# CAPACITY BUILDING FOR CURRICULUM DIFFERENTIATION IN THE TEACHING OF FOUNDATION PHASE MATHEMATICS IN NGWARITSI CIRCUIT, LIMPOPO PROVINCE

**by**

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## DECLARATION

I declare that: “CAPACITY BUILDING FOR CURRICULUM DIFFERENTIATION IN THE TEACHING OF FOUNDATION PHASE MATHEMATICS IN NGWARITSI CIRCUIT, LIMPOPO PROVINCE” is my own work and all the sources used have been acknowledged.

07/04/2014

M.A. MARISHANE DATE

## DEDICATION

*This work is dedicated to my parents*

*MogomaneThermotious and the late Mabuse David Masemola*

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## ABSTRACT

This study aims at examining capacity building for Foundation Phase Mathematics teachers in curriculum differentiation in Limpopo Province. Proceeding within the framework of inclusive education, it takes as its point of departure two issues which are collectively critical for learner performance in Mathematics, namely, teacher capacity and differentiated instruction. The study revolves around the view that for improved learner achievement in Mathematics, particularly in lower grades, instructional practices aimed at supporting learners should be differentiated; and, that for this to be possible, teachers should be equipped with the capacity needed to carry out curriculum differentiation. This view emerges from the convergence of three problems which constitute the motivation for conducting this study. The first problem is poor learner achievement in Mathematics in South Africa, which is a subject dominating the public media and scientific discourse. The second problem is a documented general lack among teachers of appropriate knowledge, skills and attitudes needed for modification and adaptation of curriculum to the differentiated needs of learners. The last problem is the changing curriculum policy context in which teachers work as represented by the current national curriculum policy taking place against the backdrop of the broader South African education transformation agenda, geared towards inclusion. Underlying these problems is the recognition of curriculum as constituting one of the barriers to inclusive education.Based on an assumption that poor performance of learners in the Foundation Phase Mathematics is due to teachers' inability to differentiate curriculum and their lack of the necessary capacity, this study adopts a qualitative research design and follows a qualitative approach to examine the problem. Data was collected by means of interviews, observations and document analysis. Twelve Mathematics teachers from three purposively selected schools and one curriculumadvisor from one circuit participated in the study. Data were analysed by means ofBraun and Clarke's method of thematic analysis. The results present the challenges that Foundation Phase Mathematics teachers face, which include inability to respond to learner diversity and inadequate training in curriculum differentiation.

**Keywords**: curriculum differentiation, capacity building, differentiated instruction continuing professional development, anchoring, flexible grouping, compacting

## LIST OF ABBREVIATIONS

| | |
|---|---|
| AERA | American Educational Research Association |
| ANA | Annual National Assessment |
| CAPS | Curriculum and Assessment Policy Statement |
| CASS | Continuous Assessment |
| CORD | Centre for Occupational Research and Development |
| CPD | Continuing Professional Development |
| DOE | Department of Education |
| HOD | Head of Department |
| LSM | Learning Support Material |
| OECD | Organisation for Economic Cooperation and Development |
| PALAMA | Public Administration Leadership and Management Academy |
| UNEP | United Nations Environment Programme |
| UNESCO | United Nations Educational, Scientific and Cultural Organisation |
| UNICEF | United Nations Children's Fund |

## LIST OF TABLES

**TABLE OF CONTENTS**

# CHAPTER ONE

# GENERAL ORIENTATION

## 1.1 BACKGROUND OF THE STUDY

As part of its broader education transformation agenda, South Africa is pursuing the policy of inclusive education, advocated by such world bodies as the World Bank, United Nations Educational, Scientific and Cultural Organisation (UNESCO) and Organisation for Economic Cooperation and Development (OECD). In practical terms, inclusive education is a process that involves modification in contents, structures, approaches and strategies to cover all children (UNESCO, 2009. It is an approach to education directed at the realisation of a broader vision of the World Declaration on Education for All (UNESCO, 2000). One important principle underpinning an inclusive education approach, according to the Department of Education (DoE), is that all learners should be given the opportunity to learn together, despite their differences in terms of age, ethnicity, language, class, disability and HIV status(DoE, 2001:16). This involves maximising learner participation in learning processes and activities by identification and removal of barriers to learning. The curriculum has been identified in many education systems as one of the major barriers to facilitating the development of more inclusive system (UNESCO, 2003:16). Curriculum that constituting major barriers to inclusion include content, assessment, teaching styles, learning support materials and equipment, instructional time, methods and processes, medium of instruction, classroom organisation and management (DoE, 2001:19).

For the curriculum to be accessible and thus, inclusive for all learners, it needs to be differentiated. Curriculum differentiation refers to changes that relate specifically to instruction or curriculum content. It deals with adaptation, modification and any adjustment to learning, teaching and assessment environment (DoE, 2006:105). In practical terms it may be seen as a process of modifying or adapting the curriculum according to the different ability levels of learners in one class (UNESCO, 2004a:14).

This implies that the curriculum should provide opportunities for adaptation to the individual differences and needs of all learners. For this to be realised, learners need optimal learning support from teachers as people who are in direct contact with them. There is, however, a general lack of capacity among teachers to adapt curriculum to the differentiated needs of learners as various studies show (UNESCO, 2005; Vaillant, 2011). It is particularly pointed out that teachers lack knowledge and skills needed for adapting, modifying and differentiating teaching to ensure that all learners learn to their potential (UNESCO, 2004a:6). What this suggests is that for teachers to succeed in supporting all learners to reach their potential they need to be equipped for the task – they need capacity building. Building capacity for teachers refers provision of the essential resources, materials and 'tools' that are required for effective teaching (Egbo, 2011).

It is at the Foundation Phase where support for learners in curriculum, particularly in Mathematics, is most needed, since this phase is an important entry point into the education system and into the future of learners. This is because it is at this point where learners start to learn together; where learners and teachers, teaching and learning processes start to interact; and where teachers play a critical role in curriculum policy implementation as professional education service providers. As key players in curriculum delivery at this level, teachers are best positioned to give the necessary support to learners, on condition that they possess the needed capacity to carry out the task.

The emergence of special needs education (DoE, 2001) on the education landscape together with studies that continue to show that the majority of learners in our schools lack skills in numeracy, literacy and visualisation (Foko, 2006) suggests a need for teacher capacity building. Capacity building is a focused and specialized professional assistance which is provided to those who lack, and thus, need such assistance. It is a personal and professional development process that equips teachers with knowledge and skills necessary to support learners. Teacher capacity-building for sustainable inclusive education delivery through differentiated curriculum is critical for the realisation of the vision of Education for All.

## 1.2 MOTIVATION TO EMBARK ON THE STUDY

Schools in South Africa like other schools in countries experiencing education reform are required to implement the national policy on inclusive education. Central to this policy is the view that all learners should learn together despite the diversity of their differences and needs. In other words, the policy suggests that differences existing among learners with regard to capabilities, disabilities, needs and interests should not exclude them from participation in education. For this to be possible, curriculum should be differentiated. The researcher's preliminary study reveals two sets of challenges relating to the current curriculum. The first set of challenges relates to transforming the curriculum at the institutional level in such a way that it is adaptable to learners' diverse needs and differences. The second set of challenge relates to teachers' capacity to engage meaningfully in performing this task. On the side-line of the latter set of challenges, is the fact that majority of teachers in South Africa are still struggling to come to grips with the changes taking place in the National Curriculum. Viewed collectively, the two sets of challenges suggest a need for study into curriculum differentiation and capacity building for teachers who will carry out this task for the benefit of all learners within the framework of a transformed National Curriculum.

As a primary school teacher who has been teaching Mathematics in the Foundation Phase for many years, the researcher was motivated by a direct and well-informed personal experience of the above-mentioned challenges in her daily world of practice to conduct this study.She hoped that what the study would reveal eventually would not only assist in improving her personal practice, but would also be a valuable resource of guidance to others in the profession. Because of the aforementioned reason and the fact that the primary school represents an entry point for learners into the education system, this study would focus on the differentiated curriculum and teaching practice as they apply to the Foundation Phase Mathematics within the realm of an inclusive education approach. The focus on Mathematics stems from studies that continue to reveal worrying trends in the mathematics performance of South African learners (Mji&Makgatho, 2006; Naroth, 2010; Baloyi, 2011),

particularly when compared with the performance of learners from countries with the same level of development as South Africa.

## 1.3 PROBLEM STATEMENT

Current policies on inclusive education carried out in response to international calls for Education for All are based on fundamental principle that all learners should have equal opportunity to learn together. The application of this principle in the school environment involves the reduction of all possible barriers to learning to ensure that all learners, including those previously marginalized and excluded from participation in the education system could receive quality education. Since the curriculum is identified as one of the barriers that stand in the way of providing quality education to all learners, teachers as key players at school level are expected to ensure learners' access to curriculum. The researcher was of the view that this required adaptation of the curriculum to the differentiated needs of learners and capacity building for teachers to carry out this task in support of learners in the classroom. The problem was how to bring the two processes together in a primary school setting.

## 1.4. RESEARCH QUESTION

In the light of the statement presented above, this study intended on seeking an answer to the question: How are teachers capacitated to apply curriculum differentiation in the teaching of Foundation Phase Mathematics? The following sub-questions emerging from the main question were raised in this study:

1.4.1 How do teachers respond to learner diversity in the class?

1.4.2 What challenges do teachers experience when applying curriculum differentiation in the class?

1.4.3 What capacity-building strategies are needed for curriculum differentiation in the class?

## 1.5 AIM OF THE RESEARCH

The aim of this research was to examine capacity building for Foundation Phase Mathematics teachers in curriculum differentiation. To achieve this aim, the following specific objectives would be pursued in this study:

1.5.1 To examine how teachers respond to learner diversity in the class.
1.5.2 To find out the challenges teachers experience in applying curriculum differentiation in the class.
1.5.3 To explore strategies for capacity building for curriculum differentiation in the class.

## 1.6 LITERATURE REVIEW

The researcher intended to review both primary sources and secondary sources as part of the study. Among primary sources, the review covered policies, legislation and journal articles that presented recent information on key concepts of curriculum differentiation, capacity building, and inclusive education. The review of secondary sources covered academic books, newspaper and research articles interpreting previous findings. For the purpose of this study, the researcher has conducted a preliminary literature review with special focus on two key issues, namely, curriculum differentiation and capacity building for teachers. The preliminary literature review has provided the researcher with a theoretical framework underpinning the two issues. This has enabled her to pursue the study within a specific educational context, namely, the inclusive education.

### 1.6.1 Curriculum differentiation and its role in teaching and learning

Since learners have different strengths and weaknesses that need to be identified and accommodated in the instructional (teaching, learning and assessment) programme, curriculum differentiation is seen as a viable strategy to support all learners regardless of their weaknesses and strengths. This is because it is seen as providing flexibility in terms of concepts, processes and products that can cater for

learners' individual learning needs (Noble, 2004:193). The implementation of curriculum differentiation in the classrooms can develop learners' confidence and success, that is, give learners the opportunity to display their talents. Studies showed that most learners who experience curriculum-based barriers to learning demonstrate fear of failure and become passive in the classroom (Brunvand& Byrd, 2011; Haywood et al., 2009). What these studies suggest is that when the curriculum is undifferentiated, lack of participation, interest and confidence may emerge among learners in the classroom, especially when learners cannot identify themselves with its content (Haywood et al., 2009). This may affect effective teaching and learning, leading to poor academic achievement.

### 1.6.2 **Importance of curriculum differentiation to learners**

Reports from studies conducted in recent years show that curriculum differentiation benefits both the gifted learners and the low-attaining learners. Three examples can be cited in this regard. Firstly, in their study into effective teaching and learning for pupils in low-attaining groups (Dunne, Humphreys, Sebba, Dyson &Muijs, 2007) has found that when curriculum differentiation is followed in such extra support programmes as literacy/English and numeracy/Mathematics, low-attaining learners no longer show signs of withdrawal from their class. What this implies is that curriculum differentiation enables learners to become confident as they use their strengths to overcome their weaknesses. Secondly, study into curriculum differentiation for gifted primary school Mathematics learners (Wilkins, Wilkins& Oliver, 2006) shows us curriculum differentiated enables gifted learners to reach their potential in mathematics by developing their skills, motivation and perseverance. In other words, through curriculum differentiation gifted learners learn not to take things for granted, but rather to see mathematics as a subject in which they have to struggle to achieve success. Lastly, the study conducted in the US (Mastropieri, Scruggs, Norland, Berkely, McDuffie, Tornquist& Connors, 2006) shows that differentiated curriculum enhancement improves the academic performance of learners with disabilities. Curriculum differentiation can therefore,

benefit these learners and thus, eliminate any feeling of isolation from the teaching and learning process.

### 1.6.3 **Access to learning through curriculum differentiation**

In their discussion called "*E-forum Discussion Paper on Inclusive Education and Inclusive Curriculum,"*Halinen and Savolainen (2009) argue that while curriculum is indisputably one major area that can foster inclusive education, it can become a barrier for inclusion. Though this depends on a number of contextual exclusion factors, one common dominating exclusion factor that prevails in all contexts is perceived to be the lack of a robust, motivated, relevant and flexible curriculum (Acedo, Opertti, Brady &Duncombe, 2011:13). This is a curriculum that does not accommodate and address the different needs of learners – a curriculum that is not accessible. In other words, for curriculum to be accessible to all learners in the class, curricular content, context, processes and provisions and approaches should be tailored to thepersonal needs of all learners (Acedo et al., 2011:15). In the South African context there are two systemic educational developments that reinforce access to curriculum. The first development is represented by the Education White Paper 6 on Special Needs Education outlines how the education and training system must change to accommodate the full range of learning needs with particular attention to strategies for instructional and curriculum transformation (DoE, 2001:11). Among other things, the White Paper envisages a future in which learners with special needs will be accommodated in mainstream schools. The second development is represented by the introduction of the new approach to the National Curriculum represented by such innovations as Curriculum and Assessment Policy Statement (CAPS), Annual National Assessment (ANA), emphasis on workbooks and teacher development (DoE, 2012a).

