic development of the questionnaire was based on Content, Construct and Criterion-related validity. For content validity, a group of curriculum content educators, from a target group, participated during the construction of a questionnaire as indicated in chapter three. Thereafter, the questionnaire was refined according to the outcomes and expectations. During the construction of the questionnaire errors that might challenge the validity and reliability of the instrument were critically diagnosed and rectified.

3.5.2 Pretesting and Validation

Pre-testing and validity plays a critical role in research questionnaire construction. The research instrument was tested in term of whether it was achieving the objective which it was designed for, including wording and clarity. There are a number of researchers cited by Rothgeb (2007), Campanili, 1997; DeMaio, Mathiowetz, Rothgeb, Beach, and Durant, 1993; Esposito and Rothgeb, 1997; Forsyth and Lessler, 1991; Oksenberg, Cannell, and Kalton, 1991; Presser and Blair, 1994; Schaeffer and Dykema 2004; Willis, 2005. All of them tried to address issues related to questionnaires evaluation, and in the process endeavored to determine possible strengths and weaknesses. The consensus was that the questionnaire pre-testing and validity must answer the following questions:

- Do each question measures what it was intended for?
- Are all terms clear and understandable by respondents?
- Do the respondents interpret questions in the same manner?
- Is there any positive impression created by questionnaire such that respondents are motivated to answer?
- Is there any biasness from the researcher that is suggested by the nature of formulated questionnaires?
- How long does it take to finish responding to the questionnaire?

A group of 8 people from a targeted group, Mathematics educators at ILembe district were used for pre-testing survey questionnaires. This was done during school visits programs, Mathematics workshops or during moderation meetings.

The feedback from that exercise after consulting more on question formulation assisted in shaping survey questionnaires to achieve the purpose for which they were intended.

3.5.3 Analysis of Data

According to Griffiths (2008), on defining quantitative data analyses he refers to it as a systematic approach to investigations during which numerical data is collected and/or the researcher transforms what is collected or observed into numerical data. Muhamed and Yaakub (2013) confirmed this on alluding to quantitative data analyses as techniques by which researchers translate data to numerical forms and subject them to statistical analysis. The numerical representation and manipulation of observations play an important role in describing and explaining the phenomena that those observations reflect (Babbie, 2010).

The framework in figure 3.1 under analysis stage alludes to the grouping according to similar, or almost similar, responses and views as well as differences from data collected. The data was representing the opinions, feelings, values and status of Mathematics educators at ILembe district. Since the data was collected using quantitative questions seeking educators to express their experience, opinions, knowledge, and input about poor performance of Mathematics, deductive approach was used.

The format of grouping data using the research questions was also adopted, thus engaging the process of looking at the similarities and differences.

Interpretivism is a philosophical orientation that honors the understanding of a whole phenomenon by constructing meaning and interpretations through the perspective of those who actually live it and make sense of it (Cohen, Manion & Morrison, 2000; Suter, 2012). The information received from educators through questionnaires about causes of poor performance in Mathematics was used as a reliable source for analysis and interpretation, since educators are hands-on.

In contextualizing data analysis, it is worth mentioning that in quantitative studies, the researcher often is the instrument, relying on his or her skills to collect information from participants in natural contexts, and employs both descriptive and exploratory procedures to uncover and explain the meaning of the shared information (Suter, 2012). The responses that were gathered through questionnaires provided vast information that was sequentially analyzed to present meaningful interpretation.

Fantigrossi's (2013), three stages and six steps of components for data analysis was adopted, which is presented in Figure 3.3:

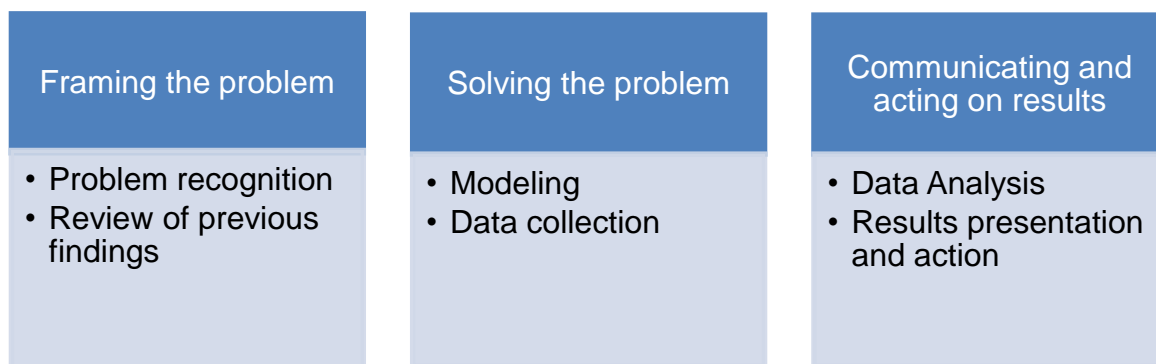


Figure: 3.3 Source: Quantitative analytics, Fantigrossi (2013)

The first stage was problem framing that has two steps which are, problem recognition and previous findings review. The second stage was solving the problem and it consist of two steps as well, the modeling and data collection. Third and last stage was the communicating and acting on results which also consist of two steps, the data analysis and results presentation and action.

Condensing of data was not merely for manageability purposes only, but it has to be transformed so that it can be made comprehensible in terms of issues in question. A data display can take the format of being a comprehensive piece of text or a diagram, chart that provides a new dimension of positioning and thinking about the more textually implanted data. This will then enable the analyst to extrapolate from the data forming systematic patterns and interrelationships. Data display also enables the analyst to identify why a system or a program is not working well and what are the measures to be engaged in order to fix the challenge. From systematic patterns and inter-relationships from data collected, a guiding theme will manifest itself, thus pointing to a frame of reference in order to overcome the challenge of poor results in mathematics. Figure 3.3 represents the summary of events as adopted from Fantigrossi (2013).

3.6 CONCLUSION

According to Joseph (2014), quantitative data is numerical. This implies that one can gather percentages and statistics and analyze the results using graphs and charts. Most data revealed by quantitative methods are less prone to prejudice and can often be generalized to fit a larger sample size than the data was collected from. Numerical data analysis permits one to make sense of any data that is currently available. The use of quantitative data analysis in this study, have allowed one to organize, summarize, and prepare the data for dissemination to others. The operating frameworks that was adopted in this study was of great assistance in quantitative data analyses. Hence this study through quantitative approach is hoping to come up with a framework on which KZNDoE will refer to in order to overcome poor performance of Mathematics in schools.

CHAPTER 4

DATA PRESENTATION

4.1 INTRODUCTION

This chapter will illustrate presentation of the results that have been obtained from the questionnaire used in the study. The questionnaire was used as a major tool to collect data from targeted group. Out of 120 Mathematics educators who were targeted at ILembe District only 86 managed to participate. Among 86 who participated 28 are Heads of Mathematics & Science departments in their schools. The data to be presented will be mainly quantitative, and questionnaires were designed to respond to the research questions. Descriptive statistics results will be presented as pie charts, graphs and tables.

4.2 The Sample Size

Questionnaires were distributed to all targeted group members of 120 in total. Questionnaires were distributed during Mathematics Continuous Assessment Moderation sessions, only 72% of questionnaires were able to be collected and the remaining 28% educators were given an opportunity to finalize their responses at their earliest convenience. All follow up efforts to collect outstanding questionnaires were in vain, due to a hectic examinations period. Most educators were writing examinations with different universities to improve their state of being under-qualified and unqualified as indicated on the abstract as a result effort to meet them and collect outstanding questionnaires were not successful.

4.3 The Research Instrument

The investigating instrument consists of 6 sections of 32 questions. The sections were designed to capture data on following concerns of the study:

Section A: Questions primarily about time taken by educators on activities leading to effective teaching and gaining insight for a subject (10 questions), covering Curriculum Management and Support issues.

Section B: Question mainly about the period educators take for planning, discussing curriculum and teaching approaches (1 question).

Section C: Questions primarily about educators' confidence in teaching different section in Mathematics for grade 10 – 12 curriculum (12 questions), covering educators' competency in the subject.

Section D: Questions mainly exposing challenges in teaching Mathematics in a classroom situation (7 questions), covering availability of educators and their flexibility.

Section E: Questions about educators' highest qualifications in Mathematics (6 questions).

Section F: Question about independent views on challenges in the teaching and learning of Mathematics (1open question).

4.4 Participants' Data Description

4.4.1 Mathematics Curriculum Management and Support

In Chapter two of this study it was indicated that according to KZN DoE Curriculum Management Strategy (2014), curriculum management and support involves among other aspects the following:

Supervising of the curriculum that is being taught at the classroom level, monitoring and evaluation of curriculum implementation in schools, as well as quality assuring the assessments for learning. The underlying principle for the development of the strategy among others was: poor learner performance, lack of monitoring in schools as well as poor supervision by the School Management Teams (SMT's), (KZN DoE 2014). Considering the rationale on the development of KZN DoE Curriculum Management and Delivery strategy (2014), educators during the survey were expected to tick a relevant box on the time they spend on curriculum based activities.

Table 4.1 will be the illustration of total responses of educators who participated in Section A of the Questionnaire.

Table 4.1- Educators' time spent on curriculum activities outside school hours.