### 1.6.4 **Teacher capacity building**

Among a wide range of barriers to learning two main sets of barriers which revolve around curriculum become prominent, namely, access to and learner participation in

curriculum and teacher involvement in effective curriculum delivery to ensure both access to and participation in curriculum.The two sets of barriers pose at least two capacity-building challenges for teachers, namely organisational challenges and teacher competency challenges.

#### *1.6.4.1 Organisational challenges*

The first challenge is of organisational nature and involves establishing a close connection between learners and the curriculum by creating opportunities for learners to have equal access to the curriculum and ensuring that once access has been gained, learners will participate actively in learning despite their diverse needs. This places demands on teachers to organise curriculum in such a way that it will be inclusive. In other words, “the curriculum must be tailored to the needs of children in different or difficult circumstances” (UNICEF, 2007:33). Here the main emphasis fall on how to adapt the curriculum to the different needs of learners, that is, make it ‘learner-friendly’ in a given context (school). Adapting the curriculum to meet the learners’ needs is an essential part of an effective approach to inclusion (OFSTED, 2004:13).

#### *1.6.4.2 Teacher competency challenges*

The second challenge is of practical nature and revolves around the competencies required on the part of teachers to support learners realise their full potential through curriculum. This challenge stems from the recognition within the inclusive education system of the teacher’s primary responsibility for meeting the needs of each learner (UNESCO, 2008:12). In order to meet the needs of each learner and ensure success for every learner in the classroom, Nel (2007:2) suggests that teachers need to be qualified, competent, dedicated and caring. This is the issue of teacher capacity and what it suggests is that teachers need to possess appropriate knowledge, skills, values and attitudes necessary for successful achievement of learners as they deliver the curriculum in the classroom. In other words, for teachers to succeed in supporting all learners in an inclusive learning environment there is a need for change in their teaching practices. Here the challenge is how “to further and

continuously strengthen the competencies of teachers in order to enable them to take leading role in modernising the teaching-learning process" (UNESCO, 2005:71). This suggests the need for teacher development to acquire skills needed for inclusive curriculum delivery in an inclusive school environment where improvement in teaching and learning is pursued.

Research indicates that the starting point for any school improvement must be the teaching staff (Ainscow, 2005:11). This, in turn, suggests that teacher development for improved teaching practice should be a prerequisite for effective learning in an inclusive classroom environment where such improvement is to be pursued and sustained. To sustain such development necessitates longer-term and persistent strategies for capacity building at the school level (Ainscow, 2005:8). The focus on teacher development at the institutional or school level is crucial as it underscores the view that "classroom practices influence teaching and learning" (UNESCO, 2007:29). Central to these classroom practices is curriculum delivery to learners in the class through differentiated instruction. Differentiated instruction involves "instructional practices and teaching strategies that are inclusive in nature, practices that enable all children including those with disabilities to access and succeed in the general education classroom and curriculum" (Santmaria& Thousand, 2004:15). The emphasis on the classroom stems from the fact it is at this level where teaching and learning processes, learners, teachers and the curriculum interact.

It follows from the discussions outlined above that challenges relating to the curriculum as a barrier to learning are of both organisational and practical nature and for this reason, require teachers who possess the capacity to give the necessary support to learners. In the light of the preliminary literature review, this study laid more emphasis on the two connected key issues of curriculum differentiation and capacity building.

## 1.7 RESEARCH METHODOLOGY

The study of curriculum differentiation requires a qualitative research design. Qualitative research focuses on the study of phenomena in their natural settings and tries to interpret and understand them in terms of the meaning people bring to them

(Denzin& Lincoln, 2005:3). After careful consideration of the research objectives in this study, the researcher decided to follow the qualitative methodology for gathering and analysing her data. In this case the researcher chose to undertake a case study because the study aims to examine capacity building for Foundation Phase Mathematics teachers in curriculum differentiation. According to Gerring(2004: 342) a case study involves" an intensive study of a single unit for the purpose of understandinga large class of (similar) units." A unit in this study refers to teacher capacity in the teaching of differentiated Mathematics curriculum. Given importance of qualitative research and its relation to the research problem in this study, she found it imperative to apply observation, in-depth and focus group interviews and study documents as data collection methods suitable for addressing the research problem and answering the research questions already stated above.

The observation strategy of the qualitative methodology involved a series of 30-minutes observation sessions of teachers as they presented their lessons in the classroom and taking notes during the process. As an observer, the researcher was be able to study the interaction between the teacher and the learners and thus got a better understanding of how curriculum is delivered to learners in the classroom. Data collected through the observation strategy enabled the researcher to get answers to the first two research questions raised in 1.3.1 and 1.3.2. Lesson plans in teachers' workbooks were studied to establish their alignment with the actual lesson presentations in the classrooms. Three (3) focus group interviews with teachers whose lessons were observed were conducted subsequent to observations. Each of this interviews lasted for 45 minutes. This, in the researcher's opinion, would enhance the quality of data collection since focus groups are found to be useful when multiple viewpoints are needed in a specific topic (Letts, Wilkins, Law, Stewart, Bosch,& Westmorland, 2007). In addition to the focus group interviews, one in-depth interview was held with one curriculum advisor from Ngwaritsi Circuit Office. The purpose of the interviews was to establish capacity building strategies currently applied to support teachers who teach Mathematics in an inclusive classroom setting. Data gathered from these interviews assisted the researcher in addressing the research question raised in 1.3.3. A voice recorder and a semi-structured interview schedule were used as data-gathering instruments. Bean (2011:174)

emphasizes the importance of interviews in a study like this by stating that they “yield a gold mine of insights into people’s lives and situations.”

### 1.7.1 **Population**

Ngwaritsi Circuit has a population of 23 primary schools. For this study, the population comprised curriculum advisors and primary schools and teachers involved in teaching Mathematics in the four grades of the Foundation Phase, namely, Grades R 1, 2 and 3. Because of the size of the Ngwaritsi Circuit and the time and financial constraints involved in covering all schools, only a sample of schools, teachers and curriculum advisors drawn from the population would be studied as explained in the next paragraph.

### 1.7.2 Sample

The researcher’s prior review of research methodology studies let her to the conclusion that the most common type of sampling was purposive sampling. After consideration of the different types of sampling procedures and the objectives of this study, the researcher selected a criterion sampling as one of the purposive sampling strategies advocated by Given (2008: 697-698). The criteria used in the selection would be that (a) teachers involved in the study should have attended at least one workshop on curriculum organized by the Circuit and (b) worked for more than one year as subject teacher in the Foundation Phase. One head of department (HOD) responsible for the Foundation Phase would join the group. The teachers’ experience and prior participation in in-service training, the researcher believed, would add value to the data to be collected to enhance the quality thereof. The inclusion of an HOD in the focus group is based on the understanding that HODs play an important role in the implementation of curriculum (Gulston, 2010). They are responsible for guiding, supporting, monitoring and giving strategic direction to teachers. In terms of the sample size, a sample of three (3) primary schools out of a total of 23 schools in the Ngwaritsi Circuit would be drawn. From each school, one Mathematics teacher from each Foundation Phase grade (Grades R to Grade 3)

would participate in the study, giving the researcher a sample size of 15 participants. Table 1 summarises the data.

**Table 1: Participants in a study into Teacher Capacity for Curriculum Differentiation**

| Schools | Teachers | | | | | Total |
|---|---|---|---|---|---|---|
| | Grade R | Grade 1 | Grade 2 | Grade 3 | HOD | |
| A | 1 | 1 | 1 | 1 | 1 | 5 |
| B | 1 | 1 | 1 | 1 | 1 | 5 |
| C | 1 | 1 | 1 | 1 | 1 | 5 |
| **Total** | 3 | 3 | 3 | 3 | 3 | **15** |

### 1.7.3 Data analysis

The qualitative data collected from lesson observations, study of teachers' lesson plans, and from interviews with teachers and the curriculum advisors were analysed thematically. Thematic analysis is a defined as a method followed in identifying,analysing and reporting patterns or themes within data (Braun & Clarke, 2006:101). In this study, the researcher would analyse data by following Braun and Clarke's five-phase thematic analysis strategy (Braun & Clarke, 2006:87) which cover the following procedure:

- Familiarizing oneself with data
- generating initial codes
- searching for themes
- reviewing themes
- defining and naming themes, and
- generating a report

As Bean (2011: 173) once remarked, "the quality of research depends on the quality of data analysed." Having studied the above-mentioned strategy, the researcher was convinced that when applied to data gathered in this study, it would enhance its quality.

## 1.8 RESEARCH ETHICS

Given that this study would involve people who were expected to share their personal views regarding the research problem, it would be important to assure them in advance of the confidentiality and security of the data they were going to provide to avoid any harm that they might incur as a result of the disclosure of such data. The researcher was also well aware of the fact that this study would most likely culminate into a product that would appear in a public domain. She was also aware that she was obliged to work within the boundaries of professional ethics and standards. Considering the two grounds, the researcher planned to take the following ethical measures:

- To seek prior permission from the Limpopo Department of Education through the Circuit Manager in charge of Ngwaritsi Circuit to conduct the study in the selected schools.
- To draw a consent form to be given to participants (teachers and the curriculum advisor), requesting their permission for engaging them in the study and assuring their anonymity in the process and to have the example of this form provided as an attachment to the final product.
- To acknowledge sources referred to throughout the study to assist other researchers with potential interest in the study problem area with reference material.
- To share knowledge and results of this study not only with participants in the study, but also with the broader community by publishing them both as a dissertation and a research article in an accredited and peer-reviewed scientific journal, since the results are of public interest.

## 1.9 LIST OF TERMS

The following key concepts pertaining to the study problem are used frequently in this study and for this reason, defined as follows:

**1.9.1. Capacity building**: The concept capacity building as defined in literature (Egbo, 2011) refers investment in and allocation of physical, intellectual or human resources to an institution or social context. As used in this study, capacity building refers to the development of knowledge and skills andimprovement of attitudes of teachers involved in curriculum implementation and the empowerment of these individuals in matters relating to curriculum.

**1.9.2 Curriculum differentiation**: There are various definitions of curriculum differentiation depending on the aspect of teaching and learning (learners, curriculum, instruction and learning environment) being described (Kaplan, 2004:18). Curriculum differentiation is a strategy for responding to the diverse learning styles and needs of learners (DoE, 2011a:7). As used in this study, curriculum differentiation is the process in which curriculum is modified or adapted to the different ability levels of learners in a given class through instruction, assessment, content and leaning support materials (LSM).

**1.9.3Differentiated instruction**: Differentiated is an approach to teaching that enables the successful inclusion of all learners, including the disabled in the general-education classroom (Broderick, et al. 2005: 194). It is defined “a set of strategies that will help teachers meet each child where they are and when they enter class and move them forward as far as possible on their educational path” (Levy, 2008:162). In other words, it covers inclusive instructional practices and teaching strategies that enable all children including those with disabilities to access and succeed in the general education classroom and curriculum.

**1.9.4 Ngwaritsi Circuit:** Ngwaritsi Circuit is situated in the middle of the Greater Sekhukhune District in Limpopo Province. The circuit is predominantly rural and is one of the 33 circuits into which the district is divided. The circuit has 23 primary schools.

**1.9.5 Foundation Phase:** Referstothe first four grades in the primary school, namely, Grade R, Grade1, Grade 2 and Grade 3.

## 1.9 OUTLINE OF STUDY

The study follows the following structure or outline:

Chapter One focuses on General Orientation and deals with matters such as rational for the study, statement of the problem, aim of the study, definition of concepts and division into chapters.

Chapter Two focuses on Curriculum Differentiation and the Need for Teacher Capacity.

Chapter Three deals with the Research Design and Methodology.

Chapter Four deals with the Analysis and Interpretation of Results.

Chapter Five covers Summary, Recommendations and Conclusions.

## 1.10 CONCLUSION

The aim of this chapter was to present a general background of the research into Curriculum Differentiation in the Teaching of Foundation Phase Mathematics Teachers with special reference to Ngwaritsi Circuit in Limpopo Province in order to orientate the reader. The next chapter will focus on the review of literature on curriculum differentiation for Foundation Phase Mathematics and the need for teacher capacity in the process.

# CHAPTER 2

# CURRICULUM DIFFERENTIATION AND THE NEED FOR TEACHER CAPACITY

## 2.1 INTRODUCTION

Poor learner achievement in Mathematics in South Africa is one of the headlines that occupy space on public media and is quite often talked about in scientific studies (Monama, 2011; Bloch, 2012; Meier, 2011). What gives a great sense of discomfort is when such achievement is compared with the achievement of other learners on the African continent. A study by Ross and Zuze (2004:6) has found that South African learners perform poorly when compared with their counterparts in other African countries. Such a finding is corroborated by the recent World Economic Forum report (Schwab, 2012) that places the country at the bottom in terms of the quality of Mathematics performance. A study by Human Sciences Research Council (Reddy &Janse van Rensberg, 2011) has found that despite the recognition of the importance of Mathematics skills for high skills capacity that South Africa requires as well as active citizen participation in the knowledge economy, 70% of the country's schools are underperforming in Mathematics. This is inevitably worrying and given such performance, the spotlight now falls on how teachers teach Mathematics, particularly at the Foundation level. The reason for focusing at this level is defended on the scientific ground that it is in the early years where the child's foundational knowledge and skills are acquired (Reddy, Van den Berg, Janse van Rensberg& Taylor, 2012:108). What this suggests is that failure to teach learners Mathematics effectively at the foundation level, may impact negatively on the learners' performance in subsequent schooling levels. A recent Department of Basic Education's Annual National Assessment (DoE, 2012a) showing a Grade 9 national Mathematics average of 13 %, validates this point.

Given the picture presented above, it is important to note that learners that enter a primary school to begin their education in the Foundation Phase come from different backgrounds and come with different needs, profiles, problems and abilities. Despite these differences, the learners should receive quality education and benefit equally

from the curriculum through which such education is delivered in the school. This implies that curriculum should be differentiated. The importance of differentiating curriculum for learners with different educational needs, abilities and behavioral problems has been recognized for many years and documented in many studies (Tomlinson, 1995; Guild, 2001; Subban, 2006). This recognition resulted from absence of empirical evidence in support of segregated education (Sobsey, 2005). Absence of such evidence has generated advocacy by the international community for nations to pursue the ideals of *InclusiveEducation* and *Quality Education for All* learners (Acedo, Opertti, Brady &Duncombe, 2011; UNESCO, 2000). These ideals include addressing and responding to the needs of all learners, reducing exclusion from and within education and increasing participation of learners in the learning process ( Acedo et al., 2011:6). It is against the background of these ideals that the importance of curriculum differentiation is enhanced. Given such importance, they emerging educational trends throughout the world reflect a significant increase in the diversity of classrooms that cater for learners from diverse backgrounds, learners with disabilities, and gifted learners. These trends signal a need for teachers to be responsive and approach curriculum and instruction in a different way if learners are to benefit from teaching and learning process.

The implication for the above-mentioned trends in the teaching of Mathematics is that when teachers plan their lessons and present them in the classrooms, they should do so with full recognition, understanding and acceptance of the reality that learners are not the same. This puts at least two demands on teachers. The first demand is for teachers to change their attitudes towards inclusion (Sharma, Forlin, Loreman, & Earle, 2006:81). They have to accept that despite their diversity, learners have to receive the same quality instruction under the same roof. The second demand is for teachers to differentiate instruction by revisiting their teaching and instructional practices and adjusting their teaching methods in line with current trends (Subban, 2006: 935). In other words, teachers should ensure that in the Foundation Phase Mathematics classes, the learning content, teaching and learning processes, activities and outcomes are adjusted to the different needs of learners. The same should apply to the classroom environment. What these demands suggest is that teachers should possess the necessary capacity to deliver curriculum in a

differentiated manner. In other words, for teachers to deliver curriculum in this manner they need to have sufficient knowledge, relevant skills, professional values, positive attitudes as well as motivation. Teacher capacity for curriculum delivery, as studies show (Scott & Spencer, 2006; Hlongwana, 2007) requires professional development for teachers.

Given the background picture presented above, this chapter focuses on curriculum differentiation in the teaching of Foundation Phase Mathematics with consideration given to five key aspects. These aspects cover the theoretical framework for the study, legislative and policy framework, principles underlying curriculum differentiation, differentiated Mathematics instruction, and, capacity building for teachers.

## 2.2 UNDERSTANDING THE NATURE AND SCOPE OF CURRICULUM DIFFERENTIATION

Curriculum differentiation, otherwise identified as differentiated instruction, is a process that involves adaptation or modification of the curriculum according to the different ability levels of the learners in one class (UNESCO, 2004:14). It is an approach to curriculum and instruction in which the teacher focuses on learners by appreciating their diversity in terms of learning preferences, abilities, styles, and interests and then adjust learning content, learning process, learning product and learning environment using various methods, strategies and learning support materials to cater for such diversity. Tomlinson (2000: 1) the leading expert in the field defines differentiated instruction in the following words:

> *… differentiation consists of the efforts of teachers to respond to variance among learners in the classroom. Whenever a teacher reaches out to an individual or small group to vary his or her teaching in order to create the best learning experience possible, that teacher is differentiating instruction.*

From the preceding definitions of differentiated instruction, one can deduce that the approach represents a paradigm shift in emphasis from a traditional focus on the teacher to a focus on the learner. Guided by a set of key principles and the teacher's application of appropriate strategies, differentiated instruction is context-bound and thus, takes place within a specific environment, notably, the classroom environment. The latter consists of elements through which curriculum differentiation takes place with more focus given to learner diversity as the following two paragraphs indicate.

### 2.2.1 Differentiating instruction in the Foundation Phase classroom: Tomlinson's model of differentiated Instruction

Curriculum differentiation as presented in Tomlinson's model (Tomlinson, 1999, 2000; 2001, 2003) is about the teacher's response to the learners' needs. For such response to occur, the teacher should have an in-depth understanding of the learner diversity, the principles that should guide such response, elements of a differentiated classroom and relevant strategies to be applied to achieve success in the process. These issues are briefly discussed below.

#### 2.2.1.1 *Understanding learner diversity*

Understanding learner diversity simply means understanding learners' characteristics and differentiated needs as informed by three important dimensions, namely, their prior learning experience, interests and learning profile. According to Tomlinson (2008: 27), one important requirement of curriculum differentiation is for teachers to know their learners. In other words, learners will most likely feel connected to their teachers and have confidence and trust that these teachers know them and their special needs. Tomlinson (2008:27) warns that lack of teacher-learner connectedness may spell academic failure. This is because learners cannot succeed in achieving their potential from learning if they are detached from those who are supposed to provide such learning. This view is supported by studies that shows teacher-learner relationships as having as being of considerable importance

to pupils' experiences of schooling (Munn, Lloyd & Cullen, 2000:147; Corrie, 2002:28).

#### 2.2.1.2 ***Key principles guiding differentiated instruction***

There are three sets of principles guiding differentiated instruction, namely, respectable task, flexible grouping and ongoing assessment and adjustment (Tomlinson & Strickland, 2005:16-18). These principles can be briefly described as follows:

a) *Respectable tasks:* In a differentiated instruction process, the teacher should ensure that the work given to learners is appreciated by these learners as valuable and meaningful. This implies that the learners should find the classroom activities and tasks given to them interesting and understandable and providing them with a sense of learning. In other words, learners should not be given work to 'keep them busy'.

b) *Flexible grouping:* Flexible grouping involves the creation of conditions in the classroom where learners have a freedom of choosing the groups they want to belong to during the teaching and learning process. The teacher modifies and adapts the size of a group depending on the teaching and learning activities, learners' interests and sitting arrangements in the classroom.

c) *Continuous instruction-linked assessment and adjustment*: Applying this principle involves an on-going formal and informal assessment of learners' work to identify differences in learners' learning weaknesses and strengths. Knowledge gained from such assessment enables the teacher to adjust teaching to the learners' abilities to maximize their self-confidence.

#### 2.2.1.3 ***Elements of a differentiated classroom***

There are four classroom elements available to teachers for differentiation, based on the learner's readiness, interest, or learning profile, according to Tomlinson's model, namely, content and process.

a) *Content* refers to what the teacher would like learners to learn and how to access it. As Watts (2010:5) puts it, content includes "essential knowledge, skills, facts, concepts, principles, and generalizations that the teacher conveys to students through instruction." One example of differentiated content that may be cited here is the use of different teaching and learning support materials (videos, computer programmes, voice recorder and slides) to teach the same content to different learners.
b) *Process* refers to the manner in which content is taught (Corley, 2005:14). It involves activities in which learners engage in order to gain and enhance their understanding of the curriculum delivered to them. An example may be a classroom situation in which different learners are given the same assignment with varying difficulty different completion times, while pursuing the achievement of the same learning outcome.
c) *Product* refers to the means by which learners demonstrate their knowledge, understanding and abilities (Tomlinson & Strickland, 2005: 8). It includes a variety of modalities through which learners can demonstrate to the teacher what they have learned from the curriculum. Such modalities include written work, projects, models and oral presentation.

#### 2.2.1.4 ***Strategies for differentiated instruction***

For the simple reason that learners are not the same, teachers need to apply different instructional strategies in the classroom to ensure their maximum participation in the curriculum. Such strategies include applying varying questioning strategies; varying the complexity of questions and tasks; designing multi-level activities that blend assessment and instruction; and, establishing multi-level centres or stations in the classroom (UNESCO, 2004:57-62). These strategies can be briefly explained as follows:

a) *Applying varying questioning strategies*: Application of various questioning strategies implies that when teachers ask questions for learners in the classroom they should consider such important aspects as learners' interests, learning profiles and their state of readiness. For instance, while some learners may like to answer questions orally, others may prefer to give written

answers to questions and still more others may prefer additional time to answer questions.

b) *Varying the complexity of questions and tasks*: For learners to derive confidence from lessons presented, tasks and questions given to them need to be adjusted to their unique talents and abilities. This, as Anderson (2007:51) puts it, should be done without compromising "curriculum standards and performance expectations."

c) *Designing multi-level activities that blend assessment and instruction*: For learning activities to be meaningful and benefit all learners, what learners are taught during the lesson should be combined with assessment. In other words, assessment needs to be continuous.

d) *Establishing multi-level centres or stations in the classroom*: Establishment of multi-level centres or stations in the classroom implies that the classroom should be physically arranged in such a manner that learners interested in different learning activities can sit and learn together. For example, learners can be grouped together at a work station on the basis of their shared interest in a particular topic or exercise.

## 2.3 CONSTITUTIONAL, LEGISLATIVE AND POLICY CONTEXT UNDERLYING CURRICULUM DIFFERENTIATION

Curriculum differentiation for Mathematics in South Africa can be understood within the context of the constitutional imperative of the right to education embedded in the South African Constitution (South Africa, 1996), the national legislation on education (DoE, 1996), inclusive policies (DoE, 2001; 2011b) and guidelines relating to teaching and learning (DoE, 2011a). These issues are briefly discussed in the following paragraph.

### 2.3.1 **The South African Constitution and Legislation**

Both the Constitution and the national legislation on education lay the foundation for curriculum differentiation. In its preamble, the South African Schools Act No 84 of 1996 (DoE, 1996) stresses the importance of providing quality education for and

upholding the rights of all learners. In the same manner Section 29 (1) of the South African Constitution (South Africa, 1996) under the Bill of Rights guarantees the right to education for everyone. Interpreting the two laws in relation to this study, one will argue that every learner in the Mathematics classroom has the right to quality Mathematics instruction regardless of their abilities, disabilities, background and needs.

### 2.3.2 **Inclusive Education Policies**

There are a couple of key policies with bearing on curriculum differentiation. They are specifically the National Education Policy on Inclusive Education (DoE, 2001) and the National Curriculum Statement Grades R-12 (DoE, 2011b)

#### 2.3.2.1 ***The National Education Policy on Inclusive Education***

The National Education Policy on Inclusive Education emerges from the White Paper 6 on Special Needs Education (DoE, 2001). As per the policy's definition of inclusive education, three issues with bearing on my study into curriculum differentiation are noted (DoE, 2001:6-7). The first issue is the recognition and respect for the differences existing in learners. This is rooted in the belief that "no two children are the same" (UNESCO, 2001:7). The second issues arising from the first, is the acknowledgement that in view of these differences, the learning environment, teaching methods, curriculum, attitudes and behavior should change to meet the learners' different needs. The last issue is the maximization of learner participation in curriculum.

#### 2.3.2.2 ***TheNational Curriculum Statement Grades R-12***

The need for curriculum differentiation and teacher capacity as an enabler for curriculum implementation through such differentiation has been strengthened by the emergence of the new national curriculum policy called National Curriculum Statement Grades R-12 (DoE, 2011b). The policy consists of three components, namely, the Curriculum and Assessment Policy Statements (CAPS) for all approved

subjects for Grades R-12, the *National Policy Pertaining to the Programme and promotion Requirements of the National Curriculum Statement Grades R-12*; and *National Protocol for Assessment Grades R-12* (DoE, 2011a: 3).The policy takes as its point of departure, the recognition of the school curriculum as one of the most significant barriers to learning in the classroom. This is particularly evident where instruction does not take cognizance of the different needs of learners; that is, where learner diversity is not acknowledged when curriculum is delivered in the classroom.

#### 2.3.2.3 ***Guidelines relating to teaching and learning***

With curriculum change currently underway in South Africa and continuing recognition learner diversity, a need arises for maximizing focus on effective teaching and learning, if all learners are to benefit from curriculum delivery. It is against the background of understanding this reality that the Department of Basic Education has developed and published general *Guidelines for Responding to Learner Diversity in the Classroom* (DoE, 2011a) and subject-specific CAPS for the various grades. These guidelines lay emphasis on how to teach and assess learners, given their differences.

## 2.4 DIFFERENTIATED MATHEMATICS INSTRUCTION FOR LEARNER DIVERSITY IN THE FOUNDATION PHASE

This study is grounded on the view that teachers' understanding of theories and principles guiding how children learn is crucial for curriculum delivery (Gagne & Wager, 2002). Such understanding will enable teachers to choose instructional methods which are suitable for different content, learning styles, learning outcomes and learner characteristics. This view finds expression in the integration of three categories of studies. The first category includes the best evidence synthesis of studies focusing on quality teaching for learner diversity (Alton-Lee, 2003). This study concludes that individual learners in the classroom do not learn in the same way (Fischer & Rose, 2001; Mulroy&Eddinger, 2003). The second category covers a synthesis of studies focusing on professional development for teachers (Villegas-Reimers, 2003;Scheerens, 2010). The last category includes a synthesis of studies

focusing on Tomlinson's work on differentiated instruction (Tomlinson, 2000, Tomlinson &McTighe, 2006; Subban, 2006; Watts, 2010). This framework places a strong emphasis on the teacher's responsiveness to learner diversity in the classroom with the learner taking a central point of focus.

### 2.4.1 **Understanding diversity among Foundation Phase Mathematics learners**

Learners in the Foundation Phase (Grades R to 3), which constitutes an entry point into the schooling system, are not the same but come to school from diverse backgrounds. In the first place, these learners come to school with multiple intelligences, including what Gardner (1999) calls logical-mathematical intelligence that is, the ability to work with numeric symbols and operations, identify patterns, and recognize logical connections between separate pieces of data. In other words, among these learners, are those who are mathematically gifted, those with average intelligence, those with disabilities and those who take time to learn because of some pre-existing learning barriers.