Activities	None	≤ 1hour	1– 2hours	≥3hours
Planning and preparing you lesson	00 (0.00%)	49 (56.98%)	31 (36.05%)	06 (6.98%)
Conducting extra classes	00 (0.00%)	34 (39.53%)	13 (15.12%)	39 (45.35%)
Networking for assistance on challenging sections	12 (13.95%)	32 (37.21%)	24 (27.91%)	18 (20.93%)
Analyzing learner performance in tests or exams	00 (0.00%)	40 (46.51%)	28 (32.56%)	18 (20.93%)
Self-professional development in Maths(NB: 72 responded here)	14 (19.44%)	12 (16.67%)	29 (40.28%)	17 (23.61%)
Meeting with parents	25 (29.07%)	37 (43.02%)	15 (17.44%)	09 (10.47%)
Learner One on One consultations	18 (20.93%)	34 (39.53%)	20 (23.26%)	14 (16.28%)
Assisting learners from other schools	24 (27.91%)	19 (22.09%)	26 (30.23%)	17 (19.77%)
Preparing learners for Maths competitions.	30 (34.88%)	19 (22.09%)	22 (25.58%)	15 (17.44%)

4.4.2 Educators' Periods of Meeting for Curriculum discussions, Planning & Teaching Approaches.

Sharing of ideas through curriculum discussions, planning and teaching approaches meetings, enhances insight in the delivery of the subject matter in a classroom situation. Figure 4.1 shows a graphical representation of the responses in Section B of the Questionnaire.

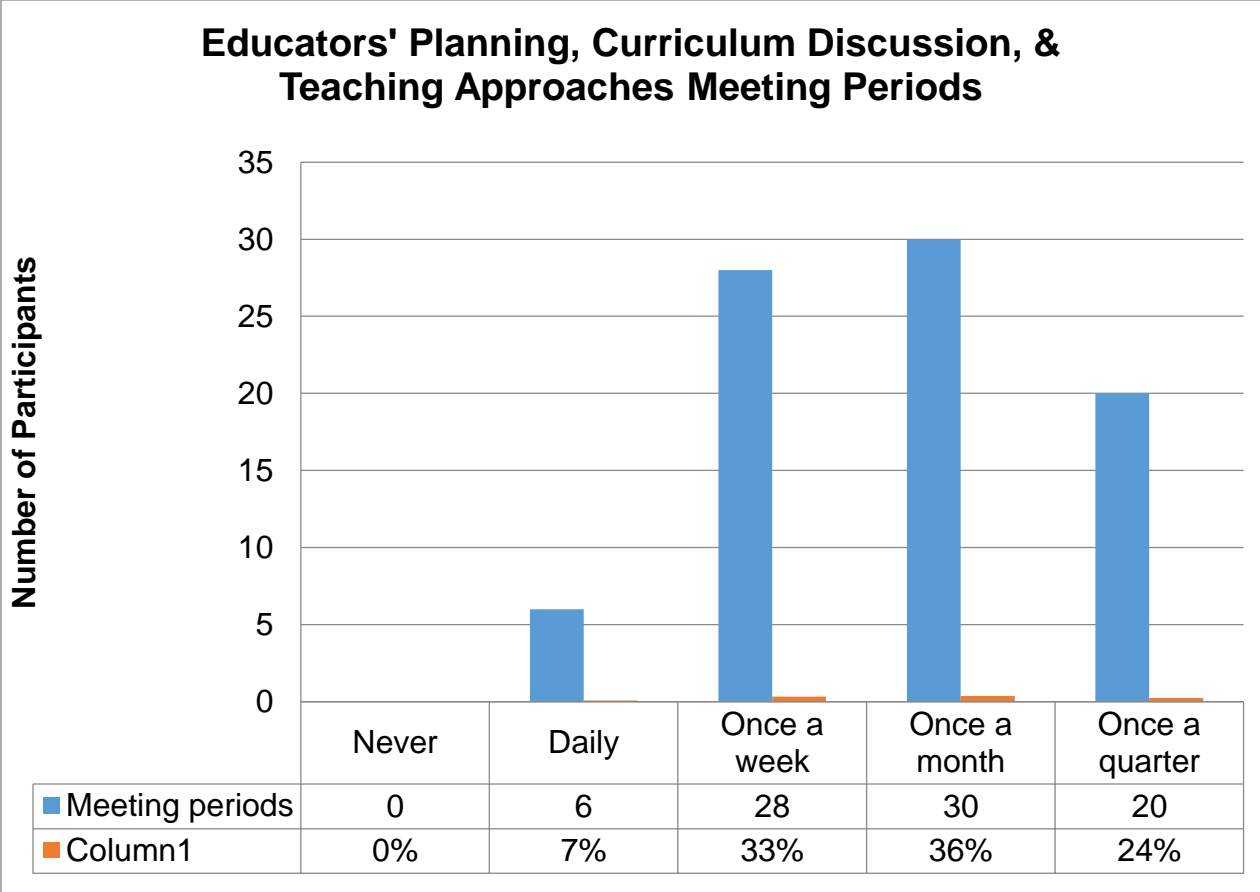


Figure 4.1- Meeting periods of educators for planning, curriculum discussions & Teaching approaches

4.4.3 Confidence levels of educators according to Mathematics curriculum sections

Confidence levels of educators' responses according to different section in mathematics as appeared in grade 10 – 12 curriculum are illustrated in Table 4.2.

Table 4.2 – Educators’ confidence levels in different sections of mathematics

Grade 10 – 12 Curriculum Sections	No Confidence	Less Confident	Confident	Very Confident
Exponents and Surds	01 (1.16%)	06 (6.98%)	45 (52.33%)	34 (39.53%)
Equations and Inequalities	00 (0.00%)	03 (3.49%)	48 (55.81%)	35 (40.70%)
Number Patterns	01 (1.16%)	08 (9.30%)	46 (53.49%)	31 (36.05%)
Analytical Geometry	00 (0.00%)	23 (26.74%)	33 (38.37%)	30 (34.88%)
Number patterns, sequence and series	00 (0.00%)	24 (27.91%)	36 (41.86%)	26 (30.23%)
Functions	00 (0.00%)	23 (26.74%)	39 (45.35%)	24 (27.91%)
Differential Calculus	00 (0.00%)	31 (36.05%)	22 (25.58%)	33 (38.37%)
Trigonometry	00 (0.00%)	34 (39.53%)	25 (29.07%)	27 (31.40%)
Euclidean Geometry	12 (13.95%)	35 (40.70%)	25 (29.07%)	14 (16.28%)
Probability	09 (10.47%)	41 (47.67%)	26 (30.23%)	10 (11.63%)
Financial Mathematics	06 (6.98%)	41 (47.67%)	25 (29.07%)	14 (16.28%)
Statistics	15 (17.44%)	28 (32.56%)	22 (25.58%)	21 (24.42%)

The data illustrated in Table 4.2 is of mutual benefit. It will play an essential role towards building the framework that will assist in facing the challenges of poor performance in Mathematics in KwaZulu-Natal Department of Education.

4.4.4 Mathematics Educators' Availability

Section D of the questionnaire strategically captures the situation on the availability of Mathematics educators at ILembe district. According to Arends, (2011), education researchers agree that there are shortages of educators in schools; however, there is a need of reliable direct information from schools.

This survey will assist in gathering the information on the status of Mathematics educators' shortages at ILembe district schools. The data after being analyzed will assist in forming a framework towards addressing the challenges of Mathematics educators' shortage.

Table 4.3 and Figure 4.2 & Figure 4.3 will show responses in summary according to participants' degree of opinions for a statements provided.

Table 4.3 – Educators’ degree of opinions on statements provided

Statements	Strongly Disagree	Disagree	Agree	Strongly Agree
Learners lack proper background in Maths	06 (6.98%)	05 (5.81%)	39 (45.35%)	33 (38.37%)
Poor performance of learners in Maths can be linked with the way in which they were taught	05 (5.81%)	15 (17.44%)	46 (53.49%)	20 (23.26%)
There are sections in grade 10 – 12 mathematics in which I am also struggling	13 (15.12%)	16 (18.60%)	42 (48.84%)	15 (17.44%)
Teaching mathematics is enjoyable	16 (18.60%)	22 (25.58%)	22 (25.58%)	26 (30.23%)
There is only one educator in my school who is qualified to teach grade 12	13 (15.12%)	12 (13.95%)	34 (39.53%)	27 (31.40%)
Most educators are afraid to teach Maths in grade 10 – 12, since they are not confident in other sections	03 (3.49%)	06 (6.98%)	56 (65.12%)	21 (24.42%)
Due to lack of qualified Maths educators learners sometimes stay for more than a month without a Maths teacher	03 (3.49%)	08 (9.30%)	43 (50.00%)	32 (37.21%)

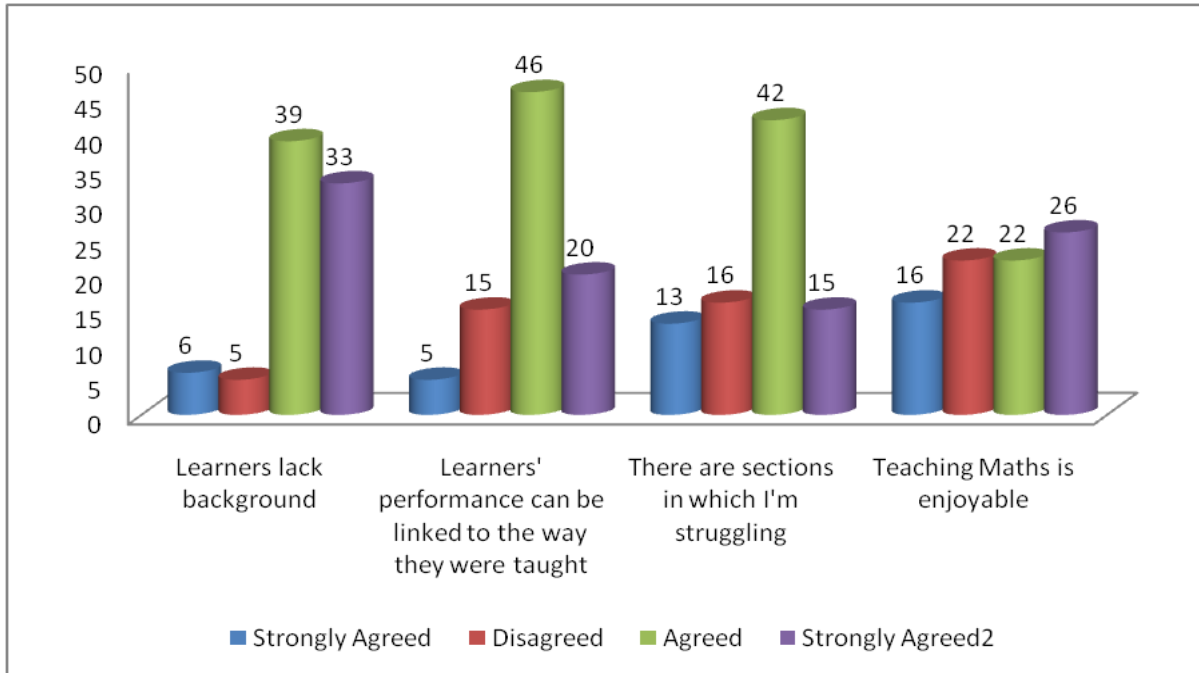


Figure 4.2 – Educators' levels of opinions on statements provided

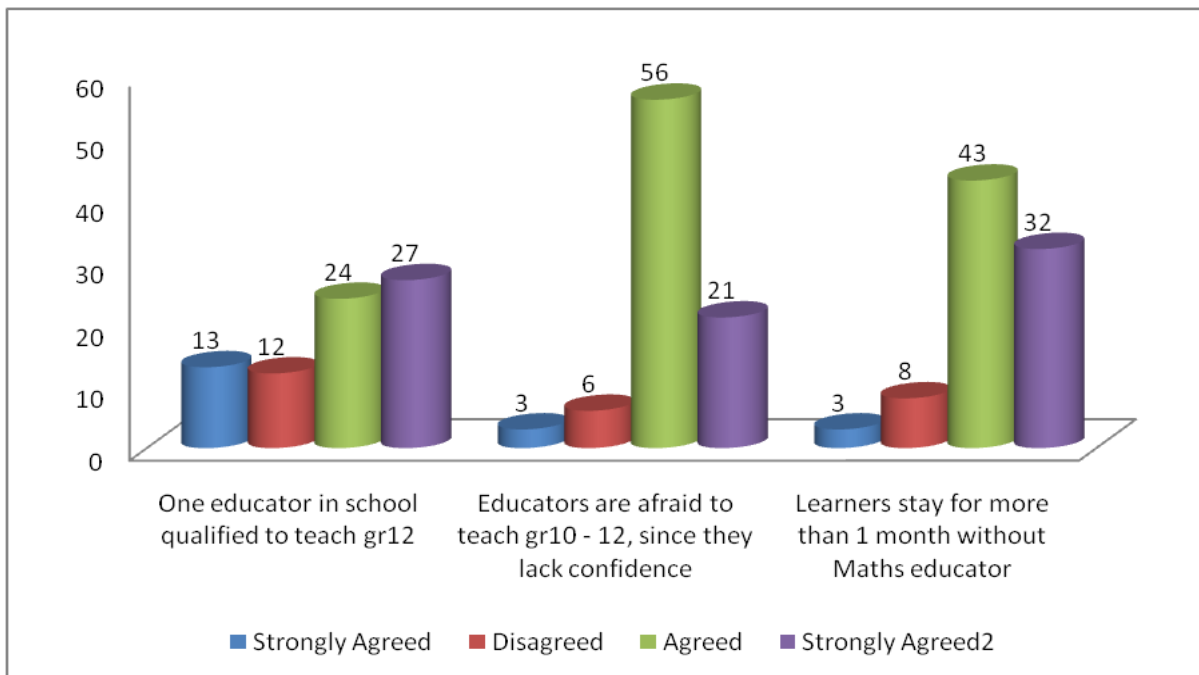


Figure 4.3 - Educators' levels of opinions on statements provided

4.4.5 Educators' highest Qualification in Mathematics

Figure 4.4 and 4.5 are an illustration of the responses of educators on the issue of a qualification in mathematics.

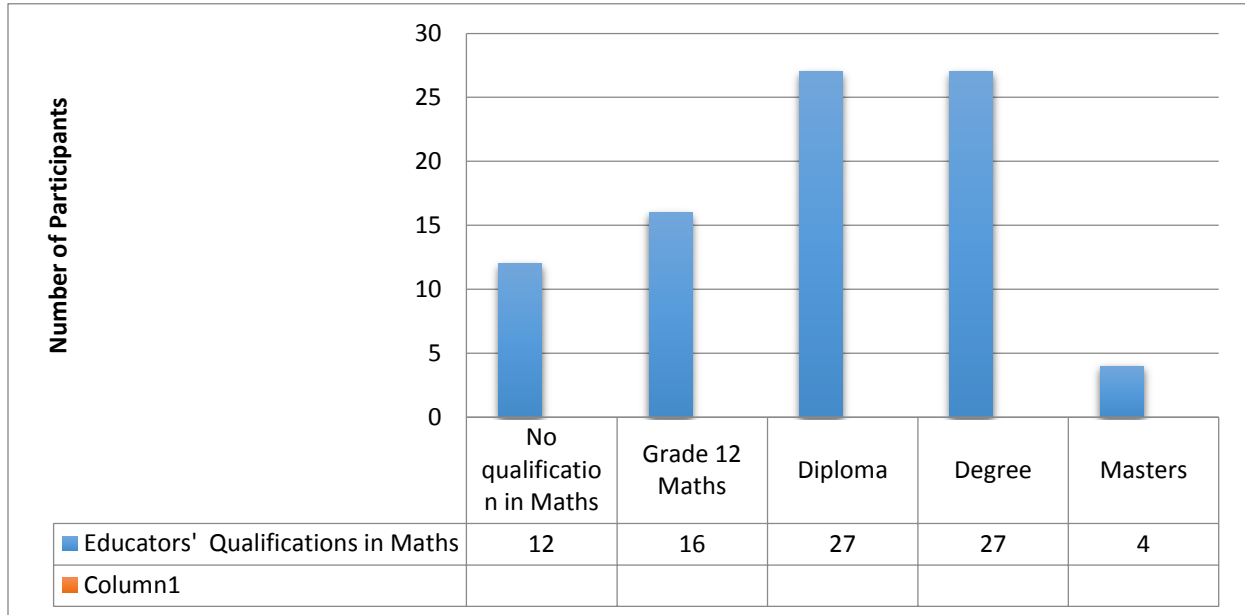


Figure 4.4 – Educators' highest qualification in Mathematics

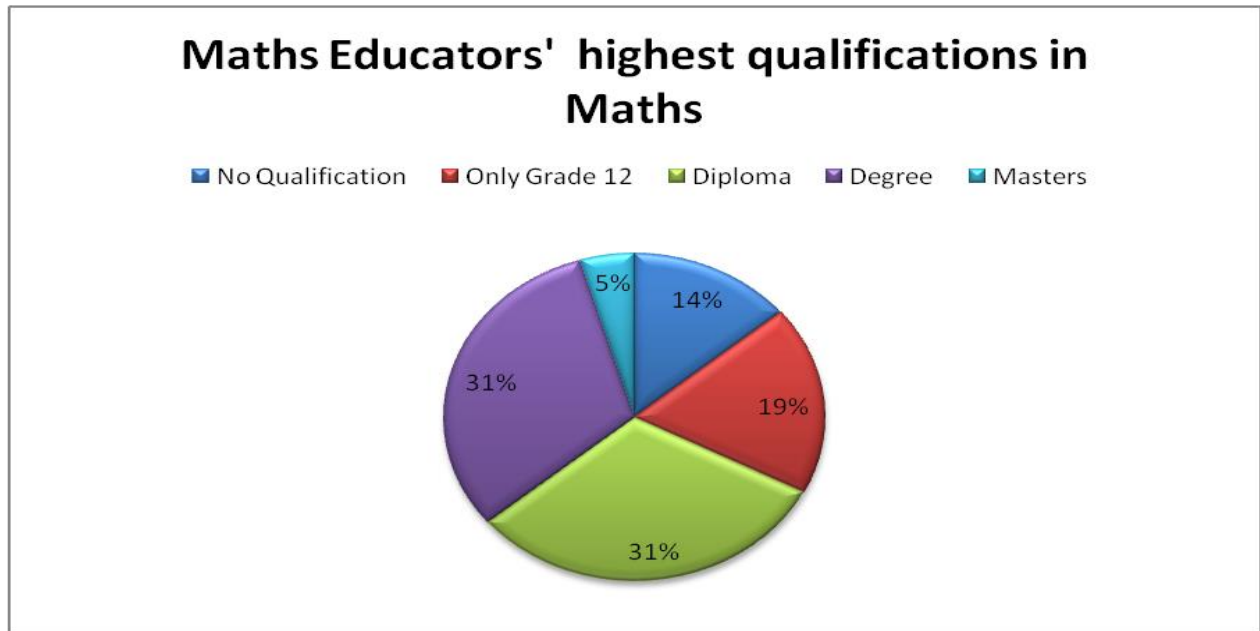


Figure 4.5 – Composition of qualifications

4.4.6 Challenges in the effective teaching and learning of mathematics in schools.

The last section of the questionnaire was aimed at capturing independent views of educators not covered on a survey questionnaire. Mostly it was filled by acting HOD's and appointed HOD's making a total of 28 responses on the last section of a questionnaire. They alluded on the following barriers that are summarized below: Table 4.4 shows different educators' views on challenges in teaching and learning of mathematics. Below the table will be the short summary of a point raised by educators.