A Mathematics teacher should know the weaknesses and strengths that different learners possess. In the second place, learners possess different learning styles (Lawrence-Brown, 2004). As an example of the latter and guided by the learners' individual interests, the teacher should have knowledge of how best the learners would prefer to learn Mathematics, that is, whether they would like to learn through listening, doing things, observation, discussion, exploration, reporting and so on. In line with the demands for inclusive education (Perner, 1997), these different learners are expected to be taught Mathematics as well as other subjects under the same roof in an inclusive classroom. In the context of curriculum differentiation and in view of the current support for mainstreaming (Stepanek, 1999), for the Mathematics teacher to recognize and accept these learner differences is a professional imperative.

### 2.4.2. Elements of a differentiated classroom for Foundation Phase Mathematics

There are four basic elements of the curriculum which the teacher can differentiate in a mathematic classroom. They include content, process, product and learning environment.

#### 2.4.2.1 *Differentiated Mathematics content*

Differentiated Mathematics content refers to all the mathematical knowledge, skills, concepts and principles that presented in the form of topics to learners in the classroom. It simply refers to *what* a Mathematics teacher should teach and alternatively, *what* learners should learn in the Mathematics class. Differentiating Mathematics content involves modification or adaptation of content by applying different strategies in delivering the content to different learners in each grade for the attainment of the same learning. Regarding learning outcomes, all learners in the Foundation Phase notwithstanding their differences, are expected to acquire basic mathematical skills such as the ability to count, calculate, reason, estimate, solve problems, investigate, interpret, describe, analyze and communicate when they leave this phase (Mpitsane, 2008). The content for the Foundation Phase Mathematics as presented through the Department of Basic Education's CAPS (DoE, 2011c) includes the following areas which are the same for all grades (Grade R to Grade 3):

a) Numbers, Operations and Relationships
b) Patterns, Functions and Algebra
c) Space and Shape (Geometry)
d) Measurement
e) Data Handling

Despite the similarities of these areas across the four grades, each area has a specific topic focusing on knowledge or skills that learners in a given grade need to acquire. For example, while the topic *Mass* in Grade R content area of *Measurement* focuses on informal measurement of objects by comparing the mass of two

classmates put on a balancing scale, in Grade 3 the same topic may focus on a formal measurement of the same classmates put on a bathroom scale and recording their mass in kilograms.

#### 2.4.2.2 *Differentiated Mathematics instruction process and strategies*

Differentiated Mathematics teaching or instruction is teaching Mathematics to different learners differently. In other words, the emphasis is put on *how* teachers teach Mathematics and *how* they engage learners in the lesson. The point of departure in teaching Mathematics to the Foundation Phase class is to consider that teaching should be carried in a fair and balanced manner, that is, equitably. Equitable teaching of Mathematics is a process in which the teacher tries to promote the achievement of learning outcomes for all learners in the class, while being sensitive to and appreciating the differences they bring into the classroom from their different backgrounds. As Van De Wille, Karp and Bay-Williams (2010) put it, equitable mathematic teaching is much more than requiring the same Mathematics courses, giving the same assignment and applying identical assessment criteria – it is about challenging the entrenched mindsets about children's ability to learnwhere diversity in the classroom is seen as a problem.Though current policies on inclusion advocate teaching of all learners, including gifted learners and those with special needs, learners cannot be taught and assessed in the same manner on the ground of equity.

Differentiated instruction for teaching Mathematics requires different strategies, depending on learners' readiness, interests and profiles. Studies (Kingore, 2006; Pearce & Adams, 2004:60) present the following examples of strategies can be applied during differentiated instruction:

a) *Tiered lessonsand assignments*: Tiered lessons are lessons in which the teacher predetermines learning outcomes and then gives tasks of varying complexity and abstractness to learners. An example in Grade 2 lesson on volume and capacity is asking some learners to measure the amount of water

a bottle contains using a non-standard measure such as a cup, while other learners measure and state the amount in litres.

b) *Compacting*: Compacting involves adjusting instruction according to the learner's mastering of the learning objectives. For an example, in a Grade 3 lesson on 3-D objects, a learner who already knows how to identify, name and describe 3-D objects, is excused from the lesson and is given a task of building 3-D objects using concrete 2D materials.

c) *Anchoring*: Anchoring involves giving learners work to do while waiting for the teacher's further instruction to proceed with other activities. In a Grade 1 Geometry lesson on 2D shape objects, learners who have completed cutting their objects may be asked to compare the size of their objects while the teacher is busy helping other children still struggling with the task.

d) *Flexible groupings*: Flexible grouping involves establishing learning groups of different sizes either randomly or allowing learners the freedom to join a group of their choice to complete a given task. For example Grade R learners can form groups to colour geometrical patterns using various colours and geometrical shapes during an Algebra lesson on geometrical patterns.

#### 2.4.2.3 *Differentiated Mathematics instructional products*

In a differentiated curriculum setting, learners can demonstrate their understanding of the teacher's instruction through various products. In Mathematics such products include projects, portfolios of evidence, written work and models to demonstrate what they have learned and the skills they have acquired. Differentiating products in this way, gives a learner a sense of 'I can do' self-confidence. According to Tomlinson and Allan (2000), teachers can differentiate products through various methods which may include the following examples:

a) *Allowing studentsto express what they have learned in multiple formats:* In Foundation Phase Mathematics Grade 3 learners can demonstrate their understanding of geometry by presenting a model of a map, drawing a map of their school from different viewpoints or interpreting a map given to them as an assignment.

b) *Encouraging the use of a variety of different resources to produce the product:* In Foundation Phase, learners can for example, use counters, beads, bottle tops, abacus or stones to solve a problem relating to numbers, operations and relationships.

c) *Using different kinds of assessments:* Learners can be assessed formally or informally in groups, pairs or individually using different products. In differentiated instruction, assessment is continuous and integrated into instruction where it is applied as formative or summative. While formative assessment is undertaken in order to assess learners' understanding of the teachers' instruction (Poham, 2008), summative assessment occurs at the completion of a task (UNESCO, 2004: 72). In South Africa (DoE, 2012b) assessment in the Foundation Phase Mathematics takes place through Continuous Assessment (CASS) in three different ways, namely observation, written work and performance-based manner. Assessment through observation, amongst others, involves a teacher observing learners' learning products such as models. Assessment through written work involves assessing learners on the basis of classroom and homework exercises. Performance-based assessment involves assessing learners on the basis of their demonstrated skills, for example, demonstrating skills such as solving mathematical problems.

#### 2.4.2.4 ***Differentiated mathematical classroom environment***

In an inclusive education context a classroom constitutes an environment in which differentiated instruction takes place. To be inclusive and serve the educational needs of all learners, a classroom as constituting such an environment should be learning-friendly (UNESCO, 2004:2). Every learner should benefit equally despite their differences from instruction offered in the classroom, lest a classroom becomes a barrier to learning. Various teacher-driven strategies are suggested for a differentiated learning environment and the following are examples (Tomlinson, 1995, 1999; Winebrenner, 1992, 1996; UNESCO, 2006):

- *Decorating the classroom* with learners' work to make it attractive and welcoming
- Creating *activity centres* to offer individual learner, or small groups of learners, the opportunity to work on projects or activities at their own pace.
- Making the classroom interactive to reduce the feeling of *crowdedness*
- developing *routines* that allow learners to get help when teachers are busy with other learners and cannot help them immediately
- Using *mixed sex groups* whenever possible, rather than boys versus girls and giving each group a complimentary activity
- Involving learners in *classroom management* to help them develop a sense of responsibility.

Relating the first two examples to the teaching of Foundation Phase Mathematics, two examples can be cited. First, to make a Mathematics classroom attractive, learners can be allowed to paste or hang learning materials such as hundreds charts, height charts, drawings with patterns and graphs on classroom walls. Activity centres for geometry lesson may consist of mixed groups of learners drawing rectangles, circles, squares and triangles of different quantities and sizes and the same time.

## 2.5 TEACHER CAPACITY BUILDING FOR CURRICULUM DIFFERENTIATION

Capacity building for teachers is a critical element for successful implementation of differentiated Mathematics instruction and subsequent learner achievement in the Foundation Phase. Several reasons can be advanced in this regard. Firstly, teachers need c*ontent-specific* knowledge. They need knowledge of Mathematics as it applies to the different grades in the Foundation Phase and policies relating to content delivery as well as new developments in this subject area. Secondly, they need to be equipped with *instructional skills* necessary for teaching Mathematics. Such skills include strategies and methodologies for differentiated instruction and assessment, differentiated classroom management skills and the use of data to make informed decisions. Lastly, as curriculum differentiation represents a new approach to teaching, teachers need to be trained on *attitudinal change* necessary for dealing

with curriculum change and for working with learners from different learning backgrounds. Teacher capacity in dealing with these issues requires an ongoing professional learning and development.

### 2.5.1 Continuing professional development (CPD) as a form of capacity building for Mathematics teachers

For teachers to teach Mathematics in an inclusive classroom environment, as highlighted in the previous paragraph, they need capacity to do so, that is, they need to have knowledge, skills, and attitudes necessary for effective delivery. This capacity does not come to teachers without effort –it needs to be built. Capacity building for teachers takes place through continued professional development (CPD). CPD is defined as a lifelong development programme focusing on a wide range of educators' knowledge, skills and attitudes necessary to educate learners more effectively (Steyn, 2004: 218). Effective professional development is defined as that which results in improvements in teachers' knowledge and instructional practice, as well as improved learning outcomes for learners (Wei, Darling-Hammond, Andree, Richardson &Orphanos, 2009:3). For professional development as a form of capacity building to be effective and thus, help achieve desirable improvements, it should meet certain basic requirements. According to studies (Garet, Porter, Desimone, Birman&Yoon, 2001:916), professional development should:

- Be sustained over time and be intensive rather than being shorter
- Focus on content knowledge
- Foster coherence of teacher learning and development
- Provide teachers with opportunities for active learning
- Encourage collective participation (collegiality) of teachers from the same school, subject or grade
- Integrate professional development into daily life of schools
- Develop buy-in among participants
- Acknowledge participants existing beliefs and practices
- Make use of an outside professional developers(experts)

What the above-mentioned requirements suggest is that for Mathematics teachers to be professionally developed, they should actively take part in learning and support the PD provided for them. For them to support the PD, the programme should meet at least two requirements. First, it should be sustainable, that is, instead of being delivered in a once-off manner as is often the case, it should be continuous to bring about sustainable Mathematics improvement to learners. Research shows that in many instances once-off PD programmes are both unsustainable and they do not lead to substantive changes in teacher practice (Parsad, Lewis & Farris, 2001). Secondly, it should be context-sensitive, that is, teachers' beliefs, knowledge of Mathematics content and existing instructional practices and challenges in schools should be considered when such a PD programme is designed.

### 2.5.2Types of professional development models

There are different types of professional development models for teachers. They include workshops, school-based coaching, teacher network learning circles (Wei et al., 2009). The existence of different professional development models carries two implications. The first is that just as there are different modalities for learning in a differentiated Mathematics classroom, there are different learning models for professional development. Second, just as the Mathematics learners have different needs, Mathematics teachers have different needs that cannot be catered for by a single professional development model. A distinction can be made between traditional teacher capacity-building models and job-embedded or practice-based capacity-building models as explained in the following paragraphs.

#### 2.5.2.1 *Traditional teacher capacity-building models*

Traditional teacher capacity-building models include formal workshops, training courses, conferences and seminars which are basically traditional form of professional development for teachers. These traditional forms of professional development usually take place outside the school and involve teachers leaving the school site and travelling to a 'training centre.' They, therefore, represent an external approach to capacity building for teachers. A typical example of professional

development belonging to this category is Borko's formal professional development model (Borko, 2004:4) which includes the following four elements:

- The professional development program;
- The teachers, who are the learners in the system;
- The facilitator, who guides teachers as they construct new knowledge and practices; and
- The context in which the professional development occurs.

A Mathematics workshop following Borko's model, can take place in three ways, namely:

- An individual professional development programme at a single site
- A single professional development programme enacted by more than one facilitator at more than one site
- Multiple professional development programs, each enacted at multiple sites.

As an external approach to instructional improvement in the classroom, a workshop has its own downside, according to studies. It is criticized for being insufficient in terms of effectiveness, specificity and sustainability (Fullan, 2007:35). Because of its detachment from the classroom as the actual site of practice, it is seen as a capacity-building strategy that lays more stress on professional development than professional learning (Easton, 2008:756).

#### 2.5.2.2 *Job-embedded professional development models*

Job-embedded or practice-based capacity-building models include teacher networks, school-based coaching and peer observations of practice (Wei, Darling-Hammond, Andree, Richardson&Orphanos, 2009). These models can be briefly presented as follows:

a) *Teacher networks* which involve collaboration of teachers organized for professional development in a specific subject. Here teachers share methodologies, strategies, problems and solutions relating to a subject.

b) *School-based coaching* which involves expert teachers in a given subject who work either part-time or full-time with a group of teachers in a school to improve instructional practice.
c) *Peer observations of practice* which involves teachers visiting their peers to observe and video-record their teaching for subsequent critic of their practice.

Comparing job-embedded professional development with traditional forms of professional development, studies regard the former as being more effective than the latter (Wei et al., 2009:16). For example, a study conducted by the American Educational Research Association (AERA, 2005:2-3) found that job-embedded professional development for teachers promoted active learning among teachers while, at the same time, it impacted on learner achievement. What these studies suggest is that job-embedded professional development benefits both teachers and learners.