Table 4.4 – Educators' views on challenges in teaching and learning of Mathematics

Participants' Views on Challenges	Participants sharing the same view	% - age
Most rural area parents are not educated hence learners don't get educational support from home.	16	57.14%
Learner progression policy challenges	23	82.14%
Skills are taught instead of Mathematics for examination results purposes	11	39.29%
The addition of the 8 th subject in substitution of Mathematics for learners to pass	14	50.00%
Overcrowding in Mathematics classes	09	32.14%
Lack of resources	21	75.00%
Learners lack motivation, discipline and they don't practice Mathematics	15	53.57%
Language barrier challenges	12	42.86%
Misdirected focus of schools in Maths teaching	08	28.57%
.Duty loads challenges	13	46.43%

1st Point: Most parents from rural areas are not educated; therefore, learners do not get educational support from their home environment. If learners are given homework, there is no monitoring from the parents' side as to whether homework is done or not.

Even if when learners were stuck when doing homework, they are not able to get any assistance from their parents. The only option would be to travel long distances for help, which would be impossible since it would be at night.

2nd Point: The learner progression policy challenges. Learner progression policy is the advancement of a learner from one grade to the other. The policy stipulates that a learner can only fail once per phase, due to this policy learner's progress until grade 12 without having passed Mathematics.

3rd Point: Due to examination results pressure, learners are taught skills to answer examination question rather than being taught concepts and computation of Mathematics.

4th Point: Schools add an 8th subject in their packages in order to pass learners irrespective whether they failed Mathematics. In such schools, learners do not take Mathematics seriously because they know it has been substituted by the 8th subject. The comments of other teachers about Mathematics being difficult and encouraging learners to stick to the 8th subject if they want to pass, makes the situation even worse.

5th Point: Over-crowding in Mathematics classes is the biggest challenge, disadvantaging the educator in giving individual attention to the learners.

6th Point: Lack of resources: learners from rural areas cannot afford a calculator which is the most important instrument towards teaching and learning of Mathematics.

7th Point: Learners lack motivation, discipline, individual Mathematics practicing, they don't ask questions during lesson presentation in class, and Mathematics background from primary school is inadequate. Learners have also developed a negative attitude towards Mathematics.

8th Point: Language barrier challenges.

9th Point: More attention and efforts are focused in grade 12. Laying proper foundation in GET phase, would create less work for FET phase, thus enhancing chances of improving the pass rate in Mathematics.

10th Point: Shortages of educators result in Mathematics educators allocated more duty loads to teach other subjects.

Figures 4.6 and 4.7 illustrate educators' views on challenges in the teaching and learning of mathematics.

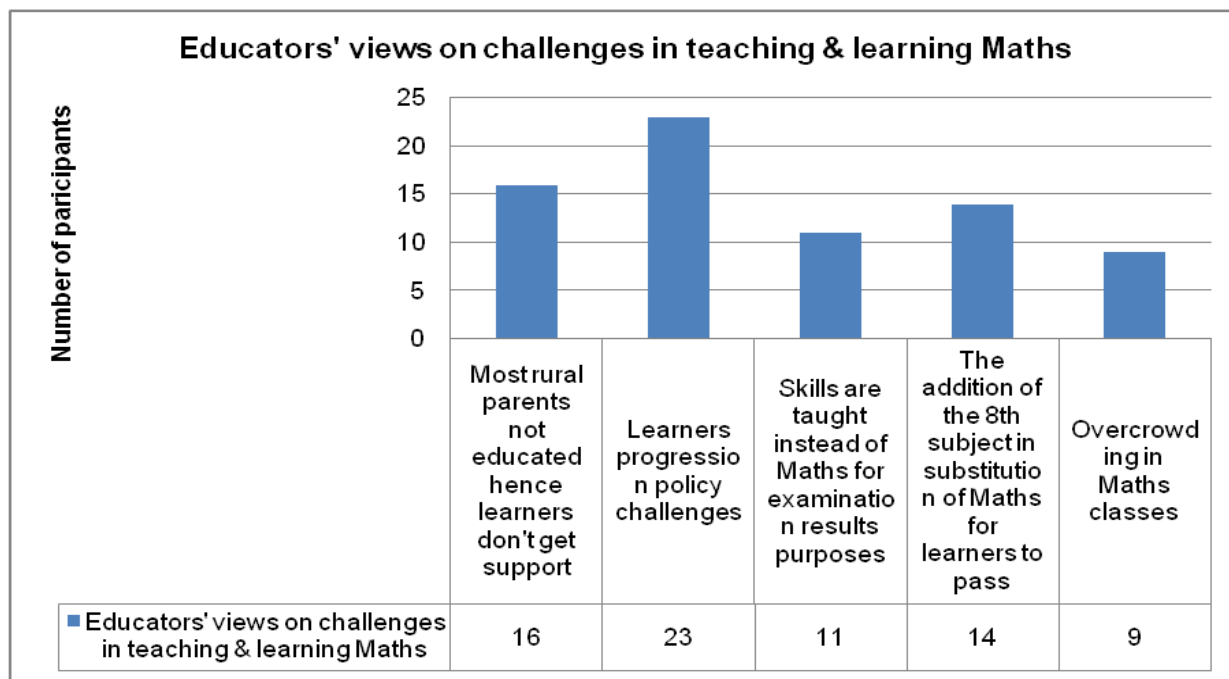


Figure 4.6 – Educators' views on challenges in teaching and learning of Maths

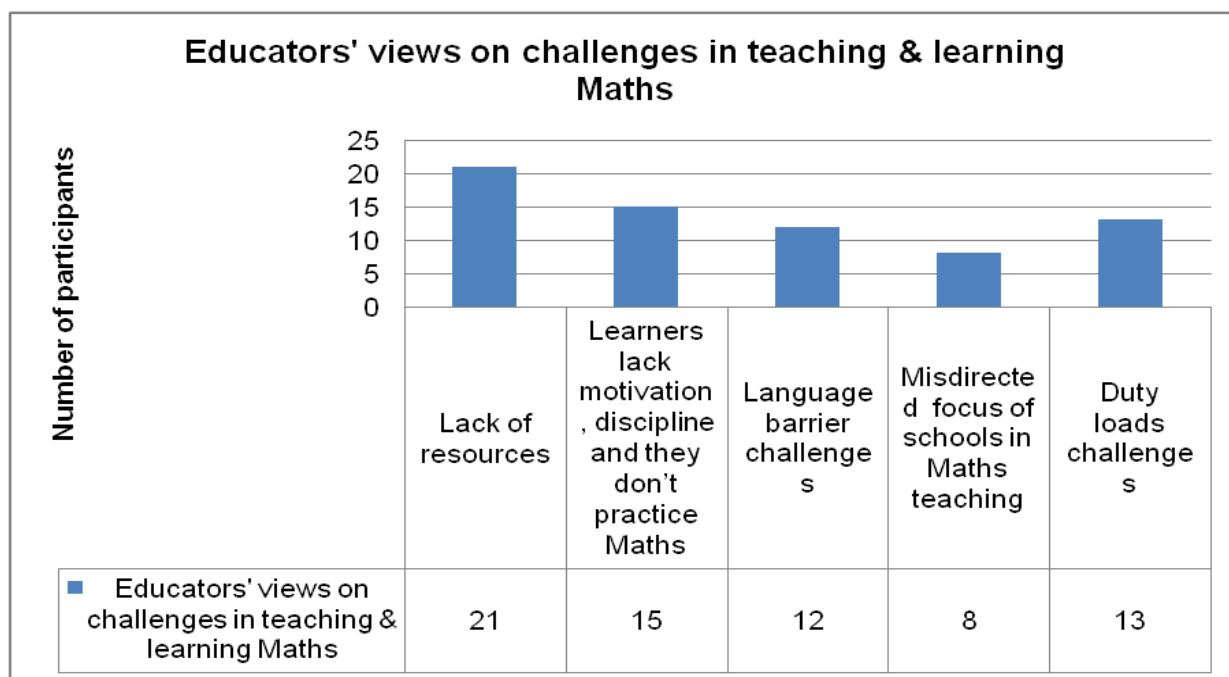


Figure 4.7 – Educators' views on challenges in teaching and learning of Maths continues.

4.5 SUMMARY

The results in this chapter were presented according to the sections on the research questionnaire survey questions. The results are also presented in the format of considering the four main concerns that need to be answered by this research: Availability of Mathematics educators, Competency of Mathematics educators, Curriculum Management and Support, and Barriers for the Effective Teaching and Learning of Mathematics. Illustrations have been displayed in the form of Tables and Pie graphs showing percentage for the findings. There are a number of conditions or situations that were exposed by illustrations during the presentation of data that will be engaged through discussions in the next chapter.

CHAPTER 5

DISCUSSION OF RESULTS

5.1 INTRODUCTION

This chapter will interpret, analyze and discuss the qualitative findings illustrated in chapter four. Findings will be discussed, analyzed and interpreted based on attributes of poor results performance in Mathematics by the KwaZulu-Natal Department of Education (KZN DoE), focusing at ILembe District. The analyses of the findings will be providing answers to the following secondary objective research questions:

- What are fundamental factors that are challenging curriculum management and support?
- Is our Education system producing enough mathematics educators?
- What are underlying factors contributing to the lack of content knowledge to our mathematics educators?
- Are there any barriers affecting effective teaching and learning of Mathematics in schools?

5.2 Participants' Data Description

5.2.1 Mathematics Curriculum Management and Support

Curriculum management forms the basis towards effective teaching and learning in schools. According to KZN DoE Curriculum Management and Delivery strategy (2014), there are number of activities illustrated in Table 4.1 and Figure 4.1, which need to be supervised and monitored by the School Management Teams (SMT's) for effective teaching and learning in their schools. Effective teaching and learning is tantamount to good results.

Activity 1: Planning and preparing your lesson

It is a concern that 56.98% of educators spend less or equal to an hour in lesson preparation and lesson planning.

The lesser time you take in preparation for lesson presentation in class, the higher the chances of conducting an unsuccessful lesson presentation.

Lesson planning involves activities like objective, content, learner and educator activities, materials, and assessment while lesson preparation includes step-by-step classroom lesson presentation. In addition, the methods and activities to be used during introduction, presentation and conclusion, speak of lesson preparation. SMT's are supposed to check, validate, and sign lesson plans for educators. Thereafter monitor and support the implementation. Seemingly educators do not do justice to these sections and SMT's are lacking behind in performing their duties adequately. In chapter two the KZN DoE Curriculum Management Delivery Strategy (2014) document highlights the challenge of Curriculum Management and Support. Among other important findings was the lack of monitoring in schools. The document outlines that the roles and responsibilities are not clear among the members of the SMT. Furthermore; the document highlights grey areas at school level in ensuring school functionality, which is the role of the Principal. Hence, the curriculum management and support at the schools is neglected.

Activity 2: Conducting extra classes

The poor performance in Mathematics results indicate that extra lessons should be conducted to clear misconceptions and misunderstanding in learners, as well as providing more practice in order for them to gain confidence. It is of great concern that 39.53% of educators are spending an hour or less on conducting extra classes. Conducting extra lessons appear in subject improvement plans of educators that were signed by SMT's, in order to monitor the implementation. If this is effectively monitored and supervised, the percentage of educators engaged in conducting extra lessons for more hours will be far above the 45.35 percent illustrated, as Table 4.1 activity 2 illustrates in chapter 4 of this study.

Activity 3: Networking for assistance on challenging sections

In Mathematics, networking plays the most important role towards improving knowledge capacity and teaching approaches.

According to the responses of educators reflected on Table 4.1, it is a serious concern that; 13.95 percent of educators do not concern themselves in networking for assistance in challenging areas, and 37.21 percent utilizes an hour or less to network. Heads of Departments (HOD's) in schools are expected to assist educators in this aspect. SMT's are supposed to join hands to assist educators to overcome their challenges in the teaching and learning of Mathematics.

Activity 4: Analyzing learner performance in tests or exams

Analyses of learner performance in tests and examinations, leads to perfect subject improvement plans. Educators are able to directly, tap into the causes of learner challenges or poor performance. Analyses reveal the sections in which learners are experiencing difficulties.

According to the KZN DoE Curriculum Management and Delivery Strategy (2014), analyses of learner tests and examination are an expectation to be performed by subject educators and be monitored by SMT's. The data illustrate that 46.51 percent of educators are taking less, or equal to an hour, for analyses, which is a concern since the exercise demands more patience and time in order to improve learner performance.

Activity 5: Self-professional development in Mathematic

Self-professional development in the subject empowers the knowledge in subject teaching. The data collected from the participants shows that 19.44 percent of Mathematics educators are not doing anything towards developing themselves. This indirectly has an impact towards producing good results. According to the Conference Board of Mathematical Sciences (2012), "professional development should include self-directed study as well as activities that involve schools' district Mathematics supervisors and faculty in Mathematics education and Mathematics". Therefore, lack of self-development can be detrimental in attempts to improve results in this subject.

Activity 6: Meeting with parents

Meeting with parents of learners for the subject an educator is teaching is of good advantage. 29.07 percent of Mathematics educators do not meet with parents of their learners. For whatever reasons that might justify why subject educators do not meet with parents of their learners, the fact will remain that the absence of such meetings will have a negative impact towards the performance of a child, hence poor results. SMT's are responsible for scheduling the parents school visit period; they are also expected to assist educators on non-compliance by parents. These activities are part of Curriculum management and support as illustrated by KZN DoE Curriculum Management and Delivery Strategy (2014).

Activity 7: Learner One-on-One consultation

Giving learners individual attention and affording them an opportunity for one-on-one consultation, increases their confidence as well as performance. This is the role and responsibility of educators in Curriculum Management in schools, as revealed by KZN DoE Curriculum Management and Delivery Strategy (2014).

The data shows that 20.93 percent of educators do not afford learners opportunities for consultations and individual attention, while 39.53 percent of educators spend less, or equals to 1 hour, for one-on-one consultations, which is not enough based on poor Mathematics results performance. The absence of these activities in educators' operation plan submitted to the HOD's sensitizes the SMT's for an immediate intervention.

Activity 8: Assisting learners from other schools

Assisting learners from the same cluster schools for educators is an indication that team teaching and networking for better results is in operation. Through such operations, educators are gaining more experience and exposure in problem solving. It is a concern that 27.91 percent of educators are not engaged in this activity, while 22.09 percent only take 1 hour or less to be engaged in this activity. Once more SMT's are supposed to be the link towards this activity for subject performance, improvement initiatives.

Activity 9: Preparing learners for Mathematics competitions.

Mathematics competitions empower learners' subject content information as well as motivate learners to achieve more. Data illustrate that 34.88 percent of educators do not engage in activities of preparing their learners to participate in Mathematics competitions, while 22.09 percent take 1 hour or less towards this activity.

Competitions enable learners to perform better thus widening chances of learners obtaining distinctions in Mathematics.

Curriculum management and Delivery strategy document for KwaZulu-Natal Department of Education (KZN DoE), alludes to poor supervision by SMT's.

According to the document SMTs seem to lack strategy to monitor the implementation of curriculum policy at classroom level and to translate the importance of effective teaching and learning into classroom excellence.

An intervention towards curriculum management in schools is urgently required for improvement of results in Mathematics performance.

5.2.2 Educators' Periods of Meeting for Curriculum discussions, Planning & Teaching Approaches.

It has been indicated in the previous chapter that sharing of ideas through curriculum discussions, planning and teaching approaches meetings enhances insight in the delivery of the subject matter in a classroom situation as illustrated on Curriculum and Assessment Policy Statement (CAPS), (2011) document. Figure 4.3 indicates that 24 percent of educators meets once a quarter, which is a concern that there may be a lot of damage that might be incurred while waiting for discussions. The 36 percent that meets once a month reveal an ideal situation and the percentage need to increase in order to improve results performance in Mathematics.

5.2.3 Confidence levels of educators according to Mathematics curriculum sections

According to Mizzi (2013), levels of confidence are important for effective teaching and learning.

Data collected shows that the levels of confidence for educators vary but the main concern is about those with no confidence and less confident, since they are likely to produce poor results in Mathematics.

5.2.3.1 Responses to different sections:

The distribution of participants' responses on prescribed curriculum document "the Annual Teaching Plan" (2015), in this section is illustrated in Table 4.2.

Section 1: Exponents and Surds.

The data shows that there is 1.16 percent of educators who are not confident at all in this section, while 6.98 percent are less confident.

According to the Department of Education (DoE) Curriculum and Assessment Policy Statement, this section consist of 25 marks or more during the final examination paper.

Therefore educators who are not confident and less confident in this section can result to poor performance of learners during exams.

Section 2: Equations and Inequalities.

There is 3.49 percent shown by the data of educators who are less confident in this section. Assessment Policy Statement indicates that this section consist of 25 marks or more during the final examination paper. Again less confident educators can cause learners to perform poorly in this section, thus contributing to the overall poor performance in Mathematics.

Section 3: Number Patterns.

It is a concern that 1.16 percent again in this section do not have confidence and 9.30 percent are less confident. According to the National Curriculum Statement (NCS) assessment policy 25 marks are allocated to the final examination of this section as well. Learners can struggle during the exams leading to poor performance.

Section 4: Analytical Geometry.

The data shows that 26.74 percent of educators are less confident in this section.

The weighting of this section during the final exam is 40 marks or more, according to the policy. This percentage is detrimental to learners content background from less confident educators. This can result to poor performance in Maths as well.

Section 5: Number Patterns, Sequence and Series.

It is a concern that 27.91 percent of educators are less confident in this section with the weighting of 25 marks in the final exam. It is evident that this might have a negative impact on learner performance in this section.

Section : Differential Calculus.

The data shows that 36.05 percent of educators are less confident in this section. According to the assessment policy this section consist of 35 marks in the final exam. Learner performance in this section could be hindered by the fact that they were taught by an educator who was less confident as a result not sure about dynamics of the concepts in problem solving.