#### 2.5.2.3 *Integrated professional development model*

It is important to note that neither the traditional teacher capacity-building approach nor practice-based approach can bring about improvements in teachers' instructional capabilities on its own. For professional development to bring about improvement, it should be seen as relevant by creating a link between theory (learning) and practice (instruction). One study (Flores, 2005) shows that, teachers appreciate professional development as relevant when it enables them to see a connection between what they learn and what they do every day. For teachers to see this connection, workshops should be linked with practice-based professional development activities. In the context of this study, for instance, workshops should proceed from providing theoretical Mathematics content knowledge to providing knowledge of how to apply differentiation as a strategy for delivering that content in a real classroom situation. What this suggests is that workshops are effective only when they are followed by job-embedded professional activities (Tate, 2009).

Lack of success in bringing improvements in learners' achievement, despite teachers attending workshops, has motivated studies to advocate the integration of both

traditional models and practice-based professional development models. One example can be cited in this regard. Conducted against the background of poor learner achievement in Mathematics, a recent South African study into continuing professional development for Foundation Phase teachers (Wium&Louw, 2012), has found a three-pronged approach to professional development to be effective. Such an approach involves a logical combination of training component (workshops), practical component (a portfolio-documented application of knowledge in the classroom) and mentoring component (collaborative peer learning and feedback on portfolio assignments) (Wium&Louw, 2012: 14). In this manner, the existing gap between theory (workshop training) and practice (classroom teaching) is closed, while the resulting link forged between the two is strengthened through continued support (mentoring).

## 2.6 **CONCLUSION**

This chapter dealt with literature review on two aspects, namely, curriculum differentiation and teacher capacity building. Discussion proceeded against the backdrop of poor performance of learners in Mathematics, particularly at the Foundation Phase level. This discussion was followed by a synoptic study of curriculum differentiation and key elements constituting it. The chapter was concluded with a discussion on capacity building for teachers teaching Mathematics with special reference made to continuing professional development for teachers. Here, various professional development models were discussed. The message carried by linking the two aspects together is that successful curriculum differentiation in Mathematics teaching requires capacity building through an effective professional development for teachers.The next chapter deals with the empirical study into the research area. The focus here is on research design and methodology.

# CHAPTER 3

# RESEARCH DESIGN AND METHODOLOGY

## 3.1 INTRODUCTION

The previous chapter focused on the review of literature on curriculum differentiation for Foundation Phase Mathematics and the need for teacher capacity in the process. Key issues addressed in the review include the discussion on the nature and scope of curriculum differentiation, the underlying legal framework and continuing professional development for effective teaching practice. The conclusion drawn from the literature review is that capacity building through effective professional development is critical for successful curriculum differentiation in the teaching of Mathematics. Proceeding from this conclusion, this chapter focuses on the description of the research design and methodology. Covered in this chapter are the outline of the research questions and description of the qualitative research design and methodology. Issues relating to the methodology followed in this study include the selection of participants, the sampling procedure followed in selecting the participants, data collection tools and procedure, analysis and interpretation of the collected data. Also discussed are ethical considerations, validity and trustworthiness of the findings, followed by the limitations and delimitation of the study.

## 3.2 RESEARCH QUESTIONS

The aim of this study was to examine capacity building for Foundation Phase Mathematics teachers in curriculum differentiation. In pursuing this aim the researcher sought answers to the main research question:How are teachers capacitated to apply curriculum differentiation in the teaching of Foundation Phase Mathematics?

3.2.1 How do teachers respond to learner diversity in the class?

3.2.2 What challenges do teachers experience when applying curriculum differentiation in the class?

3.2.3 What capacity-building strategies are needed for curriculum differentiation in the class?

## 3.3 QUALITATIVE RESEARCH DESIGN AND METHODOLOGICAL APPROACH

In view of the nature of the stated research questions and the research aim the researcher intended to achieve, a qualitative research design was adopted as an appropriate design for this study. Qualitative research focuses on the study of phenomena as they occur in their natural settings with a view to understanding and interpreting them in terms of the meanings people attach to them (Denzin& Lincoln, 2005:3). The researcher found this design relevant for the study in the sense that she wanted to examine how teachers responded to learner diversity when teaching Mathematics to Foundation Phase classes. In the course of such study, she specifically established for purposes of subsequent interpretation, the meanings teachers attached to curriculum differentiation as an instructional strategy for teaching learners with different needs. Guided by the definition of qualitative research just given, the researcher regarded the primary schools where teachers engaged in their instructional practices as providing an appropriate setting for the study of this nature.

## 3.4 SAMPLING PROCEDURE

This study confined itself to primary schools and teachers who were teaching Mathematics in the Foundation Phase classes (Grades R to 3). The sampling procedure followed in this study was criterion-based purposive sampling. Purposive sampling involves the application of specific set of criteria for selecting a research sample (Merriam, 2009:77). Two main selection criteria were applied in this study, notably, (a) teacher experience in the teaching of Mathematics in the Foundation phase and (b) teacher participation in curriculum workshops organized by the Circuit

Office. In addition to these criteria, the schools that were included in the study were selected on the basis of the availability of classroom space for interviews. This was because interviews require a space that is free from interruptions, that is, “a quiet, comfortable and private space” (Larsen, Flesaker&Stege, 2008:23). Three schools that satisfied these criteria were selected, giving rise to a sample size of three (3) primary schools drawn from a total of 23 schools in the Ngwaritsi Circuit. Four (4) teachers from each of the selected schools took part in the study. The result of the sampling procedure was that a total of 12 Mathematics teachers took part in the study. In addition to the teachers, a curriculum advisor in charge of primary schools in this circuit formed part of the study.

## 3.5 DATA COLLECTION PROCESS

Given the qualitative nature of this study, three different data collection strategies, namely, study of documents, observations and interviews were applied respectively. This pluralistic approach to qualitative data collection applied here emanated from the researcher’s need to triangulate data gathering in order to enhance the quality of the subsequent data analysis and maximize the credibility and trustworthiness thereof. Triangulation, as conventionally defined in relation to data collection, is the use of a variety of methods in the study of one object (Devetak, Glaža&Vogrine, 2010:79). Based on the researcher’s plan, teachers were observed in their classroom settings; documents such as teacher portfolios were examined; and, interviews with educators were held. The combination of the three qualitative methods, namely, interviews, study of documents and observation were meant for enhancing the credibility and trustworthiness of data as well as establishing consistencies in the findings across all methods applied.

### 3.5.1 Analysis of documents

In her attempt to understand how teachers planned their Mathematics lessons, teachers’ workbooks were studied. The researcher sought permission from four teachers whose classes were selected for observation for access to their workbooks a day before such observation was conducted. The study of these documents was

necessitated by the need to establish the extent to which the planned Mathematics lessons related to the actual teaching of the subject in a typical Foundation Phase classroom as verified by means of observations that followed. Notes were taken on the structure and content of the lesson plans. These notes became an important reference material during lesson observations.

### 3.5.2 Interviews

Two types of interviews were conducted in the study area, namely, an in-depth interview with the curriculum advisor and three focus group interviews with Mathematics teachers. The rationale for conducting these two types of interviews came out of the researcher's desire to obtain various perspectives on the research problem which would later assist during analysis. The researcher's assumption was that the Department of Education as represented by the subject advisor and the Mathematics teachers in primary schools might see the same problem differently. As a data-collection tool, an interview protocol(see Appendix G AND H)was designed for the purpose of gathering data during a focus group interview with Mathematics teachers at the sampled primary school. The protocol consisted of a series of semi-structured *simple-to-complex* questions grouped into themes and sub-themes to enable subsequent data analysis. The major themes covered (a) teachers' response to learner diversity and (b) teacher capacity-building challenges. Considering the advice of experienced researchers (Jacob &Furgerson, 2012: 2), the researcher ensured that the protocol not only contained a list of interview questions, but also the procedures to be followed throughout each interview session. Such a procedure covered prompts for reminding the researcher of the important information to ask for during the interviews and scripts of what the researcher would say before and after an interview session. To enable subsequent transcription of data all interviews were audio-recorded with prior permission of participants. With the exception of the interview held with the curriculum advisor, all interviews took place in the afternoon to limit possible interruptions and to comply with conditions laid down by the Circuit Manager in this regard.

### 3.5.3 Observations

Observation as a data-collecting strategy in qualitative research, according to Flick (2009:282), tries to bring about understanding of practices, interactions and events that take place in a specific context. Relating this role of observation in qualitative research to the first two research questions stated in paragraph 3.2 above, the researcher saw it fitting to collect data by observing teacher-learner interaction during the Mathematics lessons in the classroom. To facilitate data-capturing during these lessons, the researcher had designed an observational protocol. The protocol included the following items:

- Flexible grouping
- Respectable tasks
- Continuous assessment
- Questioning strategies
- Teaching-learning content
- Learner participation
- Learning support material (resources)

This protocol was used for recording the researcher's observations of teacher-learner interactions. It was during such interactions that the researcher could note how teachers responded to learner diversity and the challenges they experienced in the process.

## 3.6 DATA ANALYSIS AND INTERPRETATION

Data collected during classroom observation was analyzed in relation to data collected from teachers' workbook and later compared with data collected through the interviews with teachers whose lessons were observed. Data collected from the focus group interview in the sampled schools was thematically analyzed. Thematic analysis is a method applied for identification, analysis, and reporting of patterns (themes) within a collected set of interview data (Braun & Clarke, 2006:101). As part of the process of analyzing data derived from both the focus group interviews with Mathematics teachers and the in-depth interview with the curriculum advisor from

Ngwaritsi Circuit office, the researcher first organized the data into categories and generated codes that enabled her to search and identify patterns. Each identified pattern or theme was allocated a name and placed into a respective category. Since data analysis in qualitative research is a continuous process that involves, sorting, sifting, reading and rereading of data (Castellan, 2010:7), the researcher reviewed the categorized patterns several times. After a series of reviews of these patterns, a report that enabled interpretation of the results was generated. In reviewing themes, the researcher was also motivated by the view that qualitative research should be able to draw interpretations which are consistent with the data collected (Alhojailan, 2012:11). This enabled the researcher to gain an insight into educators' (teachers and the curriculum advisor) attitudes and reflections on the issue of curriculum differentiation and challenges experienced during teaching and learning in lower grades.

## 3.7 CREDIBILITY AND TRUSTWORTHINESS

Credibility as applied in qualitative research relates to the extent to which the research findings are believable (Pitney & Parker, 2009: 63). In other words, for the researcher to ensure credibility of her study there should be supportive evidence in the form of data for the accuracy of the research findings. Trustworthiness of a qualitative study, on the other hand, can be assured by making use of triangulation (Kolb, 2012:85), that is, by using multiple data-collection methods. To meet the demand for credibility and trustworthiness, the researcher followed two procedures that she regarded as important, namely, triangulation of data collection and member checks. In the first instance, the researcher strongly felt that to ensure credibility of her study and the accuracy of the research findings there were to be supportive evidence in the form of quality data. For this she triangulated data collection strategies, namely, study of documents, observation and interviews. In the second instance, data from interviews were subjected to member checks, that is, verification by staff members in the selected schools who were not part of the study. The amount and the quality of data generated through the threestrategies as well as the verification of the collected data by other staff members enabled the researcher to come to the conclusion that the research questions stated earlier on were answered.

## 3.8 ETHICAL CONSIDERATIONS

In accordance with conventional research ethics, the researcher had to consider issues such as anonymity, confidentially and permission to conduct research. For this reason she took the following steps:

### 3.8.1 Permission to conduct research

First, permission to conduct research was sought and granted by the Circuit Manager in charge of the Ngwaritsi Circuit. This made it possible for the researcher to gain access to schools selected for the study.

### 3.8.2 Confidentiality and anonymity

Secondly, since this study involved educators (teachers and the curriculum advisor) who were to share their personal views on the research problem and make their private working space available for the study, it was important to consider the issues of confidentiality and anonymity. The researcher had to assure these participants in advance of the confidentiality and security of information they were to provide to avoid any possible harm they would incur as a result of the disclosure of such information. Codes were used for their schools and fictitious names were used instead of their real names.

### 3.8.3 Informed consent

An informed consent form was designed and given to all participants to sign before interviews were conducted and access to teachers' documents could be gained. The form gave the participants the freedom of choosing whether or not to participate in the study. It also assured them that no financial gain was to be expected by both the researcher and teachers participating in the study.

## 3.9 LIMITATIONS AND DELIMITATIONS

This study was limited to primary school teachers who were teaching Mathematics in the Foundation Phase classes and thus, excluded other grades. Because of the nature of the research problem, only a qualitative research approach was followed throughout. The study took place in Ngwaritsi Circuit, Sekhukhune District of Limpopo Province.

## 3.10 CONCLUSION

In this chapter the research design and methodology employed were presented. Sampling procedure and data collection process were discussed. Data analysis and interpretation as well as credibility and trustworthiness were described. The chapter ended with discussion around research ethics, limitation and delimitation of the study.

# CHAPTER 4

# ANALYSIS AND INTERPRETATION OF RESULTS

## 4.1 INTRODUCTION

The discussion in the preceding chapter focused on the detailed description of the research design and methodological issues relating to curriculum differentiation for the teaching of Foundation Phase Mathematics and the need for teacher capacity in the process. Issues relating to how participants were selected for the study, strategies for data collection, instruments used in data collection and ethical issues pertaining to research were included in the discussion. Against this background, this chapter presents the analysis and interpretation (discussion) of the results from the data captured through the analysis of documents, observations and interviews respectively. Data analysis is a process involving data reduction,organization and synthesis, searching for significant patterns and discovering what data are important (Ary,Razaviah&Sarensen, 2006:90). With the understanding of this assertion, data in this study was analyzed manually according to the predetermined research themes that were described in Chapter 3, namely, teachers' response to learner diversity and teacher capacity-building challenges. The discussion and interpretation of the results as presented through these themes proceed in the light of the theoretical framework presented in Chapter 2 of this study.