Section 8: Trigonometry.

There is 39.53 percent of educators who are less confident in this section according to the data illustration in Table 4.2. (Educators' confidence levels in different sections of Mathematics). Trigonometry has the weighting of 40 marks during final examination. Less confident educators are expected to encounter difficulties towards delivering the new subject matter during classroom teaching. Learners performance in this section is thus expected to be poor.

Section 9: Euclidean Geometry.

It is a concern that 13.95 percent of educators do not have confident at all in this section, and 40.70 percent are less confident. This section has 50 marks during final exams. This is a scary situation, one cannot expect learners taught by such educators to have a good performance in Maths results.

Section 10: Probability.

The data shows that there is 10.47 percent of educators who do not have confidence and 47.67 percent who are less confident. A total of 58.14 percent of educators struggling in this section, it's a frightening scenario. Desirable results won't be produced under these circumstances.

Section 11: Financial Mathematics.

There is a worrying factor of 6.98 percent for educators without any confidence in this section and 47.67 percent who are less confidence. Assessment policy shows that this section has 15 marks in the final exam. Learners taught by educators on these levels of confidence are likely to perform poorly in this section hence contributing to the overall poor results in Maths.

Section 12: Statistics.

In this section the data shows that there is 17.44 percent of educators with no confidence and 32.56 percent who are less confident. Learner performance will be negatively affected for the fact that they are taught by educators on such levels of confidence. According to the assessment policy this section has 20 marks in the final exam. Out of 12 sections of grade 10 – 12 Maths, the data has illustrated that in 5 of them there is a percentage of educators that are not confident at all ranging from 1.16 percent to 17.44 percent, as well as those who are less confident with a percentage ranging from 3.49 percent to 47.67 percent. This is a worrying factor when imagining about the subject matter that the educator will deliver in a classroom teaching situation. If the educator is content challenged it's very rare that he/she can produce good results in mathematics.

5.2.4 Mathematics Educators' Availability

The effects on shortages of mathematics educators can be detrimental in many aspects: learners can lack proper Maths background, it can lead to poor results, learners stay without a Maths teacher.

The DoE system will end up producing less candidates to study for critical skills profession in which Maths is a pre-requisite. Responses of participants according to their degree of opinion to the statement provided are illustrated in Table 4.3.

Statement 1: Learners lack proper background in Maths.

The majority of participants agree with this statement, 83.72 percent (45.35 percent agree and 38.37 percent strongly agree), agree.

Lack of proper background might be the results of being taught by an educator who lacks proper content knowledge. Mji and Makgato (2006) emphasize, "Outdated teaching practices and lack of basic content knowledge have resulted in poor teaching standards", cited by Siyepu (2013).

Statement 2: Poor performance of learners in Maths can be linked with the way in which they were taught.

Data shows that 53.49 percent of educators agree and 23.26 percent strongly agree with the statement, totaling to 76.75percent. According to Siyepu (2013), learners are exposed to different learning opportunities in mathematics. Opportunities to learn include factors like educator availability and their qualifications in mathematics. The way, in which learners are taught, have an impact on their acquisition of new subject matter.

Statement 3: There are sections in grade 10 – 12 Mathematics in which I am also struggling.

The data shows that there is a consensus on this point with a total of 66.28 percent (48.84 percent agreed and 17.44 strongly agreed) agreeing. According to Ibrahim (2015), there are two factors contributing to the mass failure in mathematics: Teachers' influence and Students' mentality. Teachers' influence emanates from poor teaching techniques, inability to simplify the subject and make it practical and poor knowledge of the course.

Due to shortages of Mathematics educators in schools the duty loads for Mathematics are allocated to educators who are not specialist in the subject hence Teacher influence affects learners.

Statement 5: There is only one educator in my school, who is qualified to teach grade 12.

A total of 70.93 percent (39.53 percent agreed and 31.40 percent strongly agreed) of educators agree with the statement. According to Magano (2014), there are a number of unqualified and under-qualified Mathematics educators utilized in teaching mathematics at the schools due to shortages of qualified Mathematics educators.

Statement 6: Most educators are afraid to teach Maths in grade 10 – 12, since they are not confident in other sections

It is a concern that a total of 89.54 percent (65.12 percent agreed and 24.42 percent strongly agreed) of educators agree with the statement.

The insecurities in handling Mathematics in different grades might be caused by being unqualified and under-qualified factors. Due to scarcity of Mathematics educator, duty loads allocation are done not considering competency and qualifications of educators but based on the fact that an educator has done Mathematics in his/her secondary education. According to Humpreys (2015), the DoE's survey reveal that a large number of educators teach classes without relevant credentials.

Statement 7: Due to lack of qualified Maths educators, learners sometimes stay for more than a month without a Maths teacher

The data reflect that 87.21 percent (50 percent agreed and 37.21 percent strongly agreed) of educators confirm that learners sometimes stay longer periods without a Mathematics educator, due to unavailability of qualified Mathematics educators. This scenario can lead to poor results in mathematics. According to Getty (2013) in an article published by Independent, educators without relevant degree teach 22.2 percent of Mathematics lessons.

This is alarming an urgent intervention on proving the pools that will provide Mathematics educators as soon as they are required. The programs that are in place to deal with the demand of Mathematics educators, seemingly they are insufficient.

5.2.5 Educators' highest Qualification in Mathematics

Figures 4.7 and 4.8 illustrates the highest qualification levels of Mathematics educators. It is a concern that: 5 percent of educators don't have qualifications in Mathematics, 19 percent have only grade 12 as their highest Mathematics qualification, and 31 percent have only diplomas in which Maths is one of the modules studied. This reveal that hundreds of learners are being taught by unqualified and under-qualified staff daily. According to Carnoy et al. (2010), the acquisition of pedagogical knowledge is obtained through pre- and in-service training. Therefore it is imperative that Mathematics subject educators need to have sufficient qualifications inorder to effectively handle the subject matter in class.

5.2.6 Challenges on the effective teaching and learning of Mathematics in schools.

Table 4.4 illustrates different challenges in the teaching and learning of Mathematics highlighted by educators. Following is the analysis and discussion of challenges as they appear in Table 4.4:

1. Most rural area parents are not educated hence; learners do not get educational support from home.

Table 4.4 illustrates that; 57.14 percent of educators share the same sentiments. The outcry is based on parents' support towards their children's education. According to Goodall and Harris (2008) cited by Nyama (2010), the actual activities that what parents do to support their children learning in schools and at their homes makes a great different towards learner achievement. Homework supervision by parents as well as attending school visits meetings requested by subject teachers can assist to improve Mathematics results, but due to illiterate levels of parents, these activities are dormant.

Driessen et al. (2005) cited by Nyama (2010), indicated, “Parental involvement has been found to influence the cognitive and social development of children”.

2. Learner progression policy challenges

Table 4.4. Illustrate educators’ common view at 82.14 percent on challenges of learner progression policy. It has been indicated in the previous chapter that learner progression policy stipulates that a learner can only fail once per phase; Due to this policy, second failure in one phase qualifies a learner to progress to the next grade; which could mean that a learner might progress to grade 12 without ever having passed Mathematics in all previous grades. For improving Mathematics results, progression policy needs to be reviewed.

3. Skills are taught instead of Maths for examination results purposes

The data shows that 39.29 percent of educators teach learners skills to answer examination due to exams results pressure, rather than teaching Mathematics concepts and computations. This is a worrying concern because it reveals that learners are taught for examination purposes not to understand computations and Mathematics applications. Educators are faced with a lot of examination results pressure.

According to Henry (2014), examination oriented teaching, affects learners in a negative way. The article further indicates that education should not focus on only attainment of good results but rather focus and ensure provision of a holistic educational experience that imparts desired knowledge, values, attitudes and practical skills.

4. The addition of the 8th subject in substitution of Maths for learners to pass

The illustration of data shows that 50 percent of educators are challenged by the same practice. This is a disturbing practice if it is aimed at substituting Mathematics for learners to pass. It distracts the attention and willpower of learners to focus in Mathematics.

5. Overcrowding in Maths classes

Table 4.4 Illustrate that 32.14 percent of educators are faced with the challenge of overcrowding in Mathematics classes. According to Duru and Korkmaz (2010), there are various hardship experiences in preparing activities for a large enrolment Mathematics class. Large enrolment in Mathematics class; disadvantage an educator in attending to individual attention and thorough supervision of Mathematics work.

6. Lack of resources

The data shows that 75 percent of educators are faced with problems for resources that are inadequate. Resources play critical role towards producing good results in mathematics. There are resources that are necessary to have, just like calculators, without calculators, learners cannot manage computations in mathematics. According to Naidoo (2012), on the article for Journal of the Association for Mathematics Education of South Africa, indicates that there are resources that make mathematics more concrete, assessable, and comprehensible. Such resources enhance chances for results improvement in mathematics.

7. Learners lack motivation, discipline and they don't practice Maths

A serious concern illustrated by data that 53.57 percent of educators are challenged with a situation of learners that lack motivation and discipline. Motivation can be regarded as a key towards effective learning, lack of motivation leads to the development of a negative attitude, then lack of interest in the subject and finally the loss of discipline. After learners' loss of interest, the educators then become discouraged and the end results learners fail the subject.

8. Language barrier challenges

The data shows that 42.86 percent of educators share a common challenge of learners facing language barriers problems in mathematics.