## 4.2 ANALYSIS AND DISCUSSION OF DOCUMENTS

My study of the selected teachers' workbooks, which was necessitated by the need to examine how teachers planned their Foundation Phase Mathematics lessons revealed the following in terms of content and structure:

### 4.2.1 Lesson plan structure

I have noted during my analysis of teachers' workbooks that the Mathematics lesson plans supplied to teachers by the Department of Basic Education were based on the *Curriculum and Assessment Policy Statement (CAPS)* for *Foundation Phase Mathematics Grades R-3* (DoE, 2011a). Although each of the participants' workbooks had a lesson plan, these lesson plans were different from one Mathematics teacher to another and from one school to another in terms of structure and content. Table 4.1 and Table 4.2 show examples of two different lesson plan formats found at two schools.

**Table 4.1: Lesson plan format at School A**

| Content Area | Content Focus | Date | Day |
|---|---|---|---|
| Numbers, operations and relationships | | | |
| Patterns, functions and algebra | | | |
| Space and shape (Geometry) | | | |
| Measurement | | | |
| Data handling | | | |
| **Assessment** | | | |
| **Resources** | | | |
| **Reflection** | | | |

**Table 4.2: Lesson plan format at School B**

| Aspect | Monday | Tuesday | Wednesday | Thursday | Friday |
|---|---|---|---|---|---|
| Counting | | | | | |
| Mental Mathematics | | | | | |
| Concept development | | | | | |
| Problem Solving | | | | | |

### 4.2.2 Lesson plan content

I have found that just as the lesson plan formats reflected in the participants' workbooks were different, so were their contents. The lesson plan used by some teachers at ***School A*** (**Table 4.1**)showed content covering such mathematical aspects as numbers, operations and relationships patterns, functions and algebra; space and shape; measurement and data handling. In addition, the plans made provision for assessment, resources and teacher reflections. By contrast, the lesson plan used by other teachers at ***School B*** (**Table 4.2**) reflected aspects such as counting, mental mathematics, concept development and problem solving.

**Discussion**

The closer study of the teachers' use of different lesson plan formats presented in the two tables left me with the impression that teachers had a problem with regard to how the two different lesson plans could be integrated, despite having attended a workshop on Mathematics CAPS organized by the Provincial Department of Education. The absence of any specific guidelines in this regard, exacerbated the problem. ***Though the two lesson plans differ in terms of content (what is to be taught), they share similarities in terms of their omission of how teaching and learning classroom activities are organized to facilitate differentiated***

***instruction and how learners with barriers to learning are supported to cater for their diverse needs.***

## 4.3 ANALYSIS OF OBSERVATION DATA

The collection of data through my observation of the four lessons mentioned in the previous chapter was intended to examine the extent to which the Mathematics teachers applied the seven key principles guiding differentiated instruction during their interaction with learners in the classroom. These principles include flexible grouping, respectable tasks, continuous assessment, questioning strategies, teaching-learning content, learner participation and learning support material (resources). My observation yielded the following results:

**4.3.1** ***Flexible grouping***: During my observation of lessons in the Foundation Phase classrooms, ***I found that some Mathematics teachers in the schools I visited were not aware of the importance of*** *flexible grouping.* While these teachers organized learners into smaller manageable groups during lessons, they discouraged them from joining groups of their own choice. Grade R learners at **School A** were instructed to *sit still, keep quiet and listen attentively* to the teacher or they would be *chased out of the classroom*. Learners in a Grade 3 class at **School C** were grouped according to their abilities and instructed to stick to their allocated groups, irrespective of whether those learners were comfortable to work with members of those groups.

### Discussion

It emerged from my observation that teachers see grouping of learners in the classroom during lessons as a management strategy aimed at keeping learners under control rather than an instructional strategy aimed at addressing their different needs. Some research (Cagnole, Melograna, Morrison, Muenchenbach, Rees & Waltz, 2004: Online) has found that grouping learners according to their abilities, as some of the teachers in this study did, creates division in the classrooms between learners who understand a lesson and those who do not and are, therefore, in need of help. Such a grouping may negatively affect learners' self-esteem as it is likely to

lead to a situation in which learners feel that they are as ‘good’ or as ‘bad’ as the group they are made to belong to.

**4.3.2** ***Respectable tasks***: ***I discovered that in all the three schools I visited learners were given meaningful and respectable tasks***. These tasks were based on content derived from the CAPS policy document (cf. 2.4.2.1). Two examples can be cited in this case. The first example is a lesson on *space and shape* taught to the Grade R learners (**School A)**. Here learners were taught how to group concrete objects according to shapes and colours. I realized that learners were fascinated by the activity and were all engaged in carrying out the task. Slow learners were assisted by both their peers and the teacher.The second example is a lesson on the concept of *time* taught to a combined Grade 1 and Grade 2 class (**School B)**. Here the teacher demonstrated the four main points of a watch using her body parts, that is, the head, feet, right and left arms. This captured the interest of all the learners in the class, since they would imitate the teacher using their own body parts. This demonstration was later followed by learners drawing a watch first on the ground outside the classroom and later on the chalkboard back in the classroom. What captured my interest was the teacher’s creativity in developing this interesting task for her learners.

**Discussion**

Though the provision of the CAPS policy document for the Foundation Phase Mathematics (DoE, 2011b) made it possible for teachers to give learners tasks that were meaningful, I was concerned about some teachers’ heavy reliance on the examples of learning tasks provided in the policy document. The use of examples derived from the policy document when designing learning tasks is commendable, but over-dependence on these examples is not in the best interests of learners. What is comforting, however, was that other teachers were innovative and created their own tasks in order to captivate the learners.

**4.3.3** ***Continuous assessment***: What I wanted to observe in this regard was the teachers’ application of different assessment strategies; namely, observation, written

work and performance-based assessment (cf. 2.4.2.3). ***I found that although teachers whose lessons I observed practiced continuous assessment, such assessment was restricted to questioning and written work, giving insufficient attention to observation***. The only ways in which learners were assessed were through such informal assessment tasks as written class work exercises and formal assessment tasks such as monthly tests prepared by teachers and quarterly tests prepared by the Limpopo Provincial Education Department. In addition to this, teachers appeared to assess learners without using observation sheets. During a lesson where learners were to draw a model of a watch on the ground with their fingers **(**cf. 4.3.2), no record was made on the observation sheets of learners who found this task challenging or of the learners who completed the task faster than others.

**Discussion**

It followed from my observation that teachers appeared to separate differentiated instruction from differentiated assessment in their approach to continuous assessment. Their heavy reliance on written work as a form of assessment in exclusion of other equally important forms of assessment may disadvantage other learners whose performance can be assessed differently. For teachers not to use observation sheets suggests that the teachers would not have records of learners experiencing barriers to learning, despite having these important data recording instruments (observation sheets) at their disposal. This would make it difficult to cater for the special needs of these learners when planning subsequent lessons.

**4.3.4** ***Questioning strategies***: ***In all the lessons I observed consideration was not given to learners' preferred mode of responding to the teachers' questions***. Emphasis was put mainly on oral questioning and answering to the exclusion of other possible strategies suggested in literature (cf. 2.2.1.4). For example, during a Grade 3 lesson (**School C**) on *numbers, operations and relationships*,learners were asked to count from one to ten with their fingers and then represent numbers 1-10 on a number-line. A learner that would skip one or two numbers when counting orally would be passed over for another learner who would

then count all numbers accurately. No effort was made to ask the learner to write down the numbers that she or he could not count orally.

**Discussion**

It follows that though teachers observed in my study appeared to understand the importance of applying different questioning strategies during lessons, they did not give sufficient attention to learners who struggled to count in a specific way. Struggling learners would need to be given opportunities to answer questions in different ways.

**4.3.5** ***Teaching-learning content:I noticed that – with the exception of the Mathematics teacher at School B - though all teachers whose lessons were observed were using common Mathematics content as prescribed through the CAPS document, teachers did not attempt to differentiate this content. Instead of creating their own examples, they used the only examples provided in the document (Learners' Workbook)***. In other words, the teachers did not apply various instructional (teaching) strategies to ensure that content was adapted to the different learning styles of learners as suggested in literature (cf. 2.4.2.2). For example, while the Grade 3 teacher at **School C** was aware that some learners had problems with *counting*, she did not attempt to introduce alternative strategies such as using counters or even sticks to assist the learners in resolving their learning problem (counting accurately).

**Discussion**

Notwithstanding the assertion that learners learn differently (Lawrence-Brown, 2004), teachers appeared not to understand that the content should be differentiated according to learners' different learning styles. They appeared not to consider available alternatives to learning such as listening, doing things, observation, discussion, exploration and reporting to accommodate learners' preferences.

***4.3.6 Learner participation***: ***I realized that even though teachers tried to engage learners in participating in the lessons, they did not have strategies in place to enable such participation.***They could not engage all learners in the lesson according to their different abilities. They would either focus on struggling learners, ignoring bright learners or focus on bright learners, leaving behind those who struggled in the lesson. In other words, these teachers did not know what to do to assist learners who were not participating as expected and how to identify causes of such non-participation. For instance, in **School A**, where some Grade R learners could not identify objects of the same shape during the lesson on Space and Shape, they were told to group the objects according to their colours. At the same time, gifted learners were left without any task to do but to watch others being supported. Inadequate understanding of content on the part of struggling learners (cf. 4.3.5) appeared to be an additional limitation for their participation.

***4.3.7 Learning support material (resources)***: ***I found that all the Mathematics classrooms I visited had sufficient variety of resources (human and physical) needed for differentiated instruction.*** There were colourful physical objects of different shapes meant to attract the learners and assist them in their learning. At **School B** the teacher was there as a tool. Learners observed what she was doing with her arms and imitated her demonstration before they could be shown the real watch. **In School C** there was a number grid on the wall where learners could learn to sequence the numbers. I realized that most learners were not aware of the significance of the learning support materials available in the classroom. For example, learners who skipped numbers when counting did not attempt to look at the grid that was pasted on the wall for cues.

**Discussion**

The general picture I drew from the teachers' use of resources was that teachers in some schools did not teach learners about the importance and use of the resources available in their classrooms; they merely assumed that their presence in the classroom will carry a message to learners. Without teachers playing an active role

in this regard, learners likely remain virtually disconnected from the tools necessary for their learning.

## 4.4 THEMATIC ANALYSIS AND DICUSSION OF INTERVIEW DATA

For the purpose of answering the three research questions (cf. 3.2) and meeting the objectives of the study (cf. 1.4), data derived from both focus group interviews and an in-depth interview were analyzed according to themes and sub-themes as presented below.

### 4.4.1 Focus group interview with Mathematics teachers

#### *4.4.1.1 Teachers' responses to learner diversity*

*a. Preparing learners for a Mathematics lesson:* The focus here was to establish whether consideration was given to the different abilities of learners when a new Mathematic lesson was introduced. ***It emerged from all the three focus group interviews that teachers recognized the importance of starting a lesson by drawing learners' attention (using a song, a poem, a drawing or a story), but their introduction of content to learners differed***. Some teachers would introduce the lesson by asking questions to find out whether all learners understand the content and can link a new lesson with the previous lesson. At **School C**, for an example, the Grade 3 teacher said:*For the learners to understand, I use to present the lesson slowly and repeat, I also ask them questions to see to it that they do understand the lesson.* By contrast, at **School B**, after drawing learners' attention, the teacher would go straight to the content. For example, a teacher at this school said: *I get every learner's attention firstly by … We can sing a song so that they can numerate and focus and thereafter when I see that everyone is settled I can start with my lesson.*

*b. Learner participation in the lesson:* The focus here was to establish teachers' understanding of learner diversity and application of different teaching strategies.***In all the schools, teachers were aware of existing differences in learners' abilities, but they appeared to be unable to apply such understanding when teaching to enhance meaningful participation of all learners in the Mathematics lessons.*** It emerged from the interviews that teachers focused more

on the slow learners than the average and the gifted ones. They took for granted that the gifted and the average learners understood the learning content and that there was no need to focus on their participation in the lesson other than keeping them busy. This point is supported by the following admission by a teacher at **School A**: *If you are teaching, helping those weak ones, you must give the intelligent ones enough work to let them not to play when you are helping those ones*. For this reason, average and gifted learners were given *more work that needed too much thinking and writing to do*. These remarks raise two points. The first point is that teachers in this study appeared to have insufficient understanding of the rationale of differentiating tasks according to different abilities of learners. The second point is that teachers appeared to lack knowledge of key principles guiding differentiated instruction advocated in literature such as, for example, giving learners 'respectable tasks' (cf. 2.2.1.2). In addition, consideration was rarely given to the application of different teaching strategies to cater for learners with different mathematical abilities. Whenever this was considered, learners were either grouped according to their abilities (**School A**) or *whenthere was a need* (**Schools B**). The teacher at **School C** argued: *I don't group my learners because I can see it encourages copying when a clever child can write the correct answer all of the group are going to write the same answer - that one of the clever one.* What the latter suggest is that some teachers do not see the need for and importance of establishing multi-level centres or stations in the classroom (cf. 2.2.1.4).

c. *Applied assessment strategies:*The focus here was on hearing the Mathematics teachers' voices on the strategies they were applying to assess their learners. ***While Mathematics teachers at the three schools were assessing their learners continuously, they appeared to rely mainly on written work as a preferred assessment strategy.*** They seldom used observation as one of the assessment strategies, because they regarded observation as time-consuming and whenever they used the strategy they would record their learners' performance after the lesson. This confirmed my finding during lesson observation (cf.4.3.3). *I think during the lesson you can't teach them and write. You must just know that this one is doing this and this and after a lesson you must sit down and take the record sheet and record*

*that*, said a teacher at **School A**. By contrast, during my classroom observations I hardly found any evidence of the teachers recording their observation of learners' performance after the lessons as they claimed during the interview (cf. 4.3.3). Teachers at **School C** assessed through written work because they did not know other assessment strategies. At **School B**, the teachers indicated that at times they assessed learners orally, but they did not record such assessment. I noticed that teachers were not aware that learners should be assessed informally and formally, using a variety of strategies such as observation, written work and performance-based demonstration outlined in the CAPS document (cf. 2.4.2.3).