According to Kazima (2006), Kotsopoulos (2007), Xi and Yeping (2008), cited by Shama (2015), they indicated that “Mathematics is strongly connected with language, and in order to succeed in Mathematics a learner must be able to competently understand and use Mathematical language. Language barrier challenges need special intervention in mathematics.

9. Misdirected focus of schools in Mathematics teaching

Table 4.4 illustrate that there is 28.57 percent of educators who are challenged by their schools’ circumstances concerning issues of misdirection in focus for mathematics teaching. Among issues raised was a concern that more attention is given to grade 12 rather than laying firm background from grade 8. Educators with better understanding of Mathematics within a school are not allowed to teach lower grades in order to lay firm foundation for this subject. Such educators are expected to perform wonders with learners found without proper Mathematics background in higher grades. Tsanwani (2009) conducted a study on High performing schools versus Low performing schools; he discovered that in one of the low performing schools there was only one qualified educator to teach Mathematics from grade 10 – 12 classes. The school subject allocation team was forced by circumstances to allocate teachers in lower grades who are not qualified and do not have interest at heart about the subject.

Tsanwani’s investigation confirms that through focus misdirection in schools, Mathematics educators are experiencing performance challenges.

10. Duty loads challenges

Data illustration reveals that 46.43 percent of educators are faced with a challenge of duty loads. Mathematics educators find themselves teaching other subjects, adding more duty load to that of mathematics.

According to Hepburn and Brown (2001) cited by Wang’eri & Okello (2014), teacher work overload is related to paper work, time budgets, and excessive deadlines.

They further highlight that teachers now and then take learners work to mark after hours, involved in teaching extra classes for other subjects, taking part in extra mural activities and as class teachers manage the classroom in which there is a lot of administrative work done.

All of these activities add to educators' duty loads. Such duty loads affect teaching and learning of Mathematics in a classroom situation.

5.3 Conclusion

This chapter presented discussions on fundamental factors that are challenging curriculum management and support, Mathematics educators' availability, underlying factors contributing to the lack of content knowledge to our Mathematics educators, and barriers affecting the effective teaching and learning of Mathematics in schools. The next chapter will present recommendations and conclusion to the study, implications and areas for further study.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

6.1 INTRODUCTION

This chapter will give a brief version of the research findings and will further recommend and conclude the findings. The four objectives that were highlighted in earlier chapters will be tied up with research findings then the study will be brought to closure. The main aim of the study was to verify attributes to poor results performance in Mathematics by the KwaZulu-Natal Department of Education (KZN DoE), focusing at ILembe District. The presentation of objectives achieved is as follows in section 6.2.

6.2 Were the objectives answered?

The research instrument that was used enabled the following objectives to be achieved:

6.2.1 Objective 1: To verify fundamental factors that are challenging curriculum management and support.

Activities involved in Mathematics Curriculum Management and Support

Effective management can be achieved through managers with cognitive capacity to make sense of problems emanating from their experiences. The findings reveal that the cognitive capacity of making sense of problems is insufficient in the School Management Teams. The lack of thorough supervision to curriculum management and support enable educators to spend insufficient time in preparing their subject matter for lesson delivery in a classroom. This has a negative impact on the performance of educators in lesson delivery in class thus producing poor results. Subject improvement plans are not monitored in most schools. This manifest on poor learner improvement strategy monitoring and some educators conducting extra lessons as a matter of compliancy not spending enough time.

The School Management Teams (SMTs) in most schools are not closely monitoring the networking of educators for assistance in challenging areas in Mathematics. The SMT's turnaround strategies among other factors, must indicate how they are going to improve the situation for poor result in Mathematics, and networking is one of powerful remedy to salvage the situation.

Analyzing learner performance in tests or exams, enable an educator to discover learners' challenging areas and thereafter addressing misconceptions and misunderstandings. This activity is poorly managed. The activity is expected to be supervised by Mathematics Head of Department (HOD), and should keep the records of Mathematics educators' analysis as well as improvement strategies based on the analyses. The HOD must further supervise and support the implementation of strategies.

Some educators do not meet with parents to discuss learners' progress. Meeting with parents sessions alleviate the frustrations that educators faced on poor learner performance. Working hand-in-glove with parents towards a better education future for their children improves learner concentration and focus, thus improving the results. SMTs are expected to schedule dates for parents' school visits and they are supposed to monitor, manage and support subject educators during the process. The percentage of educators who are inactive in this activity reveals that there is a challenge in curriculum management and support within the schools.

Educators in other schools do not conduct one-on-one learner consultations sessions. Depriving learners, the opportunity to consult in order to clear confusions and misunderstandings might lead to learners misleading each other. Learners need support from the SMT to monitor all activities involved in curriculum management and support in a school.

6.2.2 Objective 2: Verifying underlying factors contributing to the lack of content knowledge to our Mathematics educators.

Most educators are challenged on different sections in Mathematics, especially Euclidean Geometry and Probability.

Pedagogical content knowledge that has been alluded to in chapter 2 plays a key role towards Mathematics effective teaching and learning. Shulman (1986) defined pedagogical content knowledge as educators' interpretations and transformations of subject matter knowledge in the context of facilitating student learning. According to Weimer (2007), knowing content and being able to teach it, involves separate skills.

Educators' Periods of Meeting for Curriculum discussions, Planning & Teaching Approaches.

The education system in place does not allow educators to meet often in order to share and empower each other. Empowering gatherings of Mathematics educators should be encouraged to take place periodically. Through such gathering educators are empowered, sharpened, and they gain insight on the subject content.

Educators' highest Qualification in Mathematics

Findings have revealed that most Mathematics educators are under-qualified or unqualified. It is evident that under-qualified or unqualified educators whose mathematics content knowledge is limited teach most of learners.

Confidence levels of educators according to Mathematics curriculum section

There are 12 mathematics curriculum sections as indicated by National Curriculum Statement (NCS). In 6 of these sections, according to the findings, educators are not confident at all. In almost all sections there is a reasonable number of educators who are less confident. This indicates that each and every school day learners are taught by a number of either unqualified or underqualified less confident educators . Systems in place by DoE seem not to be adequate to deal with the challenge, hence no improvement in results for Mathematics.

6.2.3 Objective 3: To verify whether our education system is producing enough Mathematics educators (Mathematics Educators' Availability).

According to Arends (2011) from Human Science Research Council (HSRC), on issues of teacher demand and supply, he shows that if the current trend continues, there will be a massive shortage of teachers but more significantly, shortages will be on key subjects. Learners lack proper background in Mathematics. This was because in junior classes grades 8 – 9, duty loads subject allocation team, allocates educators who are not qualified in Mathematics, due to the shortage of Mathematics qualified educators. This is further confirmed by a high percentage of educators who are afraid to teach Mathematics in grade 10 – 12, which are senior classes. This is due to insecurities about the content of a subject matter, since they are not qualified. Unqualified or under-qualified educators teach learners in the absence of qualified; as a result, they perform poorly.

Poor performance of learners in Mathematics can be linked with the way in which they were taught. In few schools, there is only one qualified educator to teach grade 12. Such educators receive learners with poor Mathematics background in senior classes. They struggle in trying to provide the foundation, at the same time expected to cover the work schedule hence poor results are produced. Due to the lack of qualified Mathematics educators, learners sometimes stay for more than a month without Mathematics teachers. This emergency needs an immediate intervention in providing a pool from which Mathematics educators could be obtained and utilized.

6.2.4 Objective 4: Verification of barriers affecting effective teaching and learning of mathematics in schools.

According to Snoeyink and Ertmer (2001) cited by Pia (2015), educators face challenges due to the barriers that exist which can be classified as either external or internal.

Most rural areas parents are not educated hence learners do not get educational support from home.

Learners need parental support towards the future of their education working hand-in-glove with educators. The lack parental support; hinders effective teaching and learning.

According to Topor (2010), parent involvement in a child's education is consistently found to be positively associated with a child's academic performance.

If parents are participating in their children's education, according to Brown (1997), it: boost learners' self-esteem, improves learners' academic achievement, cements parent-learner connection, assist parents to develop positive attitudes about the school, and give parents a better understanding of the schooling activities, cited by Topor (2010). It is therefore important for parents to participate in the education system.

Learner progression policy challenges

Learner progression policy needs to be reviewed; it has a negative impact on Mathematics results in schools. This sensitizes for an urgent intervention. This policy encourages learners to fail Mathematics because they know they cannot fail twice in a grade, second failure in one phase qualifies a learner to progress to the next grade.

Skills are taught instead of Mathematics for examination results purposes

Due to the demand of results improvement by DoE officials, educators end up teaching for examination purposes instead of teaching Mathematics concepts and computations. This brings confusion in teaching and learning of Mathematics, educators adopting misleading strategies in trying to achieve better results.

The addition of the 8th subject in substitution of Mathematics for learners to pass

Schools are introducing the eight subject with an aim of passing learners should they fail Mathematics. This result in learners shifting focus from Mathematics and paying attention the newly introduced subject as it substitutes Mathematics. This is a critical practice if left unattended it will cripple the image and importance of Mathematics. District officials need to intervene on this matter.

Overcrowding in Mathematics classes

Educators are faced with a challenge of overcrowding in their Mathematics classes.

Large enrolments in Mathematics classes disadvantage learners the opportunities to learn and be taught effectively, giving them individual attention, and ongoing homework and class works monitoring.

Lack of resources

Mathematics educators are experiencing inadequate resources. Without enough resources, there are no miracles that could be done by Mathematics educators to produce good results. In most cases, they are improvising.