**Discussion**

A couple of issues emerged from the findings from the focus group interviews I held with the Foundation Phase Mathematics teachers. These issues revolve around teachers' approach to instruction and assessment. The first issue is that while teachers recognized the different abilities of learners and would accordingly introduce each lesson differently, they had challenges when it comes to differentiating instruction and assessment. In the first instance, they would group learners according to their abilities and then pay more attention to struggling learners than to gifted ones, creating an impression that the latter do not need much help. This classical categorization of learners into groups of 'slow learners' and groups of 'gifted learners' as a teaching strategy has been discredited on the ground that it helps some learners while ignoring others (Ford, 2005:1). The second issues is that as much as teachers seem not to be fully conversant with the importance of creating a match between different instructional strategies with the different learning styles, the same approach applies to continuous assessment. In the latter case, attention is rather given to written assessment than other alternative assessment that includes the use of pictures, objects and visual cues suggested in literature (Quenemoen&Thurlow, 2007), so that all learners can benefit from the process. This may be attributed to insufficient continuous development for teachers as noted in the next paragraphs (cf. 4.4.1.2; 4.4.2).

#### *4.4.1.2 Teacher capacity-building challenges*

*a. Continuing professional development for Mathematics teachers:* Teachers' challenges regarding capacity building revolved around the *type, length and scope* covered by training they received from the Limpopo Department of Education. According to the participants, ***teachers for each grade in the Foundation Phase attended a three-day once-off workshop organized and facilitated by curriculum advisors for Mathematics teachers in the Circuit and held at a central venue. The workshop focused more on the Mathematics curriculum content and less on strategies for assessing and teaching Mathematics lessons***. A typical workshop for Grade R teachers would start on a Friday mid-day and end on a Sunday mid-day in a central venue outside their circuit.

*b. Attitudes towards workshops:**All the participants expressed a sense of disaffection with the training they received from the presenters at the workshop***. Such disaffection ranged from the timing for the workshops and the facilitation strategies applied by the curriculum advisors to the content covered during the workshops. One Foundation Phase teacher from **School A** expressed a personal experience in the following words:

*My view is that the time is three days and it is so very short. They pile us with a lot of work and they don't really explain what is to be done. They just give us the sheet to write our points and then they come and collect the sheets from us, read sheet by sheet and try to collect the points and then they just summarize. Sometimes you go there and come back not really having understood what should be done. After collecting those points they give us work to do, maybe they start a lesson on Friday at ten o'clock and then after five o'clock they give us work - more work to do to prepare for the next day and sometimes we don't understand what their roles are, but instead of telling us something they don't. They are collecting some ideas from us.*

It emerged from the interviews that teachers were not satisfied with the content delivered at the workshops. One teacher said:*I went for training for two days where the presenters gave us just a list of topics that we must deal with in the classroom.*

*They did not teach us anything we were still waiting for the whole content of Mathematics to understand this CAPS.*

*c. Monitoring and support*: The Mathematics teachers interviewed complained that the subject advisors who facilitated training, never made follow-up in the form of school support monitoring visits to support them. One teacher wondered: *How can they monitor us when they don't do the spade work?*

**Discussion**

The findings from interviews with the Foundation Phase Mathematics teachers on capacity-building opportunities available to them in the province, revealed a disturbing picture of the enormous challenges they face in this regard. Challenges varied from unhappiness among teachers about the use of traditional modality of training through workshops, content covered during such training and the quality of training. Their unhappiness about workshops, reinforces findings from literature that criticize this type of training for being insufficient in terms of effectiveness, specificity and sustainability (cf. 2.5.2.1). Just as we have differentiated instruction and differentiated instruction for learners with different needs, one would logically hope for differentiated training for Mathematics teachers. Following the same line of argument, one would hope that since learners in Mathematics class would need teachers who are skilled in teaching them according to their different abilities; teachers would also like to be trained by skilled and confident trainers – something that does not happen, according to the participants in the interviews.

### 4.4.2 In-depth interview with the curriculum advisor

The interview held with the curriculum advisor for Mathematics covered issues relating to training modalities, training content, teacher participation during training, alignment of training with CAPS and monitoring and support. The aim was to examine the capacity building strategies the Limpopo Department of Education applied to support Mathematics teachers.

#### *4.4.2.1 Training modalities*

One of the key issues covered during the interview with the Curriculum Advisor related to how the training offered the Mathematics teachers was structured. According to the Curriculum Advisor, since the Department did not allow training of teachers in the morning, ***training took place in the afternoon at 1 o'clock***. ***A central place that has a hall and facilities to accommodate teachers was selected*** to train in clusters rather than per circuit. ***The training lasted for two to three hours or two to three days*** depending on the training workload. From the interview with the Curriculum Advisor, I found that such training has several challenges. The challenges include the following:

- ***Trainers' lack of knowledge of Mathematics***: *I like Mathematics but I did not do Mathematics at school. I have done arithmetic in Grade … let me say Form 2.*
- ***Lack of the necessary facilities, making training difficult***: *We used to use laptops for power presentations. So, we reach schools we find a disappointment with electricity*.
- ***Long distances teachers have to travel to workshops after school hours:*** *As the curriculum advisor admitted, training teachers at central locations away from their schools after working hours when they are hungry and tired from the day's work.*
- ***Teacher's negative attitudes towards Mathematics***: The Curriculum Advisor's personal experience in training Mathematics teachers was that *most teachers had a negative attitude towards Mathematics.*
- ***Lack of motivation on the part of the curriculum advisors to travel to training venues:***The Curriculum Advisor expressed unhappiness about their usage of personal transport to the venues and stated that, *we don't have the transport also. We use our own - our family cars and there is no compensation.*

#### *4.4.2.2 Training content*

***The content covered during the training,*** according to the Curriculum Advisor, ***included the modification of the curriculum, where learning outcomes were changed to content areas such as number patterns, measurement, data handling, number operation and relationship, shape and space.***

#### *4.4.2.3 Teacher participation during training*

***According to the Curriculum Advisor the Mathematics teachers participated actively during training, despite the challenges they identified (cf. 4.4.2.1)****: Ja, they enjoy our facilitation.* This assertion was, however, refuted by what I observed during the school visits and heard during the focus group interviews. I could not find any evidence in support of teachers' 'joy' about the training they had received from their workshop facilitators. What I found from my analysis of the focus group interview data was, instead, a general discontent about training the Foundation Phase Mathematic teachers were offered.

#### *4.4.2.4 Alignment of training with CAPS*

The focus here was to examine the extent to which training was aligned with the provision of CAPS regarding teaching and assessment in Mathematics. From the interview I held with the Curriculum Advisor, I found that training of the Mathematics teachers was mainly rudimentary and focusing on orientation rather than on strategies for the teaching of Mathematics in line with the CAPS document. For this reason, there appeared to be no clear strategy for aligning training with the provisions of the CAPS regarding teaching Mathematics to learners with differentiated needs. Regarding the alignment of assessment with the provisions of the policy, the only strategy the Circuit applied was that of sending model examination papers to school for teachers to use as they plan their annual national assessment (ANA) of their learners. In this case, the Curriculum Advisor explained: *Hmm, usually we have the exemplars of question papers on Mathematics that we*

*take at the District and I use to send them to schools so that they prepare learners to ANA.*

#### *4.4.2.5 Monitoring and support*

***The Curriculum Advisor admitted that there was no monitoring and follow-up support for Mathematics teachers and this was attributed to three factors:***

- ***The clash between the Circuit and the District programmes:*** *Sometimes when you plan, you find the District has planned something also and there is break in between.*
- ***Tight school schedule:*** *They are also busy at schools…*
- ***Lack of transport for school visits:****I only sacrifice when I do workshops but when it comes to monitoring I feel no reason why I should sacrifice also.*

**Discussion**

During my analysis of the in-depth interview I held with the Curriculum Advisor, I noted that most of the substantial challenges that Mathematics teachers claimed to have experienced during training were well-founded. What was meant to be training at the workshops was actually *information* about changes brought about by the Department of Basic Education through the CAPS document. Since training was not focused on how to teach and assess (instructional and assessment strategies) and what to teach and assess (learning content) learners with different needs, it would hardly bring about improvements in teaching learners with different needs. Lack of capacity on the part of facilitators would be transferred to lack of capacity to teach learners Mathematics in a differentiated classroom. While teachers may have barriers to teaching Mathematics in their respective Foundation Phase grades as the focus group interviews suggested the same, Curriculum Advisors as people responsible for training these teachers appear to be facing the same problem. This does not auger well for improved performance of learners in Mathematics as highlighted in Chapter 1.

## 4.5 CONCLUSION

This chapter has dealt with a detailed analysis and interpretation of the findings of the empirical study into capacity building for curriculum differentiation in the teaching of the Foundation Phase Mathematics in Ngwaritsi Circuit of Limpopo Province. The chapter covered the analysis and interpretation of data collected by means of document analysis, focus group interviews held with Foundation Phase Mathematics teachers and an in-depth interview with a curriculum advisor attached to the circuit and was responsible for the training and support for the Mathematic teachers at the time of the study. The next chapter will focus on summary of the empirical research findings, recommendations and conclusions.

# CHAPTER 5

# SUMMARY, RECOMMENDATIONS AND CONCLUSIONS

## 5.1 INTRODUCTION

The discussion in the preceding chapter focused on the analysis and interpretation of the results of the empirical study into capacity building for curriculum differentiation in the teaching of the Foundation Phase Mathematics in Ngwaritsi Circuit of Limpopo Province. This final chapter presents the summary of the results derived from the study, recommendations and conclusions.

The dissertation consists of five chapters. The following is a synoptic outline of each of each chapter:

Chapter 1 presents a general orientation to the study and covers matters such as rationale for the study, statement of the problem, aim of the study, definition of concepts research methodology, research ethics and an outline of the study.

Chapter 2 focuses on the review of literature on curriculum differentiation with special focus on Foundation Phase Mathematics and capacity building for teachers. This review covers the discussion on issues that include the nature and scope of curriculum differentiation, the underlying legal framework and continuing professional development of teachers for effective teaching practice.

Chapter 3 deals with the research design and methodology. It outlines the research questions and describes the qualitative research design and methodology followed. Specific methodological issues covered in this chapter include the procedure followed in the selection of the participants, data collection procedure and instruments, analysis and interpretation data, ethical considerations, validity and trustworthiness of the findings, the limitations and delimitation of the study.

Chapter 4 presents analyses and discusses results emerging from the data captured through the analysis of documents, observations and interviews respectively.

Chapter 5 presents a summary of the results derived from the empirical study and makes provision for recommendations and conclusions based on the analysis and discussions of the captured data.

## 5.2 RESULTS FROM THE LITERATURE STUDY

The review of literature reveals that for learners to succeed in Mathematics, teaching and learning should be informed by their different needs, which require differentiation of the curriculum in terms of content, process, product and learning environment. Against this background, literature emphasises the need for Mathematics teachers to understand curriculum differentiation as a critical element of an inclusive education, which represents a paradigm shift in emphasis from a traditional focus on the Mathematics teacher to a focus on the Mathematics learner.

The review of literature outlines the critical importance of applying differentiated instructional strategies in the teaching of Mathematics. This requires teachers to possess content-specific knowledge, necessary instructional skills and changed attitudes towards Mathematics.

The prevailing constitutional, legal and policy imperatives underpinning inclusive education in South African schools suggests that curriculum differentiation will be applied in the teaching of Mathematics, particularly in the foundation phase where poor learner performance has already been recorded, but this is not the case. My interpretation of literature in this regard gives a sense that in the absence of any intensive training of Mathematic teachers at lower levels, improvement in the performance of learners in Mathematics is unlikely to occur.

While stressing the importance of continuing professional development for Mathematics teachers, literature also suggests that relying on a single professional development modality for teachers will not improve teaching practice. Just as

learners have different learning needs and different learning styles that should be addressed differently, Mathematics teachers have different instructional needs that should be addressed through different continuous professional development programmes. This suggests the use of multiple practice-based capacity-building models. Traditional professional development approaches such as once-off training workshops that take Mathematics teachers away from their schools, are neithersustainablenor cost-effective. They are mainly meant to raise an awareness and do not go beyond that level (UNEP, 2006:3). For Mathematics teachers to gain insight into how to apply new teaching strategies is not something that can achieved in a day or two. Teacher professional development, as studies show, is not an event, but a process (Harwell, 2003: iv).

## 5.3 RESULTS FROM THE EMPIRICAL STUDY

### 5.3.1 Mathematics teachers' response to learner diversity

The Mathematics teachers who participated in the study recognized and acknowledged the fact that learners in their classes come from diverse backgrounds, have different needs and abilities and should, therefore, be taught differently. These recognition and acknowledgement was, nonetheless, did not match with what they practiced in the classroom. This was evident judging by the manner in which they planned instructional and assessment activities; how they taught these learners; how they organized their classrooms and learning activities; and, how they carried out instructional and assessment activities in the classroom. During my analysis of the teachers' workbooks I found that teachers in the same phase used different lesson plan formats, which showed that they did not plan together. During the observation of lessons it was found that learners were grouped according to their presumed level of intelligence and that more attention was given to struggling learners than intelligent learners. Regarding assessment, emphasis was placed on written work as opposed to other forms of assessment such that include observation. This was confirmed by the fact that observations of learners were not recorded.

### 5.3.2 Challenges Mathematics teachers experience when applying curriculum differentiation in the class

Mathematics teachers who were interviewed in this study showed lack of understanding of curriculum differentiation. Their lack of understanding, attributed to their insufficient professional training in this area, led to their application of instructional strategies that were in conflict with evidence-based strategies of teaching learners in an inclusive classroom setting. There were two sets of challenges teachers who participated in this study experienced. The first set of challenges involves to teaching a class with a mix of intelligent learners and struggling learners. A specific example here is inability to organize grouping of learners where teachers would use such grouping as a disciplinary strategy meant to discipline 'naughty' learners by 'keeping them busy' when they attend to struggling learners, rather than an instructional strategy to support learning. What this suggests was that intelligent learners were not given meaningful tasks in line with the principles of curriculum differentiation. The second set of challenges relates to the use of the CAPS document. Teachers appeared not to use the CAPS document as a policy document that guides teaching and learning, but to use it as a teaching instrument. This was confirmed by the teachers' heavy reliance on the examples derived from the document.