Learners lack motivation, discipline and they don't practice Mathematics

Learners lack focus and discipline. Without joint effort by parents, educators, SMTs and district officials, this challenge will be difficult to resolve.

Language barrier challenges

Learners are facing a language barrier challenge. For learners to develop Mathematical ability they have to learn and be taught the language of Mathematics and Mathematics through English. Their success in the subject is dependent on competently understanding and using Mathematical language.

Misdirected focus of schools in Mathematics teaching

The demand for better results from officials has resulted in the shift of focus as if grade 12 is the most important grade. Educators are faced with the situation where grades 12 are given full attention and lower grade are neglected. Good results are only obtained in Mathematics if a proper firm background was laid in lower grades.

Duty loads challenges

Mathematics educators are overloaded. The issue of educators being overloaded in their duty loads will always haunt DoE as long as shortages of educators still exist.

A different approach should be engaged in overcoming this barrier since it has a negative impact on the results.

6.3 Research implications

In view of the study findings curriculum management and support in schools is lacking commitment to the members of the SMT. Curriculum management and support is viewed as the heart to the education system. If not properly implemented the education system will always experience hiccups especially in producing good results. Other factors that need to be considered are whether the DoE has sufficient personnel to monitor and support curriculum management. The findings further illustrated that mathematics educators are scarce. Learners sometimes stay for more than 1 month without Mathematics educator. This is detrimental to the outcome of results at the end of the year. This is one of the factors that are crippling effective teaching and learning of mathematics. Mostly schools in the rural areas are victims to this challenge. The rate, at which educators network and attend meetings of curriculum discussions, planning and teaching approaches, is very low. In the process they are deprived the opportunities to content insight and teaching approaches. Revealed by the findings is the issue of Mathematics educators' competency. There are a number of educators without any qualification in Mathematics, others with only grade 12 as highest qualification in this subject, and most of participants with diplomas. The lack of pedagogical content knowledge has an adverse effect towards producing good results in Mathematics. The findings reveal that, there are a number of challenges affecting the effective teaching and learning of Mathematics. Parents do not support their children in schools and SMTs seem to lack strategies in dealing with this challenge. The other burning issue in challenges is the learner progression policy. It encourages learners not to work seriously because either way they will progress to the next grade even if they have failed Mathematics. Educators are teaching a number of learners in FET level who have not passed Mathematics in lower grades. These poor educators are expected to perform miracles in passing such learners.

The results pressure by officials leads to educators adopting misleading methods of teaching where they teach for examination purposes only.

The additional 8th subject by schools in substitution for Mathematics in order for learners to pass is crippling effective teaching of Mathematics. Learners lacking motivation and discipline, lack of resources, language barrier issues, misdirected focus for teaching Mathematics in schools and duty loads challenges.

6.3.1 Application of Results in Practice

In most cases, the implementation plan is confronted with a number of challenges that were not taken into consideration during the planning stage. This always results to failure of good programs. The practical application of results findings will be dependent on the following: insight and vision of the implementers, sufficient personnel in the implementation hierarchy, budget availability, and other programs in operation to remedy the same concern. Mathematics should be managed, supervised and monitored by people who are specialists in the subject, most Head of departments in schools are not subject specialists, they moderate and sign educators work without any understanding on correctness of the content. Curriculum management and support challenges can only be effectively practice if the members of the SMT know and understand their roles and responsibilities in the implementation process. More information sharing sessions and workshops can assist to salvage the situation.

The strategies towards creating a pool in which to find Mathematics educators need to be in place. If it needs to review re-opening of former colleges of education or in-service centers or centers specializing with skill shortages that will service the empowerment of Mathematics educators, that route need to be considered. The number of challenges facing Mathematics educators in effective teaching and learning will be eliminated if all the stakeholders involved join hands towards a better education for all. Further than that all stakeholders must understand their roles and responsibilities in the education system; the findings result demand more workshops on this aspect.

6.3.2 How stakeholders will benefit from the findings?

The findings of the study have revealed grey areas across the hierarchy in the education system: lack of curriculum management and support, unavailability of Mathematics educators, underlying factors contributing to the lack of content knowledge to our mathematics educators, and barriers affecting effective teaching and learning of mathematics in schools. In each and every category, contributory factors are outlined and interpreted which made it easy for a stakeholder who is responsible for that category to engage with the findings in order to resolve unfavorable outcome discovered.

6.4 Recommendations to solve the research problem

In view of the study findings as well as applicable literature reviews the research made the following recommendations:

- As revealed by results that curriculum management and support lacks commitment and understanding of the roles and responsibilities by SMT members. The recommendation is that the district officials take the responsibility to capacitate and monitor SMT's on issues of curriculum management and support as well as its importance.
- Learner progression policy according to the findings is causing havoc. Learners no longer working hard in order to pass; they rely on the policy to progress to the next grade. It is recommended that this policy need to be reviewed for the benefit of improving the quality of our education system.
- Findings further show that Mathematics educators are scarce. Programs that are in place seem to be insufficient. It is recommended that the DoE must utilize its subject experts to lead discussions with higher institutions to draft a relevant module or degree that will provide both content and methods of teaching mathematics in schools.
- The findings revealed that educators lack pedagogical content knowledge. In order to deal with this challenge, it is recommended that DoE must consider opening more in-service trainings centers.

As well as centers of Mathematics empowerment working hand-in-glove with the department. This must capacitate Mathematics educators across the bands, thus creation of the pool of educators for this subject.

- Educators' Periods of Meeting for Curriculum discussions, Planning & Teaching Approaches are limited according to the findings. The recommendation is that during planning meeting by officials they must consider increasing the number of such informative sessions and be cluster focused.
- There are a number of barriers affecting effective teaching and learning of Mathematics in schools shown by the findings. The recommendation is that the school governance sections need to work closely to the schools and need to have enough staff to deal with this challenge. School functionality as well need close monitoring and support.
- As a recommendation the DoE need to put equal efforts to all levels of education in schools from the foundation phase until further education and training phase.
- The findings show that much effort is directed to grade 12 thus lower grades suffer proper background in Mathematics.

6.5 Recommendation for future studies

The study was conducted focusing on the implementation at a school level where the tar hits the road, and looking at the consequences of areas that have been overlooked. It may be necessary to:

- Investigate the functionality of the district officials in supporting implementation of programs and policies as stipulated by DoE in schools.
- Determine the loopholes that affect the operations within the department of education.

6.6 Conclusion

The objectives for the study were critically discussed to unpack the dynamics of the findings. Furthermore, this chapter has reflected on the implication of the research in order to give more clarity on stakeholders involved, and how are they going to benefit from findings. The issue of poor results in Mathematics does not affect the KwaZulu-Natal department of education only. It is a national concern.

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education

Department:
Education
PROVINCE OF KWAZULU-NATAL

Enquiries: Nomangisi Ngubane

Tel: 033 392 1004

Ref.:2/4/8/401

Mr RD Cele
35 Lagoon Drive
LaMercy
4399


Dear Mr Cele

PERMISSION TO CONDUCT RESEARCH IN THE KZN DoE INSTITUTIONS

Your application to conduct research entitled: **“ATTRIBUTES TO POOR RESULTS PERFORMANCE IN MATHEMATICS BY KWAZULU-NATAL DEPARTMENT OF EDUCATION”**, in the KwaZulu-Natal Department of Education Institutions has been approved. The conditions of the approval are as follows:

1. The researcher will make all the arrangements concerning the research and interviews.
2. The researcher must ensure that Educator and learning programmes are not interrupted.
3. Interviews are not conducted during the time of writing examinations in schools.
4. Learners, Educators, Schools and Institutions are not identifiable in any way from the results of the research.
5. A copy of this letter is submitted to District Managers, Principals and Heads of Institutions where the intended research and interviews are to be conducted.
6. The period of investigation is limited to the period from 01 May 2015 to 30 June 2016.
7. Your research and interviews will be limited to the schools you have proposed and approved by the Head of Department. Please note that Principals, Educators, Departmental Officials and Learners are under no obligation to participate or assist you in your investigation.
8. Should you wish to extend the period of your survey at the school(s), please contact Miss Connie Kehologile at the contact numbers below.
9. Upon completion of the research, a brief summary of the findings, recommendations or a full report / dissertation / thesis must be submitted to the research office of the Department. Please address it to The Office of the HOD, Private Bag X9137, Pietermaritzburg, 3200.
10. Please note that your research and interviews will be limited to schools and institutions in KwaZulu-Natal Department of Education.

ILembe District


Nkosingathi S.P. Sishi, PhD
Head of Department: Education
Date: 22 May 2015

ETHICAL CLEARANCE



21 October 2015

Mr Reginald Dumisani Cele (944313514)
Graduate School of Business & Leadership
Westville Campus

Dear Mr Cele,

Protocol reference number: HSS/0465/015M

Project title: Attribute to poor results performance in Mathematics by KwaZulu-Natal Department of Education

Full Approval – Expedited / Amendment Application

In response to your application received on 07 May 2015 and amendment on 21 October 2015, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol have been granted **FULL APPROVAL**.

Amendment:

- Research Methodology

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number.

PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

The ethical clearance certificate is only valid for a period of 3 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

Dr Shenuka Singh (Chair)

/ms

Supervisor: Dr E Munapo
Academic Leader Research: Dr Muhammad Hoque
School Administrator: Ms Zarina Bullyraj

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