### 5.3.3 Teacher capacity building strategies for curriculum differentiation in the class

Though there is evidence of teachers having been trained, such training has several weaknesses identified during the empirical study. These weaknesses cover the training modality and content, facilitation skills of trainers and logistical problems. The only training participants in this study had received at the time of the interview was one Mathematics workshop which was rather more focused on orientating teachers to changes in the Mathematic curriculum as presented through CAPS document, than to teaching strategies to be applied in a differentiated Mathematics classroom. Their trainers, as the results from the focus group interviews which were corroborated by the in-depth interview, appeared to be lacking adequate facilitations

skills. Teachers' expressed frustration with combined weaknesses of both training and content delivered created an impression among facilitators that teachers have a negative attitude towards Mathematics. Logistical problems such as the time at which workshops were held and the distance teachers had to travel to the training venues, added to the teachers' frustrations.

## 5.4 RECOMMENDATIONS

Curriculum differentiation in the teaching of Mathematics should be viewed within the broader inclusive education context as a strategy to support learners with different needs. Against this background, the following recommendations should be noted:

### 5.4.1 Recommendation to the Department of Basic Education

It is recommended that the Department of Basic Education take note of the teachers' challenges regarding the teaching of Mathematics in a differentiated manner and consider to:

- shift from focusing on a workshop as the main professional development model for training Mathematics teachers to focusing on job-embedded continuous professional development models
- integrate Mathematics content with strategies for teaching the subject during training of Mathematics teachers
- develop and implement a sustainable programme for monitoring and supporting Mathematics teachers at their workplace
- employ full-time circuit-based professional development practitioners with specialization in Mathematics to train Mathematics teachers

### 5.4.2 Recommendations to Mathematics teachers and their schools

Schools and their teachers should entrench inclusive practices in the teaching of Mathematics. They should be creative and develop school-based improvement

strategies for the teaching of Mathematics guided by inclusive education policies. To achieve these goals, they should:

- establish school-based learning communities of Mathematics teachers to integrate professional development into daily life of schools
- adopt a multi-faceted approach to teaching and assessment in Mathematics
- design and use common lesson plan formats the content of which is informed by the school's context in terms of available teaching and learning resources and the special needs of learners

### 5.4.3 Recommendation for further study

Given that teacher's knowledge, skills and attitudes are critical for curriculum differentiation in the teaching of Mathematics, there is a need for a study to be conducted into the Mathematics teachers' responsiveness to various professional development models.

## 5.5 LIMITATIONS OF THE STUDY

This study has limitations in both its scope and the amount of data gathered. In terms of its structure as a dissertation of limited scope, the study could not go as far as exploring the important issue of seeking a suitable professional development model as suggested in Recommendation 5.4.1 above. The study was confined to a small geographical area and followed a qualitative approach in which data were collected from a small sample with the effect that its findings cannot be generalized. One would possibly get a different picture had a quantitative approach been followed in examining the research problem.

## 5.6 CONCLUSIONS

Motivated by poor Mathematics performance of learners in lower grades in South African schools, this study sought to examine the challenges that Mathematics teachers experience when responding to learner diversity in the Foundation Phase classes and capacity-building strategies available to address the challenges. To respond to the research questions that this study posed and, thus, achieve its objectives, literature on capacity building for curriculum differentiation was reviewed, followed upon by an empirical examination. The result of these efforts was the achievement of the aim of this study.

The study has revealed that for learner performance in Mathematics to improve, instruction in this subject should be differentiated. For this to be possible, teachers have to be responsive to the current context of inclusive education by acquiring the necessary knowledge and skills, developing positive attitudes towards inclusion and differentiating instruction by adjusting instructional practices and strategies to learners' different styles of learning and thus, satisfy their different needs. For teachers to succeed in this regard, this study has revealed that teachers need capacity building in the form of continuous professional development that includes training and teacher support. This is presently a challenge for teachers as the results of the empirical study here reveals.

Various options for possible improvement for both teaching practice and professional development geared towards it have been suggested in this study. With concerted effort taken to address the challenges relating to the two main issues, there is hope for possible improvement in the performance of South African learners in Mathematics.

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# APPENDICES

## APPENDIX A

P. O. Box 269
Marishane
1064
9 May 2013

The Circuit Manager
Ngwaritsi Circuit
Nebo
1059

Dear Sir/Madam

REQUEST FOR PERMISSION TO CONDUCT RESEARCH

I hereby wish to make a request for permission to conduct research in three schools in your circuit.

I am an MEd student at UNISA and my student number is 0727 2022. My research topic is *Capacity building for curriculum differentiation in the teaching of Foundation Phase Mathematics in Ngwaritsi Circuit (Limpopo Province).*

In order to fulfil the requirements of this degree, I am required to conduct an in-depth interview with the curriculum advisor and three focus group interviews with Mathematics teachers in three selected schools. In addition to the interviews, and with kind permission of the selected teachers, I shall also observe some lessons. I would like to assure you in advance that my study in the selected schools will in no way interrupt the normal teaching, learning and assessment activities. The study will be carried out between 16 May 2013 and 22 June 2013.

I shall greatly appreciate your kind permission in this regard.

Yours faithfully

Matseke Alinah Marishane
Teacher (Makgatsike Primary School)

**APPENDIX B**

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

**NGWARITSI CIRCUIT**

ENQ: MALEKA KL
CELL: 082 550 5049
DATE: 28/05/2013

**REQUEST FOR PERMISSION TO CONDUCT RESEARCH**

1. The above matter bears reference.
2. In response to your letter dated 09/05/2013 the Circuit management has no objection in giving you the permission to conduct research on your targeted schools in the circuit.
3. The Circuit further urges the schools in which research is conducted, for maximum support as reciprocal benefit is envisaged.
4. We hope you will find your studies informative and benefitting.
5. The Circuit wishes you the best in your studies.

KMaleka
.....
CIRCUIT MANGER

**APPENDIX C**

Box 269
MARISHANE
1064
2013-10-07

Dear Principal

I am a student registered for MEd (Inclusive Education) with the University of South Africa under the supervision of Dr FD Mahlo (Tel. (012) 429 4002). The purpose of this study is to examine ***capacity building for Foundation Phase Mathematics teachers in curriculum differentiation***. Data for this study will be collected by means of interviews, lesson observations and the study of documents such as teacher portfolios. Your school has been randomly selected to participate in this study. As part of the study, your teachers are requested to take part in a voice-recorded interview that will not last for more than 45 minutes. You are hereby assured that the information the teachers give will be treated with utmost confidentiality and that their identity as well as that of your school will be kept private. Data collected from this study will be kept safe for a period of five years and destroyed afterwards. The published results of this study will, however, be made available to you, the Circuit Manager and the Limpopo PED.

No direct or indirect financial benefits shall derive from carrying out this study, nor shall your teachers' participation herein incur any costs.

For any information,please, contact me at 082 743 7267 or email me at alinahmarishane@gmail.com

Thanking you in anticipation,

Matseke Alinah Marishane

**APPENDIX D**

Enquiry : Mathabatha ME
Contact : 013 219 7695
0723546242

MARISHANE PRIMARY SCHOOL

P O BOX 117
MARISHANE
1064
14.06.2013

TO WHOM IT MAY CONCERN

1. This serves to confirm that MS MARISHANE MATSEKE ALINAH has conducted interviews with foundation phase Educators under the leadership of the HOD (Foundation Phase: MS RAMABOYA ML) at MARISHANE PRIMARY SCHOOL .
2. The interviews were conducted on the 19th OF MAY 2013.
3. Hoping that the above information will serve the purpose.

Thanking you in advance.

ACTING PRINCIPAL(MATHABATHA EM

DEPARTMENT OF EDUCATION
MARISHANE PRIMARY SCHOOL
2013 -06- 14
P.O. BOX 117 MARISHANE 1064
LIMPOPO PROVINCE

**APPENDIX E**

Dear Participant

Consent to participate in the study

I am a student registered for MEd (Inclusive Education) with the University of South Africa under the supervision of Dr FD Mahlo (Tel. (012) 429 4002). The purpose of this study is to examine ***capacity building for Foundation Phase Mathematics teachers in curriculum differentiation***. Data for this study will be collected by means of interviews, lesson observations and the study of documents such as teacher portfolios. You and your school have been randomly selected to participate in this study. As part of the study, you are requested to take part in a voice-recorded interview that will not last for more than 45 minutes. You are hereby assured that the information you give will be treated with utmost confidentiality and that your identity will be kept private. Data collected from this study will be kept safe for a period of five years and destroyed afterwards. The published results of this study will, however, be made available to you, your school, the Circuit and the Limpopo PED.

No direct or indirect financial benefits shall derive from carrying out this study, nor shall your kind participation herein incur any costs. For this reason, you are kindly requested to fill in an informed consent form attached hereto.

For any information,please, contact me at 082 743 7267 or email me at alinahmarishane@gmail.com

Thanking you in anticipation,

Matseke Alinah Marishane

**APPENDIX F**

# Informed Consent Form

I, the undersigned, confirm that (please tick box as appropriate):

| | | |
|---|---|---|
| 1. | I understand the information regarding the purpose of this study as presented to me by the Researcher on _____. | ☐ |
| 2. | I have been given the opportunity to ask questions about the study and my participation. | ☐ |
| 3. | I voluntarily agree to participate in the study. | ☐ |
| 4. | I understand that I have an option to withdraw my participation from the study without justifying my withdrawal or facing any penalty for so doing. | ☐ |
| 5. | Matters relating to preservation of confidentiality and the use of pseudonyms in the process have been clearly explained to me. | ☐ |
| 6. | I consent to the use of audio recording, observation and note taking as strategies for collecting data from me in this study. | ☐ |
| 7. | The sharing of data derived from this study through publications and further studies has been explained to me. | ☐ |
| 8. | I understand that other researchers will have access to this data on condition they assure preservation of the confidentiality of the collected data and comply with conditions specified herein. | ☐ |
| 9. | Select only **one** of the following:<br>• I would like my name to be used in reports, publications and other research outputs in recognition of my participation in this study | ☐ |
| | • I do not want my name used in this study. | ☐ |
| 10. | The Researcher and I agree to sign and date this informed consent form. | ☐ |

**Participant:** _____ _____
Signature Date

**Researcher:** M.A. Marishane_____ _____ _____
Name Signature Date

# Interview schedule for teachers

# (Focus Group Interview)

**1.) Teachers' response to learner diversity.**

**1.1. Preparing for Mathematics lesson**

- Explain how you prepare learners for Mathematics lesson.
- What challenges do you experience during this stage?
- How do you address them?

**1.2. Learner participation in the lesson**

- How do you ensure that both gifted and slow learners participate in the lesson?
- What are challenges that you experience in dealing with both groups?
- How do you adjust your teaching styles to learners' learning preferences?

**1.3. Assessment strategies**

- Which strategies do you use when assessing your learners?
- How do you ensure that these strategies address learners differentiated learning needs?
- How do you ensure that your continuous assessment links with both learning content and Annual National Assessment (ANA)?

**2) Teachers' capacity-building challenges.**

- May you briefly explain the nature of training you received recently in CAPS Mathematics?
- What Mathematics aspects (methodology, content etc.) did they cover?
- To what extend did such training meet your expectations?
- What challenges did you encounter during the training?
- What do you suggest should be done to improve training?
- What kind of support did you receive?

# Interview schedule for Curriculum Advisor

**1. Structure of training**

- How do you ensure the effectiveness of the training?
- When do you train teachers?
- How long does the training session take place?
- What aspects of Mathematics did you cover in your last training?
- Briefly describe your own personal training and experience in Mathematics.

**2. Teacher participation**

- Can you describe the nature of teacher participation at the training sessions?
- What common challenges have you identified among teachers during training?
- What do you think should be done to address these challenges?

**3. Monitoring and support**

- What support do you give Mathematics teachers?
- What plans do you have in place to address the general concern relating to poor performance of learners in Mathematics?

**3. Alignment of training with CAPS**

- How do you ensure that teachers implement differentiated instruction in accordance with CAPS policy?
- How do you ensure that the school based assessment links with the ANA?

APPENDIX I

# Observation Schedule

**1. Classroom conditions**

1.1 Flexible grouping
1.2 Respectable tasks
1.3 Continuous assessment
1.4 Questioning strategies
1.5 Teaching-learning content
1.6 Learner participation
1.7 Learning support material (resources)

**2. Teacher's support**

2.1 Support for slow learners
2.2 Support for gifted learners

**APPENDIX J**

# SCHOOLOFEDUCATION

## DepartmentofCurriculumStudiesandEducationManagement

ToWhomItMayConcern

Date: 2013November26

| EDITINGOFAMASTERSDISSERTATION |
|---|

Ihavethepleasureto certify herebythat themini-dissertationtitled CAPACITY BUILDING FORCURRICULUMDIFFERENTIATION INTHETEACHING OF FOUNDATIONPHASE MATHEMATICSIN NGWARITSI CIRCUIT (LIMPOPO PROVINCE byMatsekeAlinahMarishanehasbeeneditedforgrammaticalandtechnicalerrorsbyme,DrN BSadiki.

Yoursfaithfully

DrN.B.Sadiki

UniversityofVenda

PRIVATEBACKX5050,THOHOYANDOU,0950LIMPOPO PROVINCE
TELEPHONE(0150)9628272 FAX(015)962 8050
EMAIL:Ben.Sadiki@univen.ac.